National Forum on Synergies Between Water Quality Trading and Wetland Mitigation Banking

Forum Report

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Cover Photos:

Wildlands Mitigation Bank, Placer County, California.
Courtesy of Craig Denisoff

Planting trees for a buffer with Trees Forever, Illinois Buffer Partnership, part of a three-tiered approach of trees, shrubs, and native grasses.
Courtesy of Alley Ringhausen

Stormwater retention basin: a pool of water formed by a dam, designed to detain water during a storm, thereby reducing flash flooding and controlling erosion.
Courtesy of Alley Ringhausen

Table of Contents

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National Forum on Synergies Between Water Quality Trading and Wetland Mitigation Banking

The *National Forum on Synergies Between Water Quality Trading and Wetland Mitigation Banking* was held July 11-12, 2005, in Washington, DC. The forum was sponsored by the U.S. Environmental Protection Agency.

The 2-day meeting was designed to achieve the following objectives:

- Advance point/nonpoint source trading on a watershed scale by identifying 'lessons learned' from wetland mitigation banking; and
- Explore the potential role wetlands can play in providing water quality credits as part of a watershed scale trading program.

The primary goal of the meeting was to provide a forum to discuss how market-based approaches, such as water quality trading and wetland mitigation banking, can help achieve water quality goals at lower cost. The forum was not meant to yield consensus-based directives for the agencies. However, several themes that were revisited repeatedly by the forum participants warrant mention.

- Several participants viewed water quality trading as a critical tool for achieving better environmental results at lower cost, particularly in geographic areas where nonpoint source pollution dominates water quality problems.
- Although wetland mitigation banking did not prove to be a perfect model to guide the development of water quality trading programs, the role of a third party as a credit broker or certifier did have significant resonance. Participants felt that third parties may play an important role in water quality trading, including ensuring legitimacy (e.g. third party certification, monitoring, modeling), managing risk and uncertainty/liability, and certifying and valuing credits.
- Many participants stressed the need to define credits based on sound scientific and economic modeling that can reduce uncertainty.
- Several participants stated that water quality trading programs must provide at least the same degree of certainty and transparency as the §402 permit system to allow for public oversight of the programs.
- Many participants stressed the importance of developing monitoring programs that allow for oversight.

This report is designed as a representative record of the issues discussed at the water quality trading forum. It can serve as a resource for those interested in understanding the connections between wetland mitigation banking and water quality trading, how these approaches differ in important ways, and how a third-party banking approach could be used to address some of the challenges to implementing point/nonpoint source trading on a watershed scale.

Audio recordings from the forum, as well as PowerPoint presentations, other supporting materials, and links to many of the policy and technical documents discussed in this report are available through the Environmental Law Institute's website at: http://www2.eli.org/research/wqt_main.

INTRODUCTION

The *National Forum on Synergies Between Water Quality Trading and Wetland Mitigation Banking* was held July 11-12, 2005, in Washington, DC. The forum was sponsored by the U.S. Environmental Protection Agency (EPA). The forum provided an opportunity for a diverse group of experts from the water quality trading and wetland mitigation banking professions to discuss innovative ways to promote watershed-based strategies to achieve clean water goals through market-based approaches. Stakeholders included representatives from federal and state government, non-profit organizations, academia, and the private sector.

The 2-day meeting was designed to achieve the following objectives:

- Advance point/nonpoint source trading on a watershed scale by identifying 'lessons learned' from wetland mitigation banking; and
- Explore the potential role wetlands can play in providing water quality credits as part of a watershed scale trading program.

The forum was designed to capture a variety of opinions on advancing water quality trading. It was not designed to generate consensus or develop consensus-based recommendations.

Background

Over the last several decades, significant progress has been made in cleaning up our nation's waters. Today, nearly two-thirds of our lakes and rivers are safe for swimming, as compared to just 36 percent in 1970. The Clean Water Act has successfully reduced pollution from industrial, municipal, and other point sources. But the job of achieving clean water in the United States is only about half done. Approximately 40 percent of the rivers, 45 percent of the streams, and 50 percent of the lakes that have been assessed still do not support their designated uses. Innovative market-based approaches such as water quality trading and wetland mitigation banking can help address nonpoint source pollution and achieve water quality goals at lower cost.

This year marks the 10th anniversary since the release of the federal guidance that institutionalized the practice of wetland mitigation banking. Developments in the banking arena over this time period can help inform the future of water quality trading in the United States, especially as we seek to expand trading to include more point/nonpoint source trading on a watershed scale. This forum was designed to determine if the lessons learned from wetland mitigation banking, another market-based approach to achieving Clean Water Act goals, can help inform future developments in water quality trading.

The following is a summary of the presentations and discussions that took place during the forum. The meeting facilitators have summarized the comments of participants based primarily on audio recordings and notes taken during the discussions. Points made by participants are summarized and attributed where appropriate. ELI apologizes in advance for any misrepresentation of the speakers' meaning or intent.

Day One began with opening remarks from Benjamin Grumbles, Assistant Administrator for Water, U.S. Environmental Protection Agency. This presentation was followed by a discussion of the history and status of wetland mitigation banking and water quality trading by Palmer Hough and Lynda Hall, both from the U.S. Environmental Protection Agency.

Dennis King, from University of Maryland's Center for Environmental Science, provided an overview of the challenges of point/nonpoint source trading. His presentation was followed by questions and a facilitated discussion, during which the participants were challenged to identify the existing and perceived challenges to the establishment of point/nonpoint source trading and to identify which of these challenges the wetland mitigation banking model could help address.

A lunch presentation, titled, "The Use of Water Quality Trading and Wetland Restoration to Address Hypoxia in the Gulf of Mexico," was provided by G. Tracy Mehan, III, Cadmus Group, and Paul Faeth, World Resources Institute. Following lunch, participants heard two case studies on lessons learned from point/nonpoint source trading. These were provided by Dennis O'Grady, South Nation Conservation, and Alley Ringhausen, Great Rivers Land Trust.

The final session of the day included two presentations, one from the wetland mitigation perspective and one from the water quality trading perspective, offered respectively by George I. Platt, Wetlandsbank, Inc., and Cyrus Jones, Washington Suburban Sanitary Commission. Their discussions focused on the legal and financial liability issues associated with mitigation banking and water quality trading. Their presentations were followed by questions and a facilitated discussion that sought to identify options for addressing or transferring liability in the water quality trading arena to stimulate market demand, as well as the potential strengths and limitations to these approaches.

Day Two began with a presentation on the wetland mitigation banking experience by Craig Denisoff, Wildlands, Inc., titled, "Environmental Performance Standards and Credit Release." His presentation was followed by questions and a facilitated discussion that focused on identifying the types of environmental performance standards that are needed for water quality trading to ensure improvements in water quality. The discussion also addressed the potential strengths and limitations to using these environmental performance standards.

The next session focused on bank review and certification requirements. Two presentations were offered. The first presentation, by Hank Habicht, Global Environment & Technology Foundation, was from the perspective of a third party auditor. The second presentation, by David Urban, Land and Water Resources, Inc., was from the wetland mitigation banking perspective. A facilitated discussion followed questions from the audience and focused on identifying the mechanisms that could be used to certify credits and transactions in water quality trading, the strengths and limitations of these mechanisms, and the roles that can be played by third parties in the process.

Andrew McElwaine, from the Pennsylvania Environmental Council, spoke on the topic of multiple credit types for a single project site. His presentation was followed by questions and a facilitated discussion that sought to elicit participants' viewpoints on the environmental, legal, and financial strengths and limitations of establishing water quality trading projects that can sell multiple credit types.

Donald Hey, of the Wetlands Initiative, provided an overview on stimulating the creation of a point/nonpoint source trading system on a watershed scale. His presentation was followed by questions and a facilitated discussion designed to identify participants' thoughts on what assurances or other incentives are needed to help stimulate the establishment of a point/nonpoint water quality trading system on a watershed scale.

The forum concluded with a wrap-up and closing statements by Diane Regas, Director of the Office of Wetlands, Oceans & Watersheds, U.S. Environmental Protection Agency.

Details of each presentation and facilitated discussion are summarized below.

The History and Status of Wetland Mitigation Banking and Water Quality Trading

PART I: THE HISTORY AND STATUS OF MITIGATION BANKING

Palmer Hough, *U.S. Environmental Protection Agency, Wetlands Division*

Hough explained that the primary driver for mitigation banking is rooted in the requirements of §404 of the Clean Water Act (CWA). The primary goal of the CWA is to restore and protect the chemical, physical, and biological integrity of the nation's waters. To help achieve that goal, §404 of the act requires a permit from the U.S. Army Corps of Engineers (USACE or Corps) in order to discharge dredged or fill material into waters of the U.S. As part of the permit program, impacts must be avoided and minimized to the maximum extent practicable. For remaining 'unavoidable' impacts, the Corps may require compensatory mitigation to offset or replace lost aquatic resource functions and area.

The §404 program results in an average of approximately 80,000 Corps permit actions per year.

Permit data provided by the Corps for the 8 years (1996 through 2003) demonstrates that since 1999, there has been about twice as much mitigation required as compared to permitted impacts. This data demonstrates a significant and constant demand for compensatory mitigation of 40,000 to 60,000 acres annually.

Compensatory mitigation, or actions taken to replace aquatic resources lost to authorized and unavoidable impacts, can be accomplished through one of four methods: creation, restoration, enhancement, and sometimes preservation. There are three mechanisms that provide compensatory mitigation. Under the first, known as permittee-responsible or project specific mitigation, the permittee performs the mitigation or hires a contractor to do the mitigation. Under permittee-responsible mitigation, the responsibility and liability for the completion and success of this work remains with the permittee. The other two options for a permittee to meet their mitigation requirements are through mitigation banking and in-lieu fee mitigation, both of which are termed "third-party mitigation." Third-party mitigation is characterized by the permittee paying a third party to complete the mitigation work. The third party can be either a mitigation bank or an in-lieu fee sponsor, but in either case, the third party accepts the responsibility and liability for completing the work and ensuring its success. Permittee-responsible mitigation can be either on the same site as the impacts or at another site, often termed "off-site mitigation." Third-party mitigation is generally conducted off-site.

The majority of compensatory mitigation undertaken is permittee-responsible. Banking currently represents about 10-15 percent of compensatory mitigation, however, it represents a growing percentage in many places. For example, from 1994 to 2002, the percent of permits requiring mitigation that relied upon a mitigation bank in the Corps' Chicago District increased from 1 to 14 percent.

A wetland mitigation bank is a wetland area that has been restored, created, enhanced, or, in certain circumstances, preserved and then set aside to compensate for conversions of wetlands for permitted activities. A wetland bank may be created when a government agency, a corporation, a nonprofit organization, or other entity undertakes such activities under a formal agreement with a regulatory agency.

In 1995, a federal interagency group released guidance on wetland mitigation banking.[1] The banking guidance defined a bank as having four components: 1) The bank site – the physical acreage restored to wetland condition using the science of restoration ecology; 2) The bank instrument – the legal agreement between the bank owners and (usually Corps) regulators establishing liability and

[1] *Federal Guidance for the Establishment, Use and Operation of Mitigation Banks.* Federal Register 60, no. 228 (Nov. 28, 1995): 58,605-14.

the terms of bank credit approval; 3) A Mitigation Bank Review Team (MBRT) – the interagency team that assists with the review, approval, and oversight of the bank; and 4) A service area – the geographic area in which the bank can operate and compensate for permitted impacts.

A mitigation bank differs from permittee-responsible mitigation and in-lieu fee (ILF) mitigation because it is the only mechanism that has all of the above four components. ILF programs do not have a bank site, and permittee-responsible mitigation does not have a bank instrument or interagency team review.

A bank's service area has direct relevance to the discussion of water quality trading. The 1995 banking guidance defines the service area of a mitigation bank as "the area wherein a bank can reasonably be expected to provide appropriate compensation for impacts to wetlands and/or other aquatic resources."[2] The guidance provides some direction on establishing service areas. In general, service areas should be designated in the banking instrument and be based on consideration of hydrologic and biotic criteria. The federal guidance does allow banks to compensate for impacts beyond their service areas on a case-by-case basis. The guidance recommends the use of watershed boundaries, specifically U.S. Geologic Service Hydrologic Unit Codes, ecoregional boundaries, or other classification systems developed at the state or regional level. However, the guidance does not preclude the use of political boundaries, such as counties, which are administratively convenient but not necessarily drawn with hydrologic or biotic factors in mind.

The wetland mitigation banking industry has developed gradually over a 20-year period. In 1983, the U.S. Fish and Wildlife Service (FWS) released Interim Guidance on Mitigation Banking. FWS released a survey of 16 extant banks in 1988. At the time, there was only one commercial bank in existence. Between 1992 and 1995, the Corp's Institute for Water Resources (IWR) conducted another survey of wetland mitigation banks called the *National Wetland Mitigation Banking Study.* As part of IWR's study, ELI published a report analyzing the 46 extant banks as of 1991. The study found that there was still only one commercial bank, but proposals were in the works to develop an additional 15 commercial banks.

