Opportunities for Action:

Recommendations Supporting the Next Iteration of Point-Nonpoint Water Quality Trading Programs

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About Us

Willamette Partnership is a 501c3 nonprofit working with a diverse coalition of leaders to shift the way people value, manage and regulate the environment. We continue to seek innovative ways to expand beyond the Willamette Valley in collaboration with other regional organizations with similar missions to direct investments in restoration to the places that matter most and at a scale that makes a difference.

Contact

Willamette Partnership
2550 SW Hillsboro Hwy
Hillsboro, OR 97123
503-681-5112
info@willamettepartnership.org

Layout and cover design by Joni Elteto and Nicole Gorko
Thank you to the following people for contributing photos

Clean Water Services
Joni Elteto
Kevin Hayes
Jared Kinnear
Brian Kittler
Eric Sprague
Ted Weber
USDA Forest Service, Chesapeake Bay
USDA Natural Resources Conservation Service
Willamette Restoration Initiative
Ron Nichols

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CONTRIBUTORS

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EXPERT REVIEWERS

Claire Schary, U.S. Environmental Protection Agency
Bob Rose, U.S. Environmental Protection Agency
Jimmy Daukas, American Farmland Trust
Ranei Nomura, Oregon Department of Environmental Quality
Ann Roda, Pennsylvania Department of Environmental Protection
Veronica Kasi, Pennsylvania Department of Environmental Protection
Brian Schlauderaff, Pennsylvania Department of Environmental Protection
Jeremy Sokulsky, Environmental Incentives
Jessica Fox, Energy Policy Research Institute
Mark Kieser, Kieser and Associates
Dan Nees, University of Maryland
Peter Ruffier, Clean Water Services
Tracy Stanton, The Freshwater Trust
Heather Simmons-Rigdon, South Central Washington Resource Conservation District
Paul Marchetti, Pennsylvania Infrastructure Investment Authority (PENNVEST)
Joanna Silver, Markit Environmental

i. Summary

Watersheds across the United States have used different forms of water quality trading over the last decades as a flexible tool for meeting water quality goals. The successes, failures, and valuable lessons learned gathered by pioneering groups can be instrumental in helping new trading programs lay the groundwork for success.

Water quality trading programs that connect point source buyers (e.g. municipal wastewater facilities) and nonpoint source sellers (e.g. farms) as one tool to meet water quality goals under the Clean Water Act are still young. Both emerging water quality trading programs and the 24 active point-nonpoint trading programs require support at their different stages of program evolution from policy, technical resources, and financial sources. That support must come from federal and state agencies, private organizations, and other stakeholders. This paper introduces some proposed actions that federal and state authorities can take to help programs launch, and most importantly, sustain themselves through to realized improvements in water quality.

Audience: Most of these options for action are directed toward U.S.EPA, USDA, and state water quality agencies. Many of the actions may require resources that are not available within any one agency.

Other reports have also offered recommendations for water quality trading that are still relevant today.[1]

Table 1.0. lists some of these actions. These and other actions will be needed as programs transition from their early stages of assessing feasibility, through the process of program design and gaining stakeholder agreement, and eventually being able to sustain a fully operational trading program over time.

Building a trading program can feel like climbing a mountain, which is why programs need active support (photo courtesy of by Joni Elteto)