At the same time, the federal agencies released *Interim Federal Guidance on Mitigation Banking,* which was then replaced in 1995 with the current *Federal Guidance on Mitigation Banking.* In 2001 the National Research Council released its study, "Compensating for Wetland Losses Under the Clean Water Act," which noted mitigation banking as an option for mitigation conducted under the CWA. Then, in 2002, ELI published its second study *Banks and Fees: The Status of Off-site Wetland Mitigation in the United States,* which included a review of 219 extant banks, 135 of which were commercial. This represented a 376 percent increase in the number of banks over 10 years, nearly all of which occurred following the release of the 1995 banking guidance.

Finally, in 2003, the National Defense Appropriation Act of 2004 was signed into law. The legislation directed the Secretary of the Army to promulgate regulations on compensatory mitigation by the end of 2005. The regulations must articulate equivalent standards for all three types of mitigation (in-lieu fee, permittee-responsible, and mitigation banking), with the aim of "leveling the playing field" between them.

The first commercial bank, Tenneco LaTerre, was established in Louisiana as a pilot project to "advance consolidated mitigation." The project was initiated by FWS and Tenneco Oil Co. The memorandum of understanding (MOU) was signed on December 20, 1983, without the Corps or EPA as signatories. The purpose of the bank was to provide single-use credits for the oil company, but the MOU also included a provision allowing credit sales. The first third-party credit sale occurred in 1986. However, this bank differed from true entrepreneurial banks, which did not spring up for another decade. "Modern"

[2] *See id.*

entrepreneurial banks were developed in Georgia, Florida, and Illinois in the early 1990s. They differ from Tenneco and other earlier banks by being more or less freestanding entrepreneurial entities, enabling the industry to form as a coherent interest group capable of concerted action and lobbying. The first bank permit was approved in 1992 in Millhaven, Georgia, and in 1994 the first instrument was approved in Otter Creek, Illinois. Also in 1994, the first credit sale for a mitigation bank took place in Pembroke Pines, Florida.

Mitigation banks are typically similarly organized. A bank's value is defined in terms of mitigation credits. An MBRT approves the total potential credits that are available for sale using various assessment techniques and/or best professional judgment. Those credits are then released over time as the bank sponsor demonstrates to the Corps and the MBRT that they are meeting the bank's ecological performance standards and are completing certain administrative requirements as specified in the bank's instrument.

There are various ways to define credits. ELI's 2002 study, *Banks and Fees,*[3] reported that 2 percent of banks use best professional judgment to define credits, 13 percent use functional equivalency, 62 percent rely upon acreage, and 23 percent use a combination of the above. In addition to these methods, 90 percent of all banks factor in an upland evaluation of credits.

Hough described a Florida mitigation bank to illustrate how banks commonly operate. The Florida Everglades Mitigation Bank is a 13,500-acre site in South Florida. It is operated by Florida Power and Light and is being developed in two phases. The first phase consists of 4,200 acres. The second phase is still being permitted. This tract of land yielded 391 credits of freshwater and saltwater marsh. The bank sponsors used an assessment tool called Wetland Assessment Technique for Environmental Review (WATER) to determine the number of credits they have available for sale. WATER is the same tool that is used at the impact site to determine the number of credits that the permittee must purchase from the bank to offset their impacts. WATER examines a number of different factors such as water quality, vegetation, wildlife utilization, soils, hydrology, and salinity, when applicable. Freshwater credits sell for about $45,000 and saltwater credits sell for $75,000.

The Everglades Mitigation Bank has different service areas depending on the type of impact. For linear impacts (roads, pipelines or other linear facilities that pass through a wetland but impact only a portion) the service area is the boundaries of the South Florida Management Water District. For non-linear impacts, such as residential and commercial development where a substantial wetland fill is anticipated, the service area is Dade and Broward Counties and portions of southern Palm Beach County.

ELI's 2002 study found that Florida, Georgia, and Illinois were the only states that had more than 20 banks each. In addition to the 219 approved banks, ELI documented another 95 banks that were under review with approval pending. ELI estimated that there were 139,000 acres in 219 approved banks providing a combination of wetland restoration, creation, enhancement, and/or preservation. The 95 banks under review at that time included an additional 8,000 acres. ELI also listed 40 approved umbrella banks with approximately 26,848 acres of mitigation wetlands approved at 308 individual sites. Because of regional differences in the categorization of banks, an accurate count is difficult to perform, but there are currently over 1,000 individual bank sites. An effort is currently underway to update this inventory.[4]

[3] Environmental Law Institute. *Banks and Fees: The Status of Off-site Wetland Mitigation in the United States.* Washington, DC: Environmental Law Institute, 2002.

[4] Environmental Law Institute. *A Status Report on Third Party Compensatory Mitigation in the United States.* Washington, DC: Environmental Law Institute, forthcoming.

At the time of ELI's study, most banks were private commercial and used watersheds to define their service areas. Of the banks studied, 65 percent used enhancement as their mitigation method, followed by restoration at 62 percent, creation at 45 percent, and preservation at 44 percent. Monitoring lengths varied between banks. The majority of banks – 59 percent – monitored for at least five years, while 16 percent monitored for 6-10 years and 6 percent monitored for 11-50 years.

There are various benefits and challenges to mitigation banking. Mitigation banking has a number of advantages over traditional permittee-responsible mitigation because of the ability of mitigation banking programs to:

- Reduce uncertainty over whether the mitigation will be successful in offsetting project impacts;
- Greatly expand entrepreneurial opportunities for third-party mitigation credit providers;
- Bring together extensive financial resources, planning, and scientific expertise not always available to many permittee-responsible mitigation proposals;
- Reduce permit processing times and provide more cost-effective compensatory mitigation opportunities; and
- Increase the efficiency of limited agency resources in the review and compliance monitoring of mitigation projects because of consolidation.

In its 2001 study, the National Research Council (NRC) also noted that banks are more likely than traditional compensatory mitigation to achieve desired long-term outcomes and be protected in perpetuity by organizations committed to resource conservation.[5]

The challenges to banking, according to various observers, include the concern that siting a bank is often driven by economic factors, rather than ecological factors. On a regional scale, banks tend to be sited near urban areas where there is a high level of demand. On a local scale, even within service areas or watersheds, banks are usually located in areas where the cost of production is lowest, which may not necessarily meet the ecological priorities of the watershed. Another challenge is the uneven playing field between the three different kinds of mitigation: in-lieu fee, permittee-responsible, and banking. There are also regional regulatory idiosyncrasies to consider, such as attitudes, policies, resources, and turnover. The courts are also constantly reshaping the landscape of the §404 program, which adds uncertainty to the issue of jurisdiction. Finally, there continues to be scientific uncertainty regarding the spatial movement of aquatic resource functions. It is difficult to commodify ecosystem services and move them from one part of the watershed to another.

[5] National Research Council. *Compensating for Wetland Losses Under the Clean Water Act.* Washington, DC: National Academy Press, 2001.

The History and Status of Wetland Mitigation Banking and Water Quality Trading

PART II: THE HISTORY AND STATUS OF WATER QUALITY TRADING

Lynda Hall, *U.S. Environmental Protection Agency, Assessment & Watershed Protection Division*

Hall began by describing water quality trading as a creative way to help meet the goals of the Clean Water Act. Water quality trading is defined as a broad range of practices that provide pollutant reductions in a different location, often achieved by a different party than the source required to achieve such control. It occurs where the credit supplier has lower control costs than the permittee and where other threshold conditions are in place.

In water quality trading, the buyers of the credits (the regulated dischargers) will almost always be facilities that hold National Pollutant Discharge Elimination System (NPDES) permits. The facility will purchase credits if it needs to meet a more stringent permit limit or needs to expand its operations and is met with high pollutant control costs. The seller of credits can be a point source (NPDES facility, such as a wastewater treatment plant) or nonpoint source that, although not regulated by the Clean Water act, contributes loadings of the same pollutant. The seller can generally achieve reductions at a lower cost and then can sell its surplus pollutant reduction "credits."

Trading markets are expected to revolve mainly around the control of nutrients. Thus, agricultural lands will likely play a key role in trading nitrogen and phosphorus reductions. Experience has shown that nutrients are especially amenable to trading for a number of reasons. Nutrients are generated by many different sources in a watershed and these sources often have different pollutant control costs that provide the threshold conditions for a trade. Furthermore, excess nutrients tend to exert their negative effects on a water body over time and sometimes over reasonably large areas. That provides an amount of spatial flexibility in the control of the pollutant that is helpful for trading because the location of the pollutant control can be achieved in different parts of the watershed.

There can be various catalysts or "drivers" for nutrient trading in Clean Water Act programs. The Act requires states to adopt water quality standards for all of its waters. These standards must define the designated uses for waters (e.g., recreation, water supply, aquatic life, agriculture) and the appropriate amount of pollutants that can be assimilated while still meeting the designated uses.[6] Furthermore, the CWA requires states to place the waters that fail to meet water quality standards on the CWA §303(d) list. There are thousands of water bodies on the §303(d) list, and the list is expected to grow as states continue to assess their waters. Once a water body is registered on the list, it becomes a candidate for development of a Total Maximum Daily Load (TMDL).[7] A TMDL is the maximum loading that a water body can assimilate and still meet the water quality standards set by the state. TMDL implementation can provide an impetus for trading because the TMDL assigns each NPDES point source that discharges into the listed water body with a waste load allocation. Wasteload allocations will often be more stringent than current permit limits, triggering the need for greater pollutant controls. TMDLs also assign a load allocation to nonpoint sources. As numeric nutrient water quality standards are developed in more states and as nutrient TMDLs are implemented, there will be a potential for trading in many locations around the country.

There are three different water quality trading models that will be discussed during the forum. The first is trading between two or more point sources (point source to point source), which occurs between NPDES facilities to meet a watershed goal that is often implemented through a multi-source permit.[8] The facilities could trade among themselves or through an association or a state-managed exchange. Another type of trading is point/nonpoint source trading, where an NPDES facility (the point source) buys pollutant reduction credits from a nonpoint source, such as a landowner, to meet their water

[6] For more on water quality standards, see: http://www.epa.gov/OST/standards.

[7] For more on TMDLs, see: http://www.epa.gov/owow/tmdl.

[8] For more on watershed-based NPDES permitting, see: http://cfpub.epa.gov/npdes/wqbasedpermitting/wspermitting.cfm.

quality-based effluent limit (WQBEL). Finally, a desired state for trading, which has yet to be implemented, is point/nonpoint source trading on a watershed scale, with multiple buyers and sellers involved in trades to achieve the water quality goal for the entire watershed. Desirable aspects of watershed scale point/nonpoint source trading include the ability to co-locate BMPs for greater water quality and ancillary benefits (e.g., contiguous tracts of habitat) and to achieve greater efficiencies and cost savings in meeting water quality goals.

Water quality trading has been around for about as long as wetland mitigation banking. Since the 1980s, the field has ebbed and flowed, as demonstrated by the evolution of state policies, laws, studies, pilot projects, facility offsets, and a few watershed-scale programs. This activity has been on the rise in the past two to three years. For example, several states have adopted trading policies or laws. Actual water quality trading transactions, as reflected in permits, have occurred in about 15 locations involving dozens of NPDES permittees. About a dozen other programs dealing with phosphorus, nitrogen, and other pollutants are being considered or are underway.[9] Many of these are on a watershed scale, supported by the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS) Conservation Innovation Grants or EPA's Targeted Watershed grants.

For point/nonpoint source watershed-scale trading to occur, several factors must generally be in place. These include a TMDL or consensus-based cap on total pollutant loadings, a solid understanding of pollutant sources and loadings in the watershed, multiple point sources facing more stringent NPDES permit limits, and significant differences in pollutant control costs between point sources or point/nonpoint sources. Total load reductions must be achievable by some facilities "over-controlling" pollutants and others "under-controlling" and purchasing credits to make up the difference. In some circumstances this will not work because loadings are such that every facility would have to produce substantial pollutant reductions to meet water quality standards and few "surplus" reductions would be available as credits. The success of a trade also depends on the pollutant type. Trading is easier for pollutants that exert effects over longer periods of time and on a larger scale, which is one reason nutrient trading holds the most potential. Finally, regulators and stakeholders need to be willing to embrace this non-traditional approach. If and when the above conditions are met, trading water quality credits on a watershed scale is more likely to be successful.

A water quality credit is defined as the mass of surplus pollutant reduction over a certain time period, e.g., the pounds per day of total phosphorus reduction generated over one year. Time periods can vary. NPDES facilities may use credits to meet water quality-based effluent limits but not technology-based limits developed for their industrial category. Point sources can generate credits if their pollutant discharge is reduced below their required WQBEL. At the same time, nonpoint sources can generate credits if their pollutant load is reduced beyond a specified baseline consistent with water quality standards. It is important to note that all trades must protect local water quality. Depending on circumstances and the pollutant, the need to protect local conditions could limit the number of credits purchased by a given facility.

A water quality trading boundary must be within a watershed but can vary widely within that watershed. The boundary can be determined by the ability to relate the impact of pollutant reductions across an area. Once it is no longer possible to determine if a reduction of pollution in one location improves water quality in another location, the boundary of the trading area has been exceeded and such a trade cannot take place. Models are used to determine the pollutant fate, how it travels, and the impact of watershed features. Watershed groups often develop additional factors to consider in setting trading parameters. In general, trades that occur in closer proximity are simpler and more cost-effective, but larger markets make trading more viable, resulting in potentially greater benefits to water quality.

[9] For a comprehensive summary of current trading efforts, see: Breetz, Fisher-Vanden, Garzon, Jacobs, Kroetz, Terry. "Water Quality Trading and Offset Initiatives in the U.S.: A Comprehensive Survey." Prepared for the U.S. EPA, Washington, DC, Aug. 5, 2004.

There are a variety of benefits to watershed scale point/nonpoint source trading. The first is realizing substantial cost savings while meeting a watershed goal. For example, it is estimated that relying upon point/nonpoint source trading could save $1 billion for facilities striving to meet water quality standards in the Chesapeake Bay, and $370 million for point sources in the Miami River basin in Ohio. Cost savings for credit buyers and revenue for credit suppliers could mean the difference between attaining full implementation of water quality standards and finding it prohibitively costly to do so. Point/nonpoint source trading also results in environmental benefits in addition to improved water quality, such as riparian stabilization through reduced erosion, co-control of pollutants such as sediments and pathogens, improved habitat with flood retention, and possibly more wetlands restoration. A watershed-scale approach allows for greater ability to strategically locate controls for enhanced watershed benefit.

State water pollution control agencies maintain the overall responsibility for implementing watershed trading programs under EPA oversight. Trading activity can be monitored through the point source transactions that are reflected in the NPDES permit. There are several different models for managing trades: a state-managed exchange where the state is the broker, such as in Connecticut; a NPDES Compliance Association where the Association is the broker, such as the Neuse River in North Carolina; or a third-party broker, such as the South Nation Conservation program in Ontario. Other trade managers can be non-profits, private enterprises, conservation organizations, or conservation districts.

There are still various challenges to overcome for point/nonpoint source trading, especially when expanding to watershed-scale programs. The practice of wetland mitigation banking has faced a number of similar challenges. Hopefully this forum will provide an opportunity for the water quality trading community to hear how wetland mitigation banking was able to address these impediments and move forward.

Some challenges faced by point/nonpoint source trading programs include reliably assessing nonpoint source loadings, estimating performance of best management practices, accounting for variability and uncertainty, and accounting for and verifying credits. The issue of CWA liability is also considered an impediment by some NPDES permit holders. Currently, if purchased credits fail to materialize, the NPDES permittee remains liable for any associated permit violations. In third-party wetlands mitigation, the banker or credit supplier carries this responsibility. Finally, another challenge is efficiently managing multiple transactions in watershed-scale markets with numerous buyers and sellers.

By addressing challenges similar to some of those above, credit brokers or bankers have facilitated and made possible the process of wetland mitigation banking. Brokers may be able to play a similar role in facilitating point/nonpoint source trading. For example, credit brokers could assist with connecting numerous credit buyers and sellers, such as wastewater treatment plants and landowners.

Brokers could be especially useful because, unlike in wetland mitigation banking, there are unlikely to be large “single user” banks for nonpoint source credits where a buyer provides his own credits. In wetland mitigation banking, state departments of transportation have played a dominant role in generating demand for credits. With nutrient trading, demand is likely to be generated by an aggregation of large municipalities. Landowners may shy away from interaction with municipal government entities, or may be uninterested or unable to assess credits that could be generated on their land. Brokers could aggregate credits from multiple nonpoint source locations for large buyers, verify credit performance, and discount credits for location, performance and/or uncertainty. These brokers could also select sites and locate suites of best management practices. In case of BMP failure, a broker could also possibly provide escrow or backup credits to ensure that pollutants were still reduced and the buyer’s permit limits met.

Questions & Answers

Denisoff raised the issue of transferring liability. He asked if the NPDES holder is unable to transfer liability because of a stated agency policy or because of a legal requirement. Hall replied that this is believed to be a legal requirement of the CWA.

Faeth referenced a graph in Hough's presentation that showed wetlands avoided, permitted, and mitigated over a 10-year period.[10] The graph shows that a large number of wetlands have been mitigated during this timeframe. He asked if there have been any studies conducted on the net ecological effects of the conversion of natural wetlands to mitigation wetlands across the nation. Hough responded that he is not aware of a nationwide study, only studies that examine wetland mitigation on a small scale. The FWS does conduct regular trend analyses of wetland losses, but there have not been any nationwide studies of the ecological effects associated with these conversion rates.[11]

Joyner noted that Hall's presentation focused on water quality trading for nutrients. In Florida, Joyner has been supportive of establishing response variables, rather than causal variables. He asked if daily maximum limits for nutrients in NPDES permits would constrain opportunities for trading. He feels that if there is a nutrient concentration that cannot be exceeded within a short time period, the cumulative effects of nutrients are not considered and there is little room for trading. Hall said the trading programs underway are designed to meet concentration-based limits in the water column and that the required permit reductions and trades are articulated in terms of mass. The permittee has a schedule to reduce loadings over a specified period of time with the goal of achieving the in-column target.

Joyner responded that in Florida's TMDLs, the target is generally a downstream target. He is concerned that even though there would not be an impact in the stream they are trying to trade in, daily nutrient limits would impede trading. Hall agreed that stringent daily maximum permit limits for nutrients would constrain trading.

Platt observed that Hough's maps of water quality trading and wetland mitigation activity show almost no geographic overlap.[12] He noted that creating synergies between the two fields may require focusing on two almost entirely different areas of the country. Platt asked Hall to clarify her point about trades becoming simpler and more cost-effective when point and nonpoint sources are closer to one another. He asked if credits are generated based on proximity within the watershed. Hall responded with an example. In a large watershed, if one pound of nitrogen is released in the upper reaches of the watershed, it will attenuate as it travels the distance downstream to the area targeted for pollutant reduction, until perhaps only half of the original pound of nitrogen remains. Similarly, if a pound of nitrogen is reduced at that upstream point, only half a pound of nitrogen reduction will reach the downstream location. As a result, the buyer in the lower parts of the watershed must purchase twice as many credits from an upstream seller to achieve one full pound of nitrogen reduction in the target water body. Trading programs must discount credits to take into account this attenuation and diversion. Buying credits as close as possible to the target water body will mean a smaller discount, although the credits may be more expensive. Platt responded that this might undermine the incentive for people to create banks. Hall replied that the adjustment of credits to account for location is unavoidable. However, there are many other factors that affect credit cost that the broker does have control over.

Robinson asked why Hall assumes that the nonpoint source can provide nutrient reductions at a cost savings relative to the point source. She asked if the formulas that show a cost savings allocate for a profit driver for the farmer or the stream mitigation banker who would be negotiating with the farmer. This is a challenge in stream mitigation banking. In the agricultural settings, farmers demand high prices for their water. Hall responded that she did not think the cost savings studies included that profit driver.

[10] See slide 5 at: http://www2.eli.org/pdf/wqtforum/presentations/Hough.Hall.pdf.

[11] For more information about FWS's National Wetlands Inventory trend studies, see: http://wetlands.fws.gov.

[12] See slides 17 and 29 at: http://www2.eli.org/pdf/wqtforum/presentations/Hough.Hall.pdf.

The Challenges of Point/Nonpoint Source Trading

Dennis King, *University of Maryland*

Introductory Comments

King began by offering some general comments about trading that, although obvious to some, are important to keep in mind. Environmental trading markets are not natural, but rather are entirely manufactured by regulation. All aspects of these markets, every nuance of supply and demand, are determined by regulatory decisions. These markets are a supplement to regulation, not an alternative to regulation. One of the reasons that water quality trading has not taken off is that the costs associated with noncompliance are not high.

The unit of exchange in water quality trading is a low-cost permit. Quality control must be imposed from outside, since both sides have clear incentives to collude against the regulator in order to minimize costs. The buyer is interested in securing a permit at the lowest cost possible and the mitigation provider is interested in minimizing cost. The less stringent the scoring criteria are, the more money that can be made. As regulators increase quality controls, they can limit trading. On the other hand, insufficient trade scoring criteria can reduce the environmental benefits of the program.

The repercussions of unbalanced quality control were evident in the early days of wetland trading. Strict scoring criteria were imposed, but regulators were flexible in enforcement because they did not want to hinder the development of trading. This early history of bad trades has undermined support for wetland trading to this day. Finally, trading markets are inherently risky. If the risks are not assigned to the buyers or sellers, by default they fall on the public.

The central difference between wetland and point/nonpoint source trading is that wetland trading involves trading assets that produce streams of services over time, including nutrient trapping. Point/nonpoint source trading involves exchanging a known discharge for the services of a farmer in an effort to reduce pollutant discharges.

Recent Research

To understand certain challenges water quality trading faces, it is first relevant to look at the broad market context in which this trading occurs. Nobel Prize winning economic research conducted by Jonathan Nash in 2003 found that asymmetric information problems in markets result in gaming behavior that causes excessive firm/product branding, less competition, and winner-take-all markets. In environmental markets, this means that buyers and sellers both have incentives to exploit and perpetuate quality uncertainty and to collude against trade regulators and the public interest.

The 2004 Nobel Prize winning economic research by Edward Prescott and Finn Kydland found that time inconsistency problems with the way markets are regulated result in widespread gaming behavior that causes regulatory programs to fail. In environmental markets, willingness-to-pay for credits is not based on marginal treatment costs, but on the expected cost of not complying after adjusting for political/legal maneuvering.

A 2003 paper on nutrient trading published by King and Peter Kuch[13] was initially designed to determine how people are "scoring" nutrient credit trades. However, they discovered that there were not any nonpoint source trades to score. The study then attempted to determine why there were no water quality trades taking place. As part of the study, they reviewed 37 on-the-ground water quality trading systems. There was very little trading occurring and no point/nonpoint trades. The study evaluated supply conditions, demand conditions, and institutional conditions.

The paper concluded that while institutional problems are significant, such as how buyers and sellers find one another and how scores are traded, they can and are being overcome. The authors pointed out that supply and demand problems such as connecting willing buyers and willing sellers are far more significant. These barriers are outside the control of the regional watershed organizations that

[13] King, Dennis M. and Peter J. Kuch. "Will Nutrient Credit Trading Ever Work? An Assessment of Supply and Demand Problems and Institutional Obstacles." Environmental Law Reporter 33 (May 2003): 10352-68.

are striving to make trading work. The authors also tentatively concluded that centralized trading systems (e.g., government-run offset and bidding programs) have much more near-term potential than decentralized (market-style) credit trading programs. Centralized trading systems, such as the North Carolina and Connecticut programs, were deemed to have more potential largely because they have fewer credibility problems.

King's 2005 water quality trading study,[14] which relies upon the raw data being produced by Dartmouth,[15] planned to examine trading to determine which practices were succeeding. King found that although there is a tremendous amount of interest, support, and start-up funding for water quality trading, and about 70 water quality trading efforts in place, there is still almost no trading taking place. The study found far more examples of "regulator-approved offset trades," where there are one or more buyers or sellers and some creative permitting.

The study again concluded that there are serious supply and demand problems and identified several reasons for these problems. The study claims that regulatory programs too often dictate treatment methods and levels. In addition, many subsidy programs require treatment methods and levels. King stated his opinion that discharge restrictions are not binding and not well enforced. He feels that TMDLs can help address these issues, but that it will require regulators to become more savvy about market-based solutions. He added that the 2005 study also concluded that centralized trading systems have more potential than market-style credit trading.

Types of Trading

There are two basic styles of trading: market-style credit trading (decentralized trading systems) and regulator-approved trading/government-run offset and bidding programs (centralized trading systems). Market-style credit trading, the style most often pursued, has several different distinguishing features. These include standard units of exchange (e.g., credits), many buyers and sellers (e.g., competition), and formal rules of exchange (e.g., liability assigned). The alternative style, regulator-approved offset trading, seems to be successful for point source trades. This style of trading is characterized by ad hoc trade "scoring" criteria. The trade may include simple bi-lateral or tri-lateral contracts and a single source of offsets. The single source of credits can be a government that subsidizes providers of offsets.