[1] http://water.epa.gov/type/watersheds/trading/upload/wqt.pdf

TABLE 1.0. SUMMARY OF RECOMMENDED ACTIONS TO SUPPORT WATER QUALITY TRADING

Action	Audience
Improve the opportunities for trading programs to succeed	**(acronyms defined below)**
Provide capacity to local areas to assess feasibility	USDA
Provide technical assistance so local programs can adapt existing tools	USDA, U.S.EPA, nonprofits
Identify a trading lead within each state water quality agency	State agencies
Insert trading early (e.g. in TMDL documents) as an option to meet water quality goals	State agencies
Allow Clean Water State Revolving Fund and USDA Rural Development Water and Wastewater funds to purchase nonpoint source reductions in a trading program	USDA, U.S.EPA, State agencies
Provide updated trading communication templates and points of contact for key stakeholder groups	Various stakeholders
Clarify regulatory guidance on water quality trading	
Update 2003 U.S.EPA Water Quality Trading Policy	U.S.EPA
Help states provide clear guidance on trading including updating 2003 U.S.EPA Water Quality Trading Policy and other guidance	State agencies; U.S.EPA; Assoc. of State Clean Water Agencies; USDA
Develop standards for credit quantification methods	
Make Nutrient Tracking Tool available as a national tool	USDA, U.S.EPA
Put the trading option on par with engineered solutions where feasible	
Provide tools for point sources to include trading options in their facilities plans, and market those tools to utilities and consulting engineers	WEF, NACWA, USDA, WERF, consultants
Use simple pilot transactions to show trading is viable	Various stakeholders
Provide early guaranteed buyers for water quality credits	USDA
Provide communication tools to send clear and consistent messages about their support for a trading alternative	Assoc of State Clean Water Agencies
Find ways to establish a track record for water quality credits as “capital” assets	NACWA; WEF; GASB
Encourage more systematic evaluation, sharing of program results, and adaptive management	
Provide a national reporting framework for trading programs to generate and share data	U.S.EPA, USDA
Develop a standard verification template for monitoring performance and compliance for individual nonpoint source projects	USDA, USEPA
Develop a methodology for assessing program effectiveness	U.S.EPA, USDA
Improve the systems for adaptive management of programs	Various stakeholders
Engage trading practitioners in shaping national research priorities	U.S.EPA, USDA, USGS, NSF, WERF
Link regional programs together to increase program design consistency across states	

GASB: Government Accounting Standards Board NACWA: National Assoc. of Clean Water Agencies NSF: National Science Foundation

USGS: US Geological Survey WERF: Water Environment Research Foundation WEF: Water Environment Federation

I. Improve the Opportunities for Local Trading Programs to Succeed

1.1. Provide Capacity to Local Areas to Assess Feasibility

Positive and challenging experiences with point-nonpoint trading in places like the Northwest, Upper Midwest, and Chesapeake have shown that trading programs are more likely to be successful when:

- There are clear sources of demand;
- State water quality agencies support trading;
- There is science to quantify water quality improvements from nonpoint sources;
- Groups are ready to supply credits; and
- Locally trusted leaders are ready and willing to champion trading.

There are a lot of factors to weigh before deciding to start a new program, and many groups jump into trading program design before carefully assessing whether or not a program is feasible. Agencies, foundations, and others who support water quality trading programs could consider requiring a feasibility study before funding program design and offer small grants in support of such studies (U.S.EPA, 2008).

That small grant program could include one-year grants and/or technical assistance from people who have completed feasibility studies in other watersheds. The feasibility study could include development of a mock transaction to educate stakeholders and to work through possible mechanics of trading, outreach to engage and educate stakeholders, and building a straw man outline of a trading program design. Prioritization for feasibility assessments could be based on demonstrated:

- Potential demand through new or existing NPDES permits with revised limits based on a TMDL or other regulatory instrument, or other indicators of likely investment (or need to reduce expenses) in water quality improvements;
- Support for exploring trading from state water quality agencies, point sources, producer community, and environmental groups;
- A lead convenor (e.g. a water quality agency, local government, farm group, or nonprofit) committed to facilitate stakeholder engagement; and
- A list of potential trading tools, research, and other infrastructure that may serve as the starting point for a new program.

It can sometimes be challenging to tease apart actual from potential demand, or lay out the sequencing of program design steps. It would be helpful for local groups to have a detailed road map and methodology for completing a feasibility study. This includes questions and strategies to ask state water quality regulators about their support of trading, as well as wastewater utilities about their compliance alternatives, sources of data for restoration costs, and samples of completed feasibility studies.

1.2. Provide Technical Assistance so Local Programs Can Adapt Existing Tools

No one should have to start a trading program from scratch. There are a lot of good models and experience to build from, though that material can be difficult to access. There needs to be a way to provide technical assistance to trading program developers on things like selecting and adapting credit calculation methodologies, dealing with stakeholder challenges, and securing demand. Having a central home for these tools can aid greatly in this process (e.g. the current U.S.EPA trading website).

A coalition of funders might provide access to an in-depth (e.g. over two days) water quality trading leadership development course for trading programs who have a feasibility study in hand, but who need help mapping out their process to design a program. Knowing each community has unique challenges, this training would be a forum to share information and get feedback specific to participants' local areas.

As part of NRCS's 2012 water quality trading Conservation Innovation Grant, Office of Environmental Markets planned to provide a trading network for grantees. If still active, that may be a resource for technical assistance.

1.3. Identify a Trading Lead within Each State Water Quality Agency

Many of the decisions needed to support trading will come from state water quality agencies (or from U.S.EPA in non-delegated states or tribes). Ideally, each state would dedicate some portion of a position toward a trading lead within the agency. That person would understand how NPDES permits and TMDLs are written and implemented, would have strong partnership skills, and would have direct support from agency leadership. The trading lead would consult on new TMDLs and NPDES permits to explore opportunities for trading, and they would be an active participant in trading program designs. The lead would also help train agency staff in local offices and ensure consistent views toward trading across the state. In the 24 active point-nonpoint trading programs, state water quality agencies have played an active role in making those programs work.

1.4. Insert Trading Early as an Option to Meet Water Quality Goals

Because it is a relatively new tool, water quality trading is not yet systematically considered as an option when stakeholders design programs for meeting or maintaining water quality goals in their watersheds. Implementing trading programs is more likely to succeed where state water quality agencies establish clear and legal allocations that consider trading options (e.g. in a TMDL or in a permit), and wastewater facilities include trading as an alternative early in their facility planning processes.

1.5. Allow Clean Water State Revolving Funds and USDA Rural Development Water and Wastewater funds to purchase nonpoint source Pollution Reductions

The Clean Water State Revolving Funds (CWSRF) and USDA Rural Development Water and Wastewater funds are two major sources of low-interest loans and grants to build new wastewater and drinking water facilities. Regarding wastewater, both programs could authorize use of funding to purchase nonpoint source pollution reductions in a water quality trading program. Such "green" purchases would likely be less expensive than investments in "gray" infrastructure that are the usual focus of the programs.

There is precedent for government loan and grant programs to support green infrastructure investments. The American Recovery and Reinvestment Act of 2009 stated "…not less than 20 percent of the funds appropriated herein for the Revolving Funds shall be for projects to address green infrastructure, water or energy efficiency improvements or other environmentally innovative activities."[2] Also, the Pennsylvania Infrastructure Investment Authority (PENNVEST) requires wastewater treatment plants to evaluate the most cost effective solution before it funds upgrades, whether that is treatment technology or purchasing nutrient credits.

1.6. Provide Updated Communication Templates and Points of Contact for Key Stakeholder Groups

Each of the key stakeholder groups involved in trading—water quality agencies, point sources, environmental groups, and producers—need to understand trading in their own language, and hear it from people they trust. Local groups could use a template of communication materials, targeted to each group, which would include common questions, concerns, and resources for those groups. The U.S.EPA has developed some of this for permit writers, groups like American Farmland Trust and USDA have developed these for producers, and the Water Environment Federation has developed materials for the wastewater community.[3] Some of these may need updating, while there is an additional need for materials to be developed for environmental groups about the pros and cons of trading, when it is appropriate, when it is not, and which design elements to pay closest attention to.

[2] http://water.epa.gov/grants_funding/cwsrf/upload/2003_12_11_cwfinance_cwsrf_final.pdf

[3] EPA Toolkit for Permit Writers (http://water.epa.gov/type/watersheds/trading/WQTToolkit.cfm); Getting Paid for Stewardship: ; American Farmland Trust (http://www.farmland.org/programs/environment/water-quality/water-quality-trading/What-is-Water-Quality-Trading.asp); WEF Trading Guide for the Wastewater Community (https://www.e-wef.org/Home/ProductDetails/tabid/192/productid/6920/Default.aspx)

II. Clarify Regulatory Guidance on Water Quality Trading

The Clean Water Act does not specifically address water quality trading. Some environmental groups say that without specific authorization, U.S.EPA should not allow trading, while others disagree (Inside EPA, 2012). Amending the Clean Water Act would be challenging and outcomes unpredictable. Short of revisions to the Clean Water Act, the following recommendations can help provide more certainty around water quality trading.

2.1. Update 2003 U.S.EPA Water Quality Trading Policy

U.S.EPA Water Quality Trading Policy was issued in 2003 before many of the active point-nonpoint programs were established. With new lessons learned and emerging needs for clarity from U.S.EPA, it may be time to update that guidance. This may not be feasible in the near term, but there are a number of potential updates needed to the 2003 U.S.EPA Policy. Some of the specific elements that states are struggling with include:

How do state authorities establish baselines for nonpoint sources, both in the TMDL and as part of trading program implementation?