Remaining Challenges and Questions

One of the issues affecting the supply side of water quality trading is how credits are generated, or how the "baseline" is defined. Trading programs usually prohibit farmers from selling credits for undertaking land use/land management changes that are legally required (e.g., by state regulation) or for which the farmer has already been paid (e.g., green payments). Setting the baseline for credits in this way reduces the ability of farmers in most watersheds to supply low-cost water quality credits. However, if the farmer is allowed to sell credits for activities that are covered by a green payment, the taxpayer gains nothing. This conundrum is exacerbated by the fact that foreign trade policy is shifting farm subsidy programs away from production payments to green payments. Although farmers may be paid through green payments to undertake best management practices (BMP), the real intention of these programs is to provide subsidies to agriculture. The future of green payment programs will have a large impact on the future of water quality trading markets.

Market-based environmental trading programs are often touted as alternatives to market regulation. But the markets are only successful to the degree that there are binding caps and allowances that are well defined. In addition, these markets are *never* self-regulating. The trades are *always* three-way, with the regulator overseeing the trades. Another challenge is that although water quality trading offers ancillary environmental benefits (e.g., forest buffers and wetland restoration projects provide habitat), they do not have a great enough environmental impact.

[14] King, Dennis M. "Crunch Time for Water Quality Trading." *Choices* 20, no. 1 (1st Quarter 2005): 71-75. http://www.choicesmagazine.org/2005-1/2005-1.pdf.

[15] Breetz, Fisher-Vanden, Garzon, Jacobs, Kroetz, Terry. "Water Quality Trading and Offset Initiatives in the U.S.: A Comprehensive Survey." Prepared for the U.S. EPA, Washington, DC, Aug. 5, 2004.

The level of precision and risk allowed in these programs will have a large impact on the success of these markets. Water quality trading does not allow for monitoring of every BMP. Some of the risk needs to be removed from the trades without increasing transaction costs to the extent that it stifles the programs. There are a lot of equity issues involved in how credits are assigned. If fewer credits are assigned for reductions that take place in the upper reaches of the watershed, fewer trades may occur. Although these adjustments may be important for achieving water quality benefits at the base of the watershed, those who live in the upper reaches will lose out on the benefits that would have accrued closer to their homes.

Regulators seem compelled to stimulate water quality trading markets by having point sources purchase credits from nonpoint sources. But many point sources feel that their abatement costs are high because they are already achieving significant pollution reductions, while abatement costs may be low for agricultural landowners because they do very little to reduce nonpoint source pollution. A trading system that is based on urban dwellers "bribing" farmers may become a major problem.

General questions about trading remain. These include questions about whether caps should be full or partial and whether trading can occur within or outside the cap or both. In addition, there are questions relating to how allowances are allocated within the cap and who decides how and where to modify discharges or find offsets.

Specific questions about trading need to be resolved. The first relates to how the units of exchange are defined. The units of exchange establish equivalency of water quality gains and losses. Second, the rules of exchange must be outlined so that questions about who can trade and who is liable are resolved. Finally, the incentives for exchange must be more fully developed. This includes equity of initial endowments of "rights," and fear on the part of credit producers (e.g., farmers) that water quality trading may lead to the loss of green payments and expose them to future regulations.

A Case Study

King used an example of scoring trades from a project he has been working on with the Patuxent River, which feeds into the Chesapeake Bay. There are four different criteria for assigning scores to water quality trades: 1) Site ranking (e.g., soil, slope, hydrology); 2) BMP efficiency (percent nitrogen reduction per acre); 3) Landscape ranking (proximity to other natural features); 4) River segment ranking (dilution/attenuation); and 5) Seasonal adjustment (hydrology/ecology). The project considers three BMPs on three different sites: planting a forested buffer, restoring a wetland, and removing manure. Not all of these practices would be scored the same, even though they would all remove nutrients. In addition, planting a forested buffer and restoring a wetland would have ancillary environmental benefits. The case study includes the use of Geographic Information Systems (GIS) models and the development of site indicators for the farms.

The University of Maryland's Center for Environmental Science has developed the Nutrient Enforcement Economics Decision Support (NEEDS) Model. This model is a county-level decision support tool designed to help focus, manage, and assess the likely success of initiatives to reduce nutrient discharges into the Chesapeake Bay. The model has three components: 1) County discharge capacity measures; 2) County discharge control measures; and 3) Geographic dilution/attenuation factors. NEEDS looks at the levels of effort for compliance, which they believe will drive whether or not actors will participate in the market. Most of the county nonpoint sources they interviewed were unwilling to pay for a credit because there was no enforcement for nonpoint source controls. There was also typically no monitoring of impervious areas and the maximum fine for violating an impervious area is only $500, which the developers just build into the cost of doing business.

Generating Credits

The nonpoint credits can be generated through three types of activities: 1) Those that reduce nutrient discharges (reduce fertilizer use, build/use manure sheds); 2) Those that prevent nutrients from reaching

the water body (plant wetlands or grass or forest riparian buffers); and 3) Those that remove nutrients from the water body (restore oyster beds or grow oysters on off-the-bottom racks).

Recommendations

King concluded with five suggestions for developing successful water quality trading:

- Follow the new EPA guidance;
- Discourage "command and control" regulatory programs;
- Encourage binding discharge restrictions;
- Establish meaningful monitoring and enforcement of restrictions and stiff penalties for violations, and;
- Get smart about countervailing public policies and about the "gaming" strategies that point/nonpoint sources will use to limit regulation and avoid penalties.

There has been significant discussion surrounding after-the-fact monitoring and verification. But before-the-fact monitoring, termed "investment indicators" by economists, is more important. A credible group needs to review the basis for these trades, the scoring criteria for a bank, and the particular mitigation proposal beforehand so that the parties involved trust it. Most observers think that the federal agencies do not have the manpower, budget, technical skills, or political support to provide this function.

Quality control will likely need to come from outside the federal government. King suggested establishing an environmental Securities and Exchange Commission (SEC). The SEC is an agency established to protect investors and maintain the integrity of the securities markets. It does not analyze whether stocks perform, but rather, whether or not the prospectus was accurate. An environmental SEC would manage trading risks through insurance, such as weather insurance for wetlands. Another option would be a collateral bank where the environmental services are produced beforehand. The regulator then rents this acre of wetland that is fully functioning until it is clear that the other one will succeed. In this scenario the credits are being leased to the bank, eliminating the risk from the trade completely.

Questions & Answers

Jones mentioned that where gaming is a concern, public sector agencies are different than profit driven organizations. He asked if there is any empirical evidence that public agencies can and do act in the same way as private agencies where money is the bottom line. King responded that he believes that public agencies do employ gaming strategies, but that they are not profit driven.

Collier asked King for additional information on his comments related to gaming strategies. King stated that economic research has demonstrated that businesses assume that the people who make the laws now are not going to be the ones enforcing them. Therefore, regulators can expect the regulated community to engage in political and legal strategies for delaying, postponing, and minimizing penalties. Economists refer to the phenomenon as "rational expectations theory."

Coan stated that she evaluates the success of trading programs in more general terms. She felt that King was too stringent when he concluded that no trades were taking place. She asked King if he would define a trading program as unsuccessful because there have not been any "actual trades." King responded that some researchers feel there have been no trades because the caps are set too high. He stated that when the regulated community is in opposition to the imposition of a new regulation, they game the system by insisting that compliance costs will be excessively high (e.g., $28/pound for nutrient reduction).

Facilitated Discussion

The goals of the facilitated discussion were to: 1) Identify the existing and perceived challenges to the establishment of point/nonpoint source trading; and 2) Identify which challenges the wetland mitigation banking model could help address.

Participants' comments for goal one are listed below.

Existing and perceived challenges to the establishment of point/nonpoint source trading on a watershed scale:

1. Lack of nutrient standards (Lanyon)
2. Lack of a demand driver (Denisoff)
3. Lack of easily defined credits, for example uncertainty in quantifying credits and in the duration of the credits generated (Denisoff, Jones, Joyner)
4. Lack of incentives for institutional/non-market pricing (Denisoff)
5. Liability issues
   - a. Lack of severance of liability (Denisoff)
   - b. Adequate information on liability and the consequences of failure (Jones)
6. Lack of critical mass of trades – need for regional implementation for water quality trading (Denisoff)
7. Lack of clarity over the temporal aspects of mitigation, e.g., whether or not pollution reduction must be fully achieved prior to the sale of credits (Platt)
8. In-lieu-fee programs competing with a water quality trading program would undermine the participation of third parties in water quality trading (Platt)
9. Performance standards and method of monitoring (Urban)
10. The public review process (e.g., lengthy, consensus-based public process vs. individual regulator authorized to make permit decisions) (Urban)
11. Baseline issues
    - a. Baselines for nonpoint sources need to be better defined (Corbin, Schary)
    - b. Lack of clarity on whether or not green payments are eligible for credits (O'Grady)
12. Cross-jurisdictional issues
    - a. Political barriers to working on a watershed scale (Collier)
    - b. Regional regulatory idiosyncrasies (Collier, Kieser)
13. Lack of focus on innovative technology to address nonpoint source pollution (Noyes)
14. Public perceptions of trading programs (O'Grady)
    - a. Environmental and economic benefits need to be more clearly articulated (O'Grady)
    - b. Politicians need to be informed (O'Grady)
    - c. Concern on behalf of the agriculture industry about being regulated as point sources (D. Hall, Raffini)
    - d. Perception that water quality trading is a new implementation strategy, although the implementation issue already exist under TMDLs (Schary)
15. Need for more local decision-making power (O'Grady)
16. Need to measure and define success on a programmatic basis (Coan)
17. Ability to enforce nonpoint sources (Ettinger)
18. Enforceability/lack of state capacity for developing and administering programs
19. Length of time to develop trading programs (L. Hall)
20. Higher transaction costs associated with early trades (L. Hall)
21. Public agencies' ability to compete with nonpoint source to provide less expensive credits (Joyner)
22. Possible interference with the operation of pilot products by the development of state and local rule-making (D. Hall)
23. Rules prohibiting bundling of credits (Platt)

24. Incongruity of point source and nonpoint source nutrients and the lack of adequately developed science underpinnings for establishing trading programs nationwide (Parker)
25. Equity issues – urban/rural, upstream/downstream (King)
26. Lack of state capacity for developing and administering water quality trading programs (Mehan)
27. The expectation that trading programs will become more pervasive may create a disincentive to nonpoint sources to address pollution now (Lucero)
28. Gaming strategies (King)
29. Patience (Hey)

Participants' comments addressing goal two of the session, to identify which challenges the wetland mitigation banking model could help address or that a third party could solve, are summarized below:

Robinson believes that removing liability from the permit holder (#5), which could be specified in the NPDES permit or in a separate contract, would increase people's willingness to participate. Also, in regards to whether or not mitigation needs to take place in advance (#7), pre-credits as the initial incentive would help water quality trading take place. Federal guidance and a mechanism analogous to the Mitigation Banking Instrument (MBI) could address the challenges of performance standards and method of monitoring (#9) and enforceability (#18). Finally, a third party can help the agricultural community feel less like they are being regulated as a point source (#20).

Platt commented that 15 of the 29 challenges could be addressed by creating a mitigation bank regulatory regime through banking model guidance. These 15 (#s 1, 2, 5a, 5b, 6, 7, 8, 9, 10, 13, 18, 19, 21, 22, 23) are maybe not the most important, but they lend themselves to regulation rather than innovative technology. Perhaps rule-making by state and local programs (#22) cannot be addressed with politics at the state level if the state itself does not have a regulatory framework or state regime. Therefore, federal guidance needs to encourage states to set up their own programs.

Joyner thinks the key issue is that mitigation banks get a permit. Water quality trading needs to expand the regulatory authority to the seller of the credit like the mitigation banking industry has done. Selling credits needs to be regulated to help address liability and uncertainty issues (#5), e.g. regulating ecological value of credits.

King stated that mitigation banks are suppliers of credits. A banker who supplies aggregate credits is not helpful to water quality trading. The third party consolidators are more effective and accurate at validating trades, scaling back risk, and the law of large numbers. There are two ways to validate these trades. One is to model and measure endlessly, the other is to consolidate them and use the law of large numbers. Hey disagreed, stating that it is necessary for suppliers of credits to monitor and measure the credits. If a farm is too small to do so then they should not be in the business.

Denisoff believes that King and Hey are both correct. Bankers do play a broker role and can take the private sector incentives and efficiencies to the market. At the same time, a brokerage can help consolidate trades. An effective program takes the private sector efficiencies and marries them with the oversight and resources of government programs, like the North Carolina Ecosystem Enhancement Program. This program allowed for advanced financing and mitigation, where private sector efficiencies were brought together with third parties to broker the agreements under a "triangle transaction" (buyer, seller, and broker/oversight agent). The broker can be a public or private entity.