Ideally, the TMDL nonpoint source allocation serves as a starting point for nonpoint source baselines in a trading program that is TMDL-driven. If nonpoint source baseline requirements are set too high, the cost of a water quality credit may be more than the cost for a point source to install technology, which may be completely appropriate in many watersheds. If state water quality agencies and watershed stakeholders want trading to be a feasible tool for meeting Clean Water Act goals, baseline levels need to be consistent with achievable goals. If meeting a TMDL goal for temperature means that every acre of available riparian land must be converted to forest, then no riparian

States in the Chesapeake are defining trading policies to guide projects like these (photo courtesy of USDA Forest Service)

shading project could ever be considered additional to that baseline. In cases where a nonpoint source allocation under a TMDL leaves no room for trading, state regulators, U.S.EPA, and stakeholders should work together to find a baseline solution that can still satisfy "reasonable assurance"[4] under the TMDL while creating a baseline that ensures additionality on the part of nonpoint sources.

How can states use trading concepts to incentivize action with state or local rules prior to or outside of TMDL implementation?

State policy can support NPDES permits that have concentration-based limits, mass load limits, and other incentives for early action prior to a formal TMDL being issued. Some of these incentives might include longer compliance schedules for point sources (e.g. Ohio River Basin), or better trading ratios (e.g. Great Miami River program). These permits, or other forms of agency assurances, should provide certainty that actions taken by point sources and nonpoint sources prior to a TMDL will count after a TMDL is issued. Good water quality models can help facilitate trading in these scenarios.

What measures can program designers implement to adequately deal with risk?

Programs like the Ohio River, Pennsylvania, and Willamette create reserves as a form of insurance against project failure. U.S.EPA guidance needs to be updated to include some best practices for risk management beyond use of trading ratios.

How can water quality trading program administrators monitor and track the results of trading programs over time?

U.S.EPA and individual states have developed guidance for how point sources should monitor their discharges, but there is little equivalent guidance for monitoring and tracking the results of nonpoint source improvements used as credits for a point source. Guidance on monitoring needs to cover tracking the performance of credit-generating projects for compliance purposes, monitoring of cumulative trends to assess program effectiveness, and the central systems to track transactions. This becomes especially important as programs begin operating at larger geographic scales in places like the Chesapeake, Upper Mississippi, and Pacific Northwest.

2.2. Help States Provide Clear Guidance on Trading Including Updating 2003 U.S.EPA Water Quality Trading Policy and other Guidance.

U.S.EPA guidance will not be able to provide the level of detail needed for most trading programs. State water quality agencies will need their own guidance or policy. That guidance should include standard NPDES permit and TMDL language that incorporates trading. In general, internal guidance or policy developed under existing regulatory authority provides more flexibility as states first develop programs. As a trading program matures, rules or statutes may provide stronger legal footing. However, rules or statutes can also be less supportive of the adaptive management approach necessary for the long-term success of a program.

Quantifying water quality improvements in local streams

[4]When both point and nonpoint source load allocations are defined in a TMDL, U.S.EPA's 1991 TMDL Guidance states that there needs to be "reasonable assurances" that nonpoint sources will meet their load allocations for the TMDL to be approvable (http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/final52002.cfm).

III. Develop Standards for Credit Quantification Methods

Scientifically valid and transparent methods for quantifying nonpoint source credits are essential to any trading program. These methods, whether models, direct measurement protocols, or BMP efficiency rates, need to be responsive to local conditions. Yet, within that variability, USDA and others can provide some best practices for quantification. As quantification methods are created, co-branding or endorsement from both USDA and U.S.EPA will help build confidence in those methods (U.S.EPA, 2008).

3.1. Make Nutrient Tracking Tool Available as a National Tool

Nutrient Tracking Tool[5] (NTT) has been developed by USDA NRCS as a model to quantify the site-specific reductions in nitrogen, phosphorous, and sediment from conservation practices implemented on farm fields. NTT is currently operational in Maryland, Ohio, and Oregon, and several emerging trading programs are requesting funds to use NTT to quantify water quality credits (C. Lucero, pers. comm., 2012).

The Energy Policy Research Institute (EPRI) completed a thorough review of NTT as part of its Ohio River Basin trading program (2011), and identified real potential to develop Nutrient Tracking Tool as a standardized approach to quantifying nutrient reductions around the country. Yet, there were significant weaknesses and gaps in the model that could be addressed by some of the following actions (more detailed suggestions are contained in the EPRI report):

NTT databases need to be populated with climate and crop management data from all 50 states. This gets especially challenging in states with high crop diversity (e.g. California or Florida). In these cases, crop management files may exist, but require more effort to bring into NTT. There needs to be a plan and funding to roll out NTT to additional states. This might target priority areas for USDA (e.g. based on existing trading demand or high priority watersheds for nutrient reductions), or for U.S.EPA where nutrient limits are in place or in development.

NTT produces estimated reductions at the edge of a farm field, but it does not route those nutrients into a stream or through the stream down to point of concern (e.g. from Ohio to the Gulf of Mexico). Linking NTT to watershed models like the Soil and Water Assessment Tool (SWAT) or the Watershed Analysis Risk Management Framework (WARMF) would enable NTT edge-of-field results to be translated to watershed impacts and increase its applicability in water quality trading programs. As NTT is rolled out nationally, there needs to be very clear version control, so that if a version is calibrated for crop conditions in southern Florida, changes for western Texas do not change the numbers for Florida. This is essential for using NTT in trading. Establishing a protocol whereby NTT incorporates updates to the Agricultural Policy Extender (APEX) model in a way that is transparent and regularly timed (e.g. changes are not rolled out on-the-fly, but rather saved and compiled into regular release dates) would be one approach to this. Users should be able to select which calibrated version of APEX to use.

There needs to be an organization, like USDA NRCS, that is responsible for maintaining the model code, updating data sources, and providing web support.

NTT is a compilation of several models, each with a history of application across the country. However, the primary biophysical model behind NTT, the APEX model, has not been extensively reviewed, validated, or calibrated to local conditions in most parts of the country. A reputable organization, coordinating with USDA, U.S.EPA, and other agencies, needs to conduct a thorough scientific review and set up validation and calibration sites to test model outputs against measured reductions in nutrient runoff. That work needs to result in formal documentation of NTT.

NTT also needs to be built in a way that can be integrated into other software interfaces and user tools. For example, World Resources Institute's NutrientNet[6] website is incorporating NTT into its software to be useful across the Chesapeake Bay states. As NTT is used in more and more states, there will need to be some effort to ensure clarity on which models serve as engines for which types of trading software and user tools.

[5] http://nn.tarleton.edu/NTTWebARS/
[6] http://www.nutrientnet.org

IV. Put the Trading Option on Par with Engineered Solutions where Feasible

Almost every water quality trading program is constrained by the ability of point sources to treat nonpoint source practices as a viable alternative in comparison to engineered technology. As long as agricultural BMP comparisons to grey infrastructure are apples to oranges, point sources will be hesitant to invest. Every stakeholder should be focused on how they can best increase the apples to apples comparisons for water quality improvements.

4.1. Provide Tools for Point Sources to Include Trading Options in Their Facilities Plans, and Market Those Tools to Utilities and Consulting Engineers

Generally, every point source has a 20-year facilities plan that outlines plans for future upgrades, including an alternatives analysis for meeting its treatment goals. Inserting a trading alternative into those facilities plans is important. From the facilities plan alternative, a point source begins to explore costs, financing, and implementation timelines. Inserting new alternatives later on becomes increasingly difficult. Often, facilities plans are prepared by consulting engineers. These firms rarely have direct experience with water quality trading or nonpoint source BMPs.

There is also a mismatch between the 20-year time horizon required for formal facilities plans and the shorter-term contracts for agricultural BMPs generating credits (e.g. 5 years). Point sources need the tools to manage shorter-term investments and think about the real risks of investment in water quality credits.

The Water Environment Federation (WEF), USDA, U.S.EPA, and others could provide the tools needed for consulting engineers to insert a trading alternative into facilities plans. PENNVEST makes this a precondition of their financing. Consulting engineers also need the direct outreach and capacity building to know how to use these tools and who they can go to for help in applying them. Outreach could occur at WEF's annual WEFTEC conference via trading sessions or pre-conference workshops.