Robertson pointed out that banking was initially designed to solve the problem of defining the commodity that was being sold, i.e., the chemical/biological integrity of the nation's water. The degree to which water quality trading can learn from mitigation banking may be limited by whether or not the commodity in water quality trading can be modeled from a distance. Mitigation banking provided an answer to the question of spatial consolidation; however, this is not the question in water quality trading. In terms of patience (#29), we cannot solve all problems at once.

Urban felt that if each individual nonpoint source has to put together an instrument and negotiate agreements the model will not work. Regas emphasized that one central challenge is the lack of a demand driver, be it a lack of enforceable TMDL standards or a lack of numeric water quality standards. Platt said that the mitigation banking model could help address this issue with a "build it and they will come" approach.

Robinson commented that people should use the term mitigation banking not wetland mitigation banking. There are other bodies of water to consider, e.g. streams, linear aquatic bodies, etc.

Ettinger pointed out that the environmental community's preference would be to have no destruction of wetlands and no discharge of pollutants into waterways. However, since the Corps does grant §404 permits and EPA does issue §402 discharge permits, the environmental community seeks to minimize the environmental impacts that stem from these programs. Under the §404 program, mitigation options include permittee-responsible mitigation and the market-based approach of purchasing credits from a wetland mitigation bank. Since permittee responsible mitigation is essentially unenforceable, and the environmental community cannot bring a lawsuit to enforce that permit, wetland mitigation banking may be a good option. Under the §402 program, however, permittees are required to meet effluent limitations and the §402 permit can be enforced in federal court. In order for the environmental community to support a market-based approach to water quality trading, and for water quality trading to succeed, water quality suppliers will need to demonstrate that they are achieving the pollution reductions and they must be legally liable for doing so.

McElwaine stressed that the key to a third party success in trading will be whether or not it reduces transaction costs, such as risk mitigation, for all parties. Water quality trading is not a "one size fits all" strategy. Each watershed is different, with different criteria and different assumptions. It is absolutely imperative to keep transaction costs down.

Schubauer-Berigan stated that the difference between mitigation banking and water quality trading is that in water quality trading, context is important, while in mitigation banking, habitat is important. Trades depend on what will be released in response to certain restrictions versus where the trade will occur. This relates to how to prevent a series of landowners from becoming the losers in a large trading game. They need to find recourse for problems occurring in their section of the watershed as opposed to someone else who is gaining benefits from the treatment. Finally, there is a misnomer about "small farms." Most farms are large. Large farms should be required to monitor like businesses and other industries. Farm size should not always be determined by acreage.

Coan responded that the average size of a farm in her state is 140 acres. This points to the fact that there cannot be a "one size fits all" approach to developing regulatory schemes. What will work in her state will not work on the big farms. Joyner commented that a farm in Florida (regardless of size and profitability) will not generate credits by just implementing BMPs. It must go above and beyond the baseline.

Lanyon said that publicly owned treatment works (POTW) trading will only work if a broker is involved. This separate entity could find appropriate parties or technology for nutrient removal. POTWs can transfer their liability to this third party. It is crucial that POTWs not be in a position where they can be sued. It is easiest to deal with one entity/broker.

The Use of Water Quality Trading and Wetland Restoration to Address Hypoxia in the Gulf of Mexico

G. Tracy Mehan, III, ***Cadmus Group***
Paul Faeth, ***World Resources Institute***

Hypoxia in the Gulf of Mexico is prevalent along the entire coast of Louisiana. There have been a number of studies demonstrating that hypoxia is increasing every year as a result of discharges from point and nonpoint sources in the Mississippi River basin.

World Resources Institute (WRI) and the USDA Economic Research Service developed a model to determine what would be required to stabilize and reduce hypoxia and reduce nitrogen and phosphorus by 30 percent. The model also ascertained how a trading program could be developed in the Mississippi River basin to reach the 30 percent reduction goal. The model assumed that point sources, including significant agricultural point sources, would have an obligation to curb discharges. The model depicts where significant reductions are most likely to occur and shows a great deal of trading activity in those regions with the greatest concentration of point sources. These areas coincide with areas of high agricultural productivity, where the use of fertilizers and animal waste treatment facilities is also high.

In addition to nutrients and sediments, the model also has the capacity to examine greenhouse gas emissions. The most significant greenhouse gas contributed by agriculture is nitrous oxide, followed by methane, and then carbon. Nitrous oxide is a significantly more powerful greenhouse gas than carbon dioxide. It is produced when agricultural use of nitrogen leads to the input of nitrogen into the water system, which is then largely released into the atmosphere as nitrous oxide. Thus, a nitrogen trading program aimed at water quality would also result in notable green house gas reductions because there would be less nitrogen in the environment. A map presented depicted the location of the highest percentage of greenhouse gas reductions.[16]

Faeth highlighted the findings of various studies that have sought to determine the cost of reducing nitrogen inputs into the water system through wetland protection.[17] Some of these reductions would be cost effective. If producers were able to bundle production practices, they could actually make money. At the lower end, credits generated from wetlands can be competitive, but not necessarily at the high end. These studies do include the opportunity costs of agricultural production.

The model also found an important correlation between the location of wetlands in the Mississippi River basin[18] and the location of the highest nitrogen delivery ratios.[19] Historically the wetlands of the Mississippi River basin have been located in the lower parts of the basin in areas where there is high nitrogen delivery along the main stem. Wetlands built in these areas would attenuate the most nitrogen and would stimulate very competitive reductions.

In order to encourage the development of nutrient trading programs, WRI developed a website called NutrientNet,[20] where farmers can access a photo of their property. By selecting different fields in the photo, farmers can retrieve information on several factors, such as slope, distance to the nearest stream, and soil type, among others. The farmer can then enter information into the site on how much fertilizer they use and their cropping practices to estimate their nutrient contributions. The website can calculate the baseline, which is ultimately decided by the regulatory agency regulatory decision. In places like the Chesapeake Bay, there is a baseline the farmers must achieve first, and then any credits generated above that baseline can be traded.

After the website calculates the baseline, it provides options for either reducing discharges or selling credits. However, the farmer has no obligation to reduce discharges. The website also outlines subsidies, BMP options, and provides the form for

[16] See slide 4 at: http://www2.eli.org/pdf/wqtforum/presentations/Faeth.Mehan.pdf.

[17] See slide 5 at: http://www2.eli.org/pdf/wqtforum/presentations/Faeth.Mehan.pdf.

[18] See slide 6 at: http://www2.eli.org/pdf/wqtforum/presentations/Faeth.Mehan.pdf.

[19] See slide 7 at: http://www2.eli.org/pdf/wqtforum/presentations/Faeth.Mehan.pdf.

[20] See: http://www.nutrientnet.org.

selling credits. The website incorporates opportunity costs then calculates the price for reducing each pound of nitrogen. In 2006, Faeth anticipates conducting a test with Andrew McElwaine of the Pennsylvania Environmental Council to use cash to buy credits from farmers through a grant from the U.S. Department of Agriculture.

Mehan continued the presentation, emphasizing that the Mississippi River basin is considered the largest nutrient challenge in the entire country given the size of its drainage and number of rivers. For some time now, trading has been considered a possible solution, but how to start such a program is still unclear. He stated that trading must be a part of the solution to the problems in the Gulf of Mexico.

There are three essential components to establishing a water quality trading program: water quality standards, TMDLs, and NPDES permits. The standards must be in place to correctly assess the TMDL. The TMDL is essentially a pollution budget, which is defined through a waste load allocation in a point source NPDES permit. Having all three of these components in place would be the ultimate driver for point sources.

Setting water quality standards related to nutrients has been very problematic. An administrative law petition filed with EPA a few years ago by a public interest group in St. Louis highlighted the lack of standards in the Mississippi River and the problems with these standards when applied to nutrients. In the Gulf of Mexico, they have reached a political agreement with an arbitrary reduction goal, but there are no legal ramifications with respect to what will be reflected in NPDES permits.

EPA's Office of Science and Technology and Office of Water are moving toward focusing on water quality standards as a priority, if the courts will allow them to move away from an almost exclusive focus on technology-based effluent guidelines. The TMDL program is improving through trial and error. Eventually this will result in tighter NPDES limits. However, this necessary evolution may take a long time.

Mehan suggested that the Chicago Climate Exchange could set up a market and begin to trade greenhouse gas (GHG) credits. American Electric Power is spending a fortune reforesting the entire Mississippi delta to generate GHG credits. They might get more bang for their buck if they were dealing with a stronger GHG, such as nitrous oxide. This type of market could operate on a national scale. It fits the concept of a centralized system and would benefit any water body impaired by nitrogen.

Say's Law dictates that supply creates demand. Mehan suggested that an institution could manage nonpoint sources in a given watershed or TMDL segment. If the nonpoint sources were reduced beyond a baseline level dictated by a regulatory agency, credits could be generated and made available, creating a demand upon which point sources could capitalize. Such an arrangement would require active intervention by a third party institution, such as a not-for-profit institution that has close affinity to the agriculture community. The function of such an institution would be to preserve the anonymity of the producers involved, provide credibility to the system, and provide comfort for agriculture producers and regulators. The third party could begin to implement BMPs and generate credits in a watershed. Brokers, bankers, and aggregators could be involved at this stage to help create the supply that would then create the demand.

Questions & Answers

Schubauer-Berigan commented that he is concerned about the suggested link between nutrient trading and GHG trading. One of the problems associated with trading is that very rarely is denitrification completely nitrous oxide-free. The larger the nitrogen source, the more nitrous oxide. Nitrogen management, when managed in terms of redox, is different than if you were to manage phosphorous. Nitrification also is known to produce a lot of nitrous oxide. Schubauer-Berigan stated that we should be mindful of where nitrogen is controlled and what process is used. He was skeptical about the assumptions in their model that water quality trading would genuinely contribute to greenhouse gas emission reductions. Faeth stated that the model focused on avoiding the introduction of nitrogen in the water in the first place. However, he agreed that the process of how wetlands treat nitrogen is not well understood.

Schary asked if the Chicago Climate Exchange was genuinely getting involved in water quality trading, funding notwithstanding. Mehan said that they wanted to continue discussing it, but were not really sure how to proceed. Their interest would largely revolve around the value of reducing GHGs. Their involvement would probably require some funding. He suggested that EPA might be able to support such an effort.

Denisoff asked Mehan what he thinks would be an effective demand driver for encouraging water quality trading. For example, would stronger teeth or more incentives in NPDES permits be sufficient, or would a combination be necessary? Mehan responded that there are many possible combinations. Once the traditional regulatory components of the water program properly deal with nutrients, more drivers will be created. There are places right now where trading makes sense, such as Saginaw Bay, Michigan, where there are tremendous cost differentials in controlling phosphorous between point and nonpoint sources. Some of the barriers include the focus of regulators on the NPDES program, as well as traditional corporate culture. There are capacity, technical, and policy issues that need to be resolved.

Faeth added that the 2007 Farm Bill is an opportunity to address these issues. There has been much discussion about the barriers of the farm programs setting the baseline too high. However, farm programs could be structured to allow environmental services to be purchased from farmers. If the environmental services provided by farmers were defined in terms of credits, farmers might become more comfortable with the idea of selling services. The farm programs are an opportunity for conditioning permits and generating clean water.

Lessons Learned from Point-Nonpoint Source Trading

CASE STUDY: PHOSPHORUS TRADING AND WATER QUALITY – THE TOTAL PHOSPHORUS MANAGEMENT PROGRAM

Dennis O'Grady, *South Nation Conservation*

The South Nation River watershed is located in the eastern part of Ontario, encompassing 4,000 square kilometers. The river is 180 kilometers long but relatively flat. The watershed consists of 15 municipalities and has a population of 90,000 people. Sixty percent of the land is in agriculture. River flows in the spring are around 198 cubic meters per second and in the summer the rivers essentially dry up.

There are 36 watershed agencies, or "Conservation Authorities," in Ontario. The Conservation Authorities were established through legislation in 1946. It is interesting to note that the Conservation Authorities are all located in the southern part of the province where there are people. They have no resource problems in the northern part where human populations are low.

The South Nation Conservation Authority (SNC) became involved in a phosphorous trading program because phosphorus levels throughout the watershed were, on average, five times greater than the provincial water quality objectives (.3 mg/l). Ninety percent of the phosphorus comes from nonpoint sources.[21] The watershed has 18 wastewater lagoons, most of which discharge once every spring. The problem reached a climax in the mid-1990s when a number of plants sought to expand their operations, which would have led to additional phosphorus discharges.

The trading program is based on Provincial Water Quality Guidelines established by the Ontario Ministry of the Environment. Policy 2 of the guidelines states that when water quality does not meet provincial standards, no further degradation of water quality is allowed.[22] The province, which decides if a stream meets the Policy 2 criteria, had allowed phosphorus discharges if there was a hardship to meet standards (e.g., high costs).

The Deputy Ministers established a no net increase of phosphorus cap on a watershed scale. The Ministry of the Environment stated that this cap could be met by any new or expanded plants having zero discharge or by purchasing phosphorus credits to offset their loads.

A critical component of this program is that the method of capping is decided by the discharger, not the province. In Ontario, dischargers must prepare environmental assessments (EAs) prior to expansion or new construction. The EAs are required to outline which option they will use to control phosphorus. For example, they can build a new tertiary treatment plant, which costs about $15 million, or they can implement a Total Phosphorus Management (TPM) strategy or another system, such as treatment wetlands. Under the TMP approach, it costs an average of $370 to remove a kilogram of phosphorous. This program only applies to new plants. Wastewater discharge must still meet provincial treatment standards for all other parameters.

Phosphorus credits are generated through typical BMPs: septic, manure storage, milkhouse washwater, barnyard runoff control, livestock access, and buffer strips. The program's formulas for how many phosphorous credits could be applied to the different BMPs came from a number of studies. There was some uncertainty about how new technologies and management methods would affect these formulas, many of which relied upon 5-15 year old research. In 2002, SNC conducted a review of 80 primary research papers in an effort to develop new formulas. The results were peer reviewed. New literature is reviewed to ensure that they have the most up to date formulas.

The TPM program is a closed system. Credits are purchased only by SNC and can only be sold to specific dischargers that are expanding. There were concerns about whether or not a market exists in the context of a closed system. Dischargers must buy from someone, but what happens if there is no phosphorus to sell?

[21] South Nation River Conservation Authority. *Waste Water Assimilation Study of the South Nation River Watershed.* Toronto: Ontario Ministry of the Environment, 1993.

[22] Ontario Ministry of the Environment and Energy. "Water Management Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy." July 1994. http://www.ene.gov.on.ca/envision/gp/3303e.pdf.

Previous experience with BMPs helped the program demonstrate that a market already existed. Since 1993, SNC had been administering a Clean Water Program, which completed 420 BMP projects worth over $5.4 million. Applying the new formulas to the work they had done in the past, they were able to calculate how much phosphorus was controlled by each of the BMPs. These data allowed them to calculate the amount of phosphorus that can be removed through application of BMPs (more than 9,166 kg annually). This gave the province an adequate amount of comfort regarding phosphorus targets and allowed the program to proceed more quickly.

Funding can be used to direct the program. For example, SNC provides farmers with a 50 percent grant to install manure storage, but they cap the grant at $10,000. Manure storage costs approximately $25,000 to $30,000. They are able to satisfy the demand using this cap. But if they offered $15,000 to $20,000, they would probably increase demand for participation in the program.

This program was not easy to establish even though there was an existing program in place. The agricultural community was concerned that the offset ratio for phosphorus reduction was too low (2:1), as well as the funding level per kilogram of phosphorus ($150/kg). SNC was partially to blame, as the total costs were not considered (phosphorus reduction was being subsidized through other funding sources). Other concerns related to the fact that liability was not well defined. It was unclear if the landowners who accepted funding or the municipality/industry would bear the responsibility if phosphorus reductions were not achieved. There were also equity concerns related to the agricultural community bearing responsibility for pollution caused by urban dwellers. Finally, there was a general wariness by the farm community of urban people and politicians.

SNC established a working group to review the concerns of the agricultural community and to bring an end to two years of struggling. The group had representatives from farm organizations, farmers, SNC, and government. The process led to a signed agreement that outlined the different parties' roles and responsibilities. They settled on a 4:1 offset ratio, instead of the initial 2:1 (kilograms of phosphorous removed from nonpoint source for every kilogram discharged from a point source). The trading ratio agreed upon is not based on science, but rather on negotiation with the farmers. The negotiations established a higher cost per kilogram of phosphorus, designed an evaluation and monitoring strategy, and created a system for open reporting to municipalities and agriculture.

Two factors contributed to the success of the program. First was establishment of the Clean Water Committee, which has total control over the program. This committee ensured credibility by equally representing all the stakeholders: business, industry, environment, farm, and political interests. The committee is fully responsible for grant structure, funding approvals, committee structure and membership, promotion and evaluation, research and monitoring, and fund raising. It is chaired by a local farmer and reports to SNC's Board of Directors.

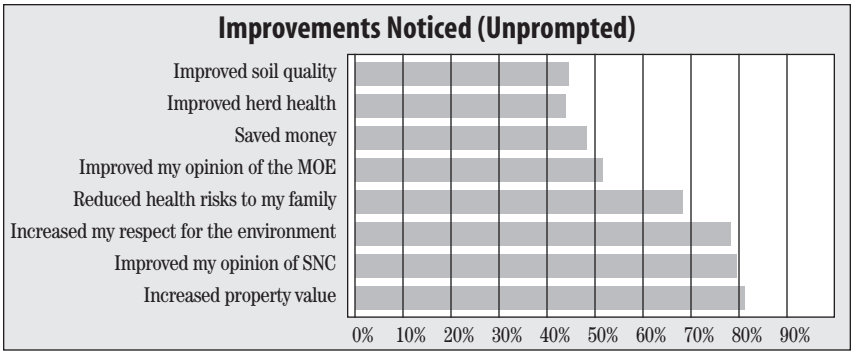
Second is the leading role played by farmers in delivering the program. The Clean Water Committee pays local farmers to conduct all site visits and the farmers are recognized as leaders in the community. The farmers make recommendations to the Committee on which projects to accept. This is also a very cost effective approach. In 2004, SNC spent $6,626 for 85 project site visits. If SNC had used full-time staff for these visits, the cost would have been around $100,000. They have been relying upon this approach for five years and have seen no negative side. This method has served to increase the credibility of and participation in the program.

The agreement signed by the stakeholders provides for monitoring, evaluation, and reporting. The monitoring component consists of sampling 13 stations for surface water quality on a monthly basis (April – November). Phosphorus trends are tracked over time by comparing this data to baseline, historical information, which has been collected for more than 40 year at some stations. However, it is still not possible to measure immediate results. Other indicators of water quality improvement must be measured.

SNC and TPM partners recently completed a program evaluation, the second component required by the agreement. The partners originally committed to evaluations in the fifth and tenth years of the program. The evaluation included a stakeholder survey, data analysis for water quality, accomplishments, challenges, and recommendations for program improvements. The evaluation found that farmers' opinions of the Ministry of Environment had improved because of this program.

Reporting is the third important component of the agreement signed by the Clean Water Committee. SNC provides annual reports to participating point source dischargers. Phosphorus credits are allocated based on targets for each discharger. SNC uses the aggregate of all BMPs, applies the formulas, and writes a report back to municipalities outlining the projects they completed and the amount of phosphorus that is being allocated back to them. Time required to achieve phosphorus reduction targets varies from one to five years. The municipalities are required to see that they are controlling the phosphorus.

When SNC provides the list of projects that make up the "bank" of phosphorus credits, individual projects and landowners are not specifically identified. All reporting is confidential and presented by township. This format was adopted to address stakeholder concerns regarding landowner liability for performance of phosphorus reducing projects.



O'Grady concluded by summarizing the TPM program. Under the program, SNC negotiates a phosphorous management agreement with the discharger. This agreement becomes part of the operating procedures for that wastewater treatment plant. The discharger pays SNC based on the number of kilograms the plant is discharging. SNC passes the money along to the Clean Water Quality Committee. The Committee allocates the funds to eligible projects. Once landowners complete the approved projects, SNC verifies that the projects have been complete by sending a farmer field representative to conduct a site inspection and report back to the committee. The inspection is documented through invoices and photos of the completed project. The field representatives randomly inspect 10 percent of the completed projects. SNC then calculates the total phosphorus reduction from these completed projects and allocates credits to the dischargers.

SNC provides annual reports to the dischargers on the amount of money contributed and phosphorus credits allocated. The Annual Clean Water Program Report is circulated to all watershed stakeholders.

This program was fortunate to have a watershed agency already in place, as well as an established Clean Water Program with a track record of providing grants for BMPs. Without these elements, wide-scale adoption of a trading program would have taken four or five years. O'Grady stressed the importance in having patience in similar developing programs. It takes a long time for people to break down communication and institutional barriers. Water quality trading programs would benefit from additional public relations exposure so that the various parties can begin to understand the benefits trading offers to government (lower grants for infrastructure), taxpayers, industry, businesses (lower taxes), agriculture (support), and the environment (controls other contaminants, in addition to phosphorus).

Lessons Learned from Point-Nonpoint Source Trading

CASE STUDY: GREAT RIVERS LAND TRUST

Alley Ringhausen, *Great Rivers Land Trust*

Great Rivers Land Trust (GRLT) is a non-profit organization dedicated to preserving open space and critical wildlife habitat in the St. Louis metropolitan region. GRLT's mission is to promote the preservation and improvement of natural resources principally in, but not limited to, the watershed of the Mississippi River for the benefit of the general public. These resources include land and water resources, the plant and animal life thereon, and the area's unique scenic, natural, and historic sites.

GRLT works with educational institutes, nonprofit organizations, private citizens, corporations, local landowners, and government entities at the local, state, and federal level. GRLT has a 13-member Board of Directors, a 57-member Advisory Board, and 485 individual donors.

GRLT manages a unique area on the Illinois side of the Mississippi River where a four-lane highway runs along the river. The area includes bluffs, prairies, and forests. As a land trust, GRLT is primarily involved with acquiring land or purchasing conservation, riparian, or scenic easements. This area is under a lot of development pressure and GRLT strives to keep it as natural as possible. In the past, GRLT has conducted wetland enhancements and reforestation projects, formed a buffer partnership with Trees Forever, and protected land for community parks and riverfronts. One such project is the Piasa Creek Watershed Project

The Piasa Creek Watershed drains over 78,000 acres in Madison, Jersey, and Macoupin counties. The lower reaches of the stream were channelized years ago and are comprised of second-growth bottomland deciduous forests. The upper reaches drain the residential landscapes of Godfrey and the agricultural lands of Jersey and Macoupin counties. The watershed's point of discharge into the Mississippi is at the Great River Road, about five miles north of Alton.

In the early 1990s GRLT started working with the American Farmland Trust, the first nationwide membership organization dedicated to protecting America's farmland. Together they began an effort to conduct pilot projects to develop watershed plans for this area. As part of the effort they brought together a group of stakeholders, including businessmen, politicians, farmers, and landowners to talk about the major problems of the watershed, possible solutions, and what resources might be available to implement these solutions. Based on the information gathered at these meetings, they developed the Piasa Creek Watershed Plan. It received a few grants, but mostly sat on the shelf; the watershed strategy was not truly being implemented.

Then in 1993, heavy rains flooded a local water company. The company, the Illinois American Water Company, wanted to relocate their water purification plant to the top of a nearby hill. Unlike the original plant, the new plant was not allowed to discharge river sediments taken through intake pipes back into the Mississippi River. Instead, they were required to build sediment lagoons and transfer the sediment to offsite landfills. As an alternative, Illinois American Water Company discovered the Piasa Creek Watershed Plan and offered to fund implementation of the plan if Illinois EPA would allow the original permit conditions to stand for sediment discharge. Implementation of the watershed plan would allow the plant to reduce the amount of sediment coming into the river from Piasa Creek, which was just above the plant's intake pipes. Illinois EPA approved their proposal.

The GRLT and the Illinois American Water Company signed an agreement to begin implementation of the Piasa Creek Watershed Project (PCWP). The $4.1 million, ten-year project will attempt to reduce sedimentation in the Piasa Creek Watershed by approximately 6,600 tons per year by the end of the contractual agreement. The groups agreed upon a 2:1 ratio, or double what the water company is estimated to discharge over the ten-year period. Achieving the sediment reduction rates will involve a variety of soil conservation practices such as the construction of silt basins and dry damns, streambank stabilization, and various other practices.

The project first sought to gather baseline data. They hired a fluvial geomorphologist to conduct an inventory and assessment of the Piasa Creek Watershed. The study identified where the erosion was, where sediment was entering the waterways, and the types of land uses creating the most erosion. The biggest source of sediments was agricultural croplands. The assessment provided information on each sub-watershed and specified which areas should be the highest priorities, as well as different tools to address the erosion issues in each area.

Various sediment control tools were identified as options for the project, including water and sediment control basins, grassed waterways, filter strips, streambank stabilization plantings, storm detention basins, terraces, and grade control structures.

The assessment identified several types of erosion taking place in the watershed: sheet erosion, rill erosion, gully erosion, and streambank erosion. The geomorphic assessment concluded that gully erosion was the watershed's biggest problem and that it needed to be addressed by the agricultural community. GRLT hired a local farmer to encourage other farmers to participate in the Piasa Creek Watershed Project. GRLT formed a partnership with Soil and Water Conservation Districts that were already working in the area. They helped build various sediment control tools for the different projects. These tools are designed to be as natural as possible and are measured using USDA standards. Stream bank stabilization projects are determined by physical measurements in the field.