4.2. Use Simple Pilot Transactions to Show Trading is Viable

Pilot transactions provide early, simple demonstrations for how a trading program can work. Pilots reveal the strengths and weaknesses of trading in ways difficult to imagine in the abstract. One of the easiest ways to initiate a pilot is to target early conservation project investments (not necessarily credit purchases) on watersheds with point sources considering trading. That early investment can help develop cost data and demonstrate viability for the point sources. It can also help build the supply capacity (e.g. trained restoration crews, nursery stock, engaged landowners), so that when a point source chooses to invest, the supply chain for credits is already in motion. This can be critical for point sources that may have credit benchmarks they need to meet in the first two years of their five-year permits. For example, the Oregon Watershed Enhancement Board has committed $400,000 to fund BMPs in the Klamath River watershed, and they are providing a portion of those funds to estimate phosphorous reductions using the same trading infrastructure that point sources might use. The state agency gets outcome measures for their investments (e.g. lbs of phosphorous removed), and Klamath point sources get to see how they might invest in similar actions.

4.3. Provide Early Guaranteed Demand or Supply for Water Quality Credits

Many factors can delay purchases of water quality credits. NPDES permits might get delayed, TMDLs could get litigated, or point sources may choose other alternatives. All this creates uncertainty in demand, which slows the ability of landowners to provide credits. Conservation investors like state agencies might consider developing a guarantee program for water quality credits. Such a program would provide added assurance to producers of credits that there will be someone there to purchase high quality credits if a point source purchaser falls through. Alternately, USDA Rural Development could use its conservation loan guarantee or other programs to provide some of this function.

PENNVEST helps guarantee a supply of credits for buyers who participate in its nutrient credit auctions.

Such guarantee programs would help smooth out supply and demand discrepancies that are more likely to occur at program start-up. As the water quality trading program matures, such guarantee programs could be phased out (e.g. after the first three years).

4.4. Provide Communication Tools for State Water Quality Agencies, Elected Officials, and Others to Send Clear and Consistent Messages about Their Support for a Trading Alternative

Trading stakeholders should not underestimate the power of their communications in ensuring successful programs. In Oregon, the Director of the Department of Environmental Quality attended a City Council meeting for a facility considering trading to assure the Council that they were in this together. That assurance, echoed from TMDL modelers to permit writers, has bred confidence in trading from other wastewater facilities. State agencies could use a brief set of talking points for clearly communicating their views on trading to wastewater operators, public works directors, and elected officials.

Senior policy makers in the Chesapeake Bay watershed have expressed their support of water quality trading. When the USDA announced its intent to focus 2012 Conservation Innovation Grants on trading, including $10 million nationally and $5 million in the Chesapeake Bay watershed, U.S. Senator Ben Cardin said "Today's funding announcement ensures that the Bay will continue to be at the cutting-edge of water quality solutions by creating market-based programs that will reduce harmful pollution while saving money for water utilities and local communities and generating needed income for our farmers." When Pennsylvania issued its water quality trading policy in 2005, then-governor Ed Rendell said "Nutrient trading provides an environmentally creative and cost-effective way to tackle water quality issues in the Commonwealth."

4.5. Find Ways to Establish a Track Record for Water Quality as "Capital" Assets

Many buyers in water quality trading programs are public entities—municipal wastewater utilities. A municipal wastewater budget generally falls into two pots—capital and operations. The capital budget is generally larger, and for local governments and special districts, it is the budget they can use to issue bonds to fund projects. If a wastewater utility's operations budget gets too large in proportion to its capital budget and rate base, the utility's bond rating (its ability to borrow money cheaply) can be negatively affected. Thus, it is very important for water quality credits to be considered capital assets. Utilities generally forecast their capital improvement budget for 5-10 years, but update it annually (see the Government Finance Officers Association site for more on Best Practices and Advisories.)[7]

In several instances, utilities can capitalize water quality credits if there is a recorded contract (e.g. a 10-year easement protecting BMPs) that the utility has some financial interest in. In other types of water quality transactions, it is less clear whether these can be capitalized. State clean water revolving funds help local governments invest in capital wastewater infrastructure. U.S.EPA and state agencies can clarify the ability of these funds to purchase credits as a viable alternative to building new technology. USDA, U.S.EPA, National Association of Clean Water Agencies, and others can provide guidance to utilities on the accounting treatment of credits.

Ultimately, the goal would be for the Government Accounting Standards Board to provide guidance to utilities on when and how to treat water quality credits as capital assets.

The Chesapeake Bay is an asset—how to account for that?

[7] http://www.gfoa.org.

V. Encourage More Systematic Evaluation, Sharing of Program Results, and Adaptive Management

One of the most common questions for trading programs is, "How do we know our water quality will get better?" Trading can be a valuable tool for providing regulated sources with the flexibility to meet their water quality obligations cost-effectively, but there does need to be a way to measure and communicate its contribution (positive or negative). These monitoring and tracking needs come in three forms: 1) national tracking of trading programs and activities; 2) verification and monitoring for compliance of projects; and 3) monitoring for program effectiveness long-term. There may be a need to look again at roles for websites such as the Environmental Trading Network and U.S.EPA's trading website to house shared resources.

5.1. Provide a National Reporting Framework for Trading Programs to Generate and Share Data

Currently, it is difficult for USDA, U.S.EPA, or anyone else to determine transaction activity and location of trading programs across the country. Individual states (e.g. Pennsylvania) provide transparent access to their program data, but there is no up-to-date, centralized, and aggregated source of data across all programs that is both transparent and easy to access and analyze. U.S.EPA and state agencies could update their reporting frameworks for trading programs, so that each water quality trading program is required to report standardized and regular data that can be rolled up into a national picture of trading activity and outcomes. Such a framework would require a central way to house and share this data, and might include a requirement in grants or permits to report data to that central source. The common reporting framework might include:

- The latitude/longitude of the center point of a program's trading activity with a listing of the 8-digit hydrologic unit watersheds encompassed by the trading program. This will enable a mapping of all active trading programs;
- Number and type of projects implemented, including the number of producers engaged;
- Total credits generated (both verified and certified) per year; and
- Total credits transacted per year.

State agencies, with support from USDA and U.S.EPA, could strongly encourage or require the use of a common or interlinked system of registries to track all water quality trades, centralize reporting, and make information transparent to the public. There may be a need for a national registry of water quality credits that localized credit tracking databases can provide data to in a standardized way.

5.2. Develop a Standard Verification Template for Monitoring Performance and Compliance for Individual Nonpoint Source Projects

Groups of states, with templates provided by USDA and U.S.EPA, might generate shared protocols for verification of estimated nonpoint pollution reductions and centralized management of credit ledgers in a way that is publically accessible and up-to-date. Verification should be clear about guidelines for avoiding conflicts of interests including: what needs to get verified, when, and by whom. Ideally, verification protocols are as similar as possible across environmental market types (e.g. carbon, water, wildlife habitat).

5.3. Develop a Methodology for Assessing Program Effectiveness

It may be some time before trading programs can say whether they are contributing to the intended water quality benefits in a TMDL or other watershed strategy. The delay is due to time required for nonpoint source BMPs to mature and realize their full potential to remove pollutants, as well as time for a significant volume of credit transactions to occur. In North Carolina, ten years of data demonstrate that an offset program in the Tar-Pamlico watershed is helping to maintain water quality. Many programs do not have a structured way of collecting the data needed to answer this question 10 years out, or to provide interim measures in 2-5 years on progress.

USDA, U.S.EPA, and/or other agencies could put together an effectiveness monitoring framework that other programs can build into their trading programs. The framework would have two functions: 1) provide data from projects and the watershed that can be used to re-calibrate credit calculation methods, and 2) track trends at the watershed scale to inform broader changes to program design and operations. This monitoring framework would have to link the contribution of trading programs toward water quality goals with other concurrent efforts (e.g. the NPDES permit program, USDA programs like the Environmental Quality Incentives Program, and other efforts).

5.4. Improve the Systems for Adaptive Management of Programs

Many trading programs recognize the need for adaptive management, but few have laid out the plans, financing strategies, and other elements needed in order to make adaptive management work. In every program, credit quantification tools will eventually need updating and rules will change based on experience. Stakeholders need a predictable schedule of changes, so that 1) changes do not create undue uncertainty, and 2) program participants are pushed to revist assumptions made early in trading program design. The Chesapeake Bay Program and the Lake Tahoe Clarity Crediting programs provide some of the most complete examples of adaptive management systems. For instance, the Chesapeake Bay Program has work groups that regularly review efficiencies of new and existing best management practices. Trading programs in the Chesapeake Bay are expected to update their programs periodically to incorporate these new efficiencies. The Great Miami program in Ohio has established a method where fifteen percent of all projects could be intensively monitored for data by Ohio State University that would be used to improve credit quantification models. During the pilot program, this data has not been collected, but would be as the program is used to meet nutrient criteria. Ambient water quality data is also collected at stations throughout the watershed to establish long-term water quality trends.