The program has generated so much interest in the agricultural community that GRLT developed a weighted system to evaluate which projects result in the greatest sediment reduction for the investment. GRLT has also implemented an educational component to the Piasa Creek Watershed Project geared toward children and landowners.

GRLT uses GIS to track each project and to identify priority areas for future projects. USGS topographic maps and aerial photos are often used as base maps, and thematic data is layered over them. Thematic data indicates which areas of the watershed are in most need of protection. The program prioritizes its work in areas with the most erosion. The data used for PCWP are quaternary geology landcover, bedrock geology, wetlands, prior converted wetlands, and soil classification. Once a project is completed, all the information used in the project is included in a GIS map organized by sub-watersheds. By clicking on a specific property, the user can access project reports for each site, including total acres benefited and total tons of sediment removed. One of the benefits is that the project is funded with private monies, rather than a government grant. To date, GRLT has more than doubled the funds received from the water company by matching it with other grants.

Another important component of PCWP is its flexibility. GRLT established an agreement with the Trails West Council of the Boy Scouts of America in 2002. In the 1980s, the 40-acre lake at Camp Warren Levis had become filled with silt due to construction in the area. The levy of the lake was breeched in 1989 in an attempt to dry the lakebed and sell the soil, however, no funds were available to complete the restoration process. GRLT offered to restore the lake if the Boy Scouts would provide GRLT with a conservation easement on the 253-acre camp. The effort is funded in part by PCWP. GRLT is restoring approximately half of the original lake and the remainder will become an enhanced wetland. Phase I excavation work on the 15-acre lake is nearly complete. Phase II designs are complete and will address the restoration of the levy and spillway.

GRLT has also put together a wish list of their research priorities related to the watershed project, which were limited by lack of funding and staff. They shared the list with universities in the area in attempt to generate interest from graduate students or professors.

Ringhausen concluded by stating that the most important factor in the success of the project has been the cooperation and buy-in of local landowners. While GRLT has more interest than they can accommodate, this allows them to pick and choose the highest quality projects that result in the largest amount of sediment reduced for the money they spend. The water company is satisfied because they can continue to discharge their sediment, keeping local water bill costs down, and lower water bills keeps local residents happy. Landowners support the project because they receive funding for conservation projects they could not normally afford, cleaning up the stream corridor, improving habitat for flora and fauna, and ultimately resulting in a cleaner Mississippi River.

Questions & Answers

Sokulsky asked Ringhausen about the level of Farm Bill program activity in the watershed and how GRLT competes with those programs. Ringhausen responded that GRLT works with these programs, such as USDA's Conservation Reserve Program, to provide farmers with more of the full costs associated with implementing projects. PCWP does not provide farmers with 100 percent of the costs because they feel that farmers must have some ownership for the projects. The likelihood of the farmers maintaining the projects is higher if the farmers have contributed. Sokulsky asked if they had any remedies if the farmer does not maintain the project. Ringhausen responded that this has not yet been an issue.

Wilson asked O'Grady if the formula they use to allocate phosphorus was a baseline or a target. O'Grady stated that they do not allocate credits, but rather, they allocate kilograms of phosphorus. For example, the number of cows kept out of the river is translated to an amount of phosphorus that is removed by the use of this BMP.

Joyner asked O'Grady to clarify how his project uses offset ratios. Farmers usually view higher ratios as less desirable. O'Grady responded that the 2:1 ratio was decided upon in an arbitrary manner. The 4:1 ratio provides more money for BMPs, because for every kilogram that is discharged into the river, the municipality must pay to remove four kilograms. This provides SNC with four times as much money to provide to the agricultural community for BMPs.

Schary asked O'Grady how SNC verifies the results of the projects that they are implementing, and whether there is any follow-up to ensure that the inspectors are conducting appropriate appraisals. O'Grady responded that no money is paid out until SNC receives a verification that the project has been completed. The program relies on using "farmer field representatives" as inspectors. These individuals are from the local area and know the farmers who are doing the projects. Although there is potential for gaming, it would be very difficult because Farmer Field Representatives are from the same community and have frequent interaction with all the farmers.

SNC randomly audits only 10 percent of the projects. They have decided it is not cost effective to design a monitoring system to identify the 5-10 percent of participants who may be gaming the system. Instead, they manage for the 95 percent of participants who participate in an honest manner. Ringhausen added that a severe rainstorm caused a blowout of several projects in his area a few years ago. Because the community is so close, GRLT knew about the failures almost instantly.

Urban asked O'Grady if the permits have a time limit and, if so, how the permits get renewed. He asked if old projects carry over when permits are renewed or if new projects must be conducted. O'Grady responded that the Certificate of Approval is in existence unless there is a change. The timeline for the completion of the phosphorus management projects and the amount of kilograms removed are based on SNC's estimates of how long it will take to remove the phosphorous. The determinations are case-specific and based on negotiations. Agreements range from one to five years.

Biorn-Hansen commented that case study projects seem to have been successful in identifying good projects that have met their goals. She asked how additional pollution control could be accomplished if they had more funding. She also asked how much of the overall pollution problem they have been able to address with current levels of funding. Ringhausen responded that they could complete additional projects with more funding.

King asked O'Grady what incentive farmers have for participating in the program, since they do not receive 100 percent of the costs for completing the projects. He added that an additional possible disincentive is that participation in the program is a time commitment to farmers. Ringhausen responded that regardless of how high the ratio is set, participation in the GRLT program is more desirable than participation in the Farm Bill programs. O'Grady added that many farmers view themselves as stewards of the land and have a strong conservation ethic. These farmers are not opposed to doing conservation work on their land because they believe that they should address the pollution for which they are responsible. Much of the time, however, they cannot afford to do the conservation work. As a result, SNC's program helps them tremendously. In addition, farmers may be participating in these programs as a result of concerns about the regulatory consequences of failing to address pollution problems. They would rather voluntarily put in a few dollars of their own than have the government force them to implement BMPs.

Dowell asked Ringhausen if he has looked into the role of farmland preservation in terms of sediment reduction – for example preserving farmland from residential development. Ringhausen replied that they have considered it, but have not yet become involved, as it does not quite fit in with what they are doing. So far, the farmers have been simply selling their land to the developers for a lot of money.

Legal and Financial Liability – Issues in Mitigation Banking and Water Quality Trading

A WETLAND MITIGATION BANKING PERSPECTIVE

George I. Platt, *Florida Wetlandsbank, Inc.*

Platt outlined the legal and financial mechanisms that help make mitigation banking successful.

The first mitigation bank sponsored by Florida Wetlandsbank was in Florida in the early 1990s, prior to issuance of federal guidance or state legislation on banking. The bank operated under a permit that gave them a starting point but left them to work out the details. The permit, for example, did not dictate the price of credits.

It has now been ten years since the federal agencies issued the mitigation banking guidance. It is a credit to government regulators and ingenuity of private sector that banking has come as far as it has. There are nearly 400 mitigation banks permitted across the country, and over 35 in the state of Florida alone. The banking industry in Florida has thrived for several reasons: there are many wetlands in the state, rapid development is occuring, the state passed wetlands legislation that mirrors the federal wetlands laws, and wetlands are regulated at the local level.

Wetlandsbank supports the no net loss goal because the more wetlands mitigation that is required, the greater the demand for credits. The 1995 banking guidance, as well as other federal policies that direct mitigation, have many parallels to water quality trading. All of these provisions have been important in encouraging mitigation banks. Similar provisions could support the development of water quality trading, as well as encourage farmers and large landowners who are near listed waterbodies to take action by working through bankers, brokers, or cooperatives.

The banking guidance establishes the specific rights and obligations related to proposed mitigation banks. It requires a detailed description of the restoration, enhancement, or creation of the bank site, timing issues, success criteria, the type and number of credits, and the credit release schedule. The release schedule is directly linked to meeting specific milestones. The federal mitigation banking instrument, and often a sister permit at the state level, establish legal duties that the banker must meet in order to commence and continue selling credits. The mitigation bank service areas are generally watershed-based, but banks may also sell credits for linear impacts, such as pipelines and railroads.

The issue of the transfer of liability is absolutely key to the success of the mitigation banking market. In the early days of banking there was skepticism about the practice. Although developers did not fully understand banks, they did not want the five-year obligation for monitoring a mitigation site on their own. Some developers realized that they could buy credits and transfer that legal liability. This characteristic is an essential component of what makes mitigation banking successful. This same transfer of liability must be developed for water quality trading, perhaps through the NPDES permit.

Under the mitigation banking instrument, the banker is responsible for the creation of a trust fund that supports long-term management. This is unlikely to occur in water quality trading. It is more likely that this continuing obligation would be handled through a trust fund or some financial assurance. The long-term management responsibilities in banking are virtually in perpetuity. Each time a banker sells a credit, they are required to post money in a trust fund, which generates income for perpetual maintenance. The banking guidance states that “it is extremely important that an enforceable mechanism be adopted establishing the responsibility of the bank sponsor to develop and operate the property.”

Financial assurances are often enforced by state or local agencies designated in the mitigation banking instrument. The process of working with the MBRT to secure a banking instrument is collaborative and can take two years. It is an arduous process and requires the banker to invest quite a bit of money up front. Paying for land up front is unpopular because the cost of land in many states is astronomical. One option is to find a joint venture partner that already owns the land.

Establishing a bank requires several types of financial assurances. The banking guidance requires the banker to secure sufficient funds, or other financial assurances, to cover the contingency actions in the event of a bank default or failure. The greater the risk of failure, the higher the financial assurances required. Financial assurances may be in the form of performance bonds, irrevocable trusts, escrow accounts, casualty insurance, letters of credit, and in the case of government operated banks in Florida, legislatively dedicated funds. States typically regulate in much greater detail the type of financial assures that are required. In Florida, bank sponsors can be required to post bonds that are 110 percent of the cost of the construction and implementation. Those bonds are reduced and phased out as certain milestones are met. The long-term trust funds are not used until after the five-year monitoring period. On the other hand, if banks are constructed in advance of the sale of credits, financial assurances for construction need not be posted. This requirement would be different in the water quality trading context.

The banking instrument includes a credit release schedule. For example, the bank sponsor may be allowed to release credits for sale after securing a conservation easement, prior to completing any major restoration work. Other milestones for credit release may be the eradication of exotic species, re-establishment of hydrology, planting, meeting certain success criteria, and completing the five-year maintenance and monitoring period. As success criteria are met, the amount of financial assurances may be reduced accordingly.

In the mitigation banking context, the Mitigation Banking Review Team process has "boxed the risk" of failure by requiring financial assurances as a backup. The same will hold true for water quality trading, where risk needs to be "boxed."

The amount of planning that takes place before a banking instrument is secured is key to the success of banking. Collaborative consensus building takes a long time, but once an instrument is submitted, the process runs fairly smoothly. Although painful, if the process did not exist, it would be much more chaotic.

Legal and Financial Liability – Issues in Mitigation Banking and Water Quality Trading

A WATER QUALITY TRADING PERSPECTIVE

Cyrus Jones, *Washington Suburban Sanitary Commission*

Wastewater treatment plants (WWTPs) have very mixed attitudes toward the Clean Water Act and NPDES permits. On the plus side, the CWA and its regulatory structure establish clear goals and rules for plants and regulators. In general these rules are practical and achievable. The biggest benefit to the regime is the ability of WWTPs to use the discharge permit as a shield. If a plant discloses all discharges in a permit application and operates in full compliance with the approved permit, it cannot be accused of excess or inappropriate discharges. This relates to water quality trading as well. If trading regulations and legislation are carefully structured, then permits will serve as a shield against trading liability issues.

There are several characteristics of the CWA that wastewater treatment plants dislike. First, strict liability is placed upon wastewater treatment plants. Second, there are multiple levels of consequence for violations. Penalties can range from a statement requesting improvements to prevent recurrences of a problem, to a considerable amount of federal control over how the plant is operated, to the possibility of severe civil and criminal sanctions. Such strict, overly prescriptive state or federal controls result in bad public relations. Finally, it is expensive to comply with the CWA.

The realities of NPDES permits and trading are such that legal liability is not transferable. Trading may be established by incorporating trades into NPDES permits. The elements that may be required in the permit and/or fact sheet include a description of how the trade is designed and how it is consistent with water quality standards. The permit must also specify how it is consistent between trade design, units and averaging periods.

There are several optional approaches for incorporating trades into the NPDES permit regime. Trading may be stipulated in a general or watershed permit, the permit can reference the state's adopted trading program, or trading rules may be incorporated into the permit.