5.5. Engage Trading Pracitioners in Shaping National Research Priorities

Water quality trading relies on robust science to quantify some complex ecological interactions in terms simple enough that rapid decisions can be made. In many places that science already exists and just needs to be linked to implementation. In others, there are pressing research questions that trading programs still need answers for. Trading programs need to be proactive about engaging researchers, and researchers need to be receptive in responding to those pressing needs.

Water quality trading programs might create a shared wish list of research questions held by USDA and/or U.S.EPA that they need answered in order to sustain or improve their programs. This wish list would include the timeframe of needed answers, who would be involved in reviewing research, and the form of information delivery most useful to local programs. The wish list could be integrated into agency research arms, university research, trade-association programs (e.g. Water Environment Research Foundation), and funding priorities for granting agencies. Some initial items for the wish list might include:

- Validation of existing water quality models (e.g. APEX and SWAT), for use nationally. This would include establishing "reference" sites for direct measurement of pollution reduction for BMP effectiveness. The Chesapeake Bay Program systematically reviews BMP literature to establish effectiveness rates, but other regions need this effort, particularly arid parts of the western United States;
- Connection of models across scales from the project level to the watershed;
- The economics and transaction costs of risk and uncertainty in trading;
- Water quality models for more complex restoration actions (e.g. floodplain and wetland restoration); and
- The science that links a numeric standard (e.g. kilocalories of thermal energy) to a narrative standard (e.g. healthy salmonid habitat) for use in permitting.

VI. Link Regional Programs Together to Increase Program Design Consistency Across States

Different elements of water quality trading operate at different scales. Trading program policy is largely driven by state agencies, while day-to-day program operations are generally done in local watersheds. Increasingly, trading infrastructure is applicable nationally. The U.S.EPA region may prove to be the ideal scale at which to coordinate information exchange, policy consistency, and infrastructure development. The U.S.EPA region scale can help balance the ecological needs of larger systems such as the Mississippi with the desire locally to shape activities in a smaller watershed.

As water quality trading evolves, increased consistency in policies and use of shared tools across states can help increase transparency and reduce start-up costs.

Environmental organizations also desire consistency by which to judge the effectiveness of trading programs. As state agencies and U.S.EPA see increases in water quality trading proposals, the need for standards through which to measure their viability grows. Local stakeholders facing resource constraints can benefit from increased consistency because of lowered start-up costs.

Where opportunities exist, non-governmental organizations, federal agencies, or the trade associations for wastewater facilities or water quality agencies can facilitate cross-regional agreements. Those regional agreements might include using Nutrient Tracking Tool to quantify on-farm nutrient reductions. The agreements could establish multi-state agency policy and standard operating procedures for trading, or call for a shared, publically-viewable database to track credit transactions.

Trading programs need to adapt to changing conditions, just like farmers do (photo courtesy of Ron Nichols)

VII. Conclusions and Next Steps

Water quality trading programs are still in their learning phases. After several decades of work, several successful examples exist of programs that have reduced costs of improving water quality, improved trust amongst stakeholders, and led to water quality improvements. It remains to be seen how significantly water quality trading might contribute to cleaner water across the country, but it is one important tool among many for improving water quality. The actions presented throughout this report, and summarized in Table 7.0., can support water quality trading as one, flexible tool watersheds across the United States can use as part of their broader efforts to improve water quality.

TABLE 7.0. ACTIONS TO SUPPORT WATER QUALITY TRADING (SUMMARIZED FROM TABLE 1.0.)
1. Improve the opportunities for trading programs to succeed
2. Clarify regulatory guidance on water quality trading
3. Develop standards for credit calculation tools
4. Put the trading option on par (economically, politically, and legally) with engineered solutions
5. Encourage more systematic evaluation, sharing of program results, and adaptive management
6. Link regional programs together to increase program design consistency across states

VIII. References

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