Sound trading programs can minimize legal liabilities. If designed appropriately, such programs can alleviate point source concerns and create more demand for trading. In the process of establishing a sound trading program, all of the issues of legal liability by all parties (EPA, state, dischargers, nonpoint source interests) can also be addressed. Trading may also serve to minimize legal liabilities through sound planning on the part of the WWTP, careful assessment of risk of default by the credit supplier, and the development of a carefully constructed contract with the credit supplier (e.g., biosolids contract). Liability may also be minimized through a "reconciliation and truing up" period at the end of the averaging period, existence of an emergency or backup source of credits, and finally, regulatory recognition and certification of the credits

Facilitated Discussion

The goal of the facilitated discussion was to identify options for addressing or transferring liability in the water quality trading arena to stimulate market demand, and to discuss the potential strengths and limitations to these approaches.

Although there are limited opportunities for transferring liability in the water quality trading context, the contract with the seller could be used to transfer some liability. For example, a sludge contract with a seller addresses liability by enabling one party to sue the other if they do not meet their contract obligations. Participants stressed that any scheme needs to be enforceable by EPA and private citizens. The current NPDES process allows for significant transparency in monitoring and reporting. Any water quality trading program that transfers pollution control responsibility to another entity must include the same level of transparency.

Another participant proposed that state agencies could be responsible for monitoring and enforcement. These agencies can verify the monitoring process and results. The permit itself should identify who is responsible for monitoring.

A participant suggested that a third-party could verify and certify credits to avoid criminal liability. This would be a good solution since states do not currently verify compliance by checking that the information contained in discharge monitoring records is accurate.

It was recommended that sellers could be required in the permit to post bonds or other financial assurances if they plan to sell credits. If the monitor (e.g., the state) determines that the project is failing, then the beneficiary agency named under the bond would have the right to call the bond and would contract to have the work performed.

Another participant suggested that a third party can play the role of broker by establishing an insurance pool. Some of the credits generated would accrue to the pool. For example, the Miami Conservancy District is currently acting as a third party in their watershed. In this case, the permit holder retains full liability, contracts with all permit holders, and establishes an extra credit insurance pool using the credits created through the trading ratios applied to each trade. The sum of credits generated at a higher cost accrue to the insurance pool and are protected.

A participant commented that water quality trading, like mitigation banking, should allow for the advance sale of credits. The credit provider must complete the work before selling credits to a buyer because nutrient reduction needs to be concurrent with credit generation. One participant emphasized that the viability of mitigation banking is in part due to the fact that banks are developed in phases.

There should be flexibility in the financial assurances to allow for adaptive management and the dynamic variability/fluctuations related to water quality.

One participant stressed that the choice of mitigation ratios can impede the development of a water quality trading market. Risks should not be dealt with through ratios because they tend to reduce the value of trades.

There was some discussion about the timing of credit generation, certification, and trades and how these factors are dependent on the pollutant at issue. The issue of selling credits in advance of generating credits is preferable in the wetland mitigation banking context. In the water quality context, its acceptance will differ based on the pollutants being addressed. If the trading scheme is expanded beyond nutrients, there will be a timing problem (e.g., algal blooms, ammonia needs to be taken out at the same place/time) and banking/brokering for water quality credits will not work. It would be very difficult to time presales to predict flows. Another participant stated that it is important to think adaptively with water quality and consider seasonal and parameter changes. Installation can be done in advance as long as reduction is continuous.

The Banking Experience: Environmental Performance Standards & Credit Release

Craig Denisoff, *Wildlands, Inc.*

Denisoff offered participants a general definition of wetland mitigation banks: large areas of restored or preserved wetlands set aside to compensate for impacts to wetlands. Mitigation banks are formally approved by regulatory agencies to provide mitigation credits. Banks are designed to create, restore, and/or enhance wetland habitat. Bank sponsors are authorized to sell credits according to a credit release schedule, which is formally reviewed and approved, and contains financial incentives to meet milestones.

Denisoff stated that mitigation banking offers several ecological advantages over mitigation conducted by permittees, including mitigation in advance of the impact, large preserve size, biological improvements, financial benefits, and mitigation conducted in reference to performance standards. In addition, mitigation sites are protected in perpetuity and banks help meet the nation's goal of no-net loss of wetlands. One of the key benefits of mitigation banks is their ability to verify performance and quantify success.

The mitigation banking instrument is the document that outlines the physical and legal characteristics of the establishment, operation, and maintenance of the bank, as well as the legal, financial, and biological assurances that must be met. Legal assurances may be in the form of deed restrictions (recorded), conservation easements (recorded), legal title or property rights, a Declaration of Trust, or a trust and bank document. Financial assurances may be in the form of construction bonding, interim management security, contingency security, or a land management/endowment account.

Denisoff provided some examples of typical biological performance standards, which may cover vegetation, hydrology, and non-native vegetation. For example, a bank may be required to have 95 percent native cover, tidal inundation twice a day and seasonal ponding, and less than 5 percent non-native vegetation. Banks may be required to monitor vegetation and hydrology at specific intervals, such as in years 1, 2, 3, 5, 10, and 20.

Performance standards should be based on a number of different criteria. Because wetlands are habitat-based systems, performance standards are often based on reference sites. A reference site is generally a naturally occurring wetland that demonstrates similar variation in functions as the wetland type being replaced. Vegetations standards are based on composition, cover, survivorship, and wetland types. Wildlife standards examine the type and number of species as well as their life stages. Hydrology standards consider inundation, duration, and flood regime. Soils standards take into account geomorphology and accretion/erosion. Both hydrology and soil standards would be important for water quality trading.

Another consideration is natural dynamic equilibrium. Changes in the environment need to be documented to allow for adaptation. Adaptive management for dynamic ecosystems is often discussed, but rarely implemented because regulators prefer to operate within static systems they can be measured on a regular basis.

To determine if performance standards are being met, mitigation banks often rely upon third parties, consultants, or the bank sponsors themselves to conduct monitoring. Monitoring reports are sent to the regulatory agencies. No fewer than three agencies review the reports. If the agencies feel that performance standards are not being met, the bank sponsor is required to take remedial action, such as replanting, reseeding, adjusting grades, or establishing supplemental irrigation.

Once predetermined performance standards are met, the bank can release mitigation credits. A credit is an agreed upon unit of measurement that represents one good or a number of goods. Once a credit is defined, it can still be changed in the future, if appropriate.

In order to determine the increase in wetland function and value that results from the restoration, a baseline must be established for a variety of parameters, such as ecological values, flood attenuation, and water quality. A wetland delineation must first be conducted to determine the total wetland acreage. Then the bank sponsor develops a restoration plan, which estimates the value that will be added to the existing wetlands. This added value is what eventually will be sold. Wetland restoration projects will generally get full credit for the wetland acreage restored. Wetland enhancement generally provides 50 percent of the proposed credit values. Another approach to assigning credits is to consider the array of environmental goods that are being provided. In this case, flora and endangered species may be measured in addition to wetlands to determine the value of a credit.

Once the credits are established, a credit release schedule is developed. In California, 20 percent of a bank's credits can be released once the bank sponsor signs the conservation easement agreement. An additional 30 percent of the credits are released after the mitigation bank is built. Once hydrology standards are met, another 30 percent of the credits are released. The final 20 percent of credits are released when all vegetation requirements are met, which often includes meeting a series of interim milestones. It usually takes three years to meet the first three milestones and an additional year to meet the final vegetation milestone.

Bankers believe there are both pros and cons to the established credit release method. The benefits include a guaranteed, high quality product, product assurances, interim milestones, public acceptance because of the credit release process, and economic incentives. The drawbacks include reduced sales rate because all of the product cannot be sold upfront, the banker must invest a lot of money and wait years to see a return, less certainty because there is no absolute guarantee that a bank will succeed, greater liability, and a competitive disadvantage to other forms of mitigation. It is necessary to make sure there is a level playing field between banks and other forms of mitigation.

Any attempt to use the banking experience to inform water quality trading will require the development of water quality performance standards and clear definitions of credits. It is necessary to have a quantifiable good, whether it is nitrogen, phosphorous, sediment, or some combination that can be grouped under a Water Quality Unit. There must also be a generally accepted unit of measurement that establishes how many pounds or units of water quality benefit one acre of buffer strip, or one acre of managed marsh, or 100 linear feet of stream, equals. Once this per unit standard is established, the release of water quality credits can be based on the percent completion of this unit. Finally, it is necessary to monitor the water quality inflow and outflow on a site-specific and watershed basis.

Finally, the market recapture mechanism needs to be slightly different than that in mitigation banking. In mitigation banking, banks sell a plot of land one time and then manage it forever. In addition, credits are sold only once. Water quality trading will need a system that works on an annual basis, or based on the length of the permit (three to five years). Payment will need to occur on an annual basis or be based on water units or flow, allowing for adaptive management based on flow and other variables. While water quality trading will necessitate the development of a different economic model, the wetland mitigation banking model can provide some valuable lessons.

Questions & Answers

Mehan asked Denisoff whether the metrics he suggested for water quality trading are limited to brokers who happen to be mitigation bankers or whether the metrics could be generalized to brokers in the water quality arena. Denisoff responded that he feels the metrics can be generalized. Bankers can play an important role in acquiring large land parcels and getting projects off the ground. However, because water quality trading projects could encompass tens of thousands of acres, it may be necessary to involve a third party broker.

Coan asked Denisoff how difficult it was to negotiate the definition of a credit. Denisoff responded that it was a very lengthy process to develop a methodology for defining credits for vernal pools. But once the credit definition was accepted, it was very easy to work with.

Schubauer-Berigan asked how regulators define the number of credits that must be purchased to offset permitted impacts. Denisoff explained that, as a banker, he supplies habitat credits, which are released when performance standards are met. The demand is created by permitted impacts. Bankers are not involved in the demand side of the equation. The regulator overseeing the permitted impacts determines how the wetland will be replaced. Schubauer-Berigan also asked why, in Denisoff's example, these projects that were designed to offset wetland impacts have been allowed to sell credits over and above the wetland replacement values. Denisoff responded that the regulators wanted to take into account several variables. In the example provided, the same model was applied to both the supply and demand side.

Kieser asked Denisoff how typical it is to include water quality credits in the overall credit assessment of his banks. Since nutrients in a trading system are fairly cheap, he asked Denisoff if it would be more beneficial to include water quality credits along with wetland credits in a bank, or if it would be more beneficial to separate those credits. Denisoff responded that wetland banks do not usually monitor or manage for water quality. They do not ask to be paid for the same thing twice. Bankers could make changes to wetland mitigation sites to get added value for water quality and do the monitoring required to determine if success criteria are met. The National Mitigation Banking Association has always supported the ability to bundle credits. A bank could include water quality credits if they can demonstrate there is value added. This would require a slightly different system because with wetlands credits are sold once. Water quality trading would require more adaptive management and stricter monitoring. There would be value added for including water quality credits in a bank, but it will cost more to generate these credits.

Jones asked whether or not wetland science is well enough developed to accurately quantify and verify credits, particularly the uptake of nutrients. Denisoff replied that there have been a lot of studies. It is "generally" accepted that mitigation banks can replace lost functions, and both the National Academy of Sciences and the Society of Wetlands Scientists have come out in support of mitigation banking as a method for achieving no-net-loss. However, there is still some skepticism. It is easier to quantify credits with native wetlands than with treatment wetlands. Some types of treatment wetlands should not be defined as natural wetlands, but rather considered managed marshes. Hough added that EPA has catalogues of wetland assessment tools. Some of the assessment tools are specific to wetland type and others are specific to regions. EPA has reached a certain comfort level with rapid assessment tools that have been developed for the purposes of mitigation conducted under CWA §404. These tools can be used to estimate potential benefits (credits) at a bank site, as well as losses (debits) at impact sites. It would be difficult to layer water quality credits on top of a mitigation bank created to generate credits under the §404 program. This would probably overtax the assessment tools developed for §404.

Alderman commented that the chart Denisoff presented[23] depicting proposed credit values varies widely from region to region and state to state. There is an excruciating process, especially in Florida, to determine the increase in wetland benefits. The same assessment methodology must be used at the impact site and at the mitigation bank site so credit can be compared in the same manner.

Biorn-Hansen asked how bankers avoid the temptation to only construct the wetland types they know will receive the most credit, such as vernal pools. Denisoff responded that the regulatory agencies that approve the design of banks have a significant say in the wetland types that are represented.

Hurld addressed Denisoff's suggestion that water quality credits could be purchased through an annual payment/fee based on water units/flow.[24] She asked if this system would create a disincentive for aggregators to make long-term investments if there is no guarantee that there will be a market five or six years. Denisoff responded that the issue would be necessary to consider when designing any program. Credit definition would depend on the type of project, e.g. a five-month buffer or a several-year marsh. The solution may be a mechanism that locks in the contract and allows for variable factors. Adaptive management must be a component that is built into the water quality trading model. There are more dynamic variables in the water quality trading context than in wetland mitigation banking.

Facilitated Discussion

The facilitated discussion sought the participants' input on the types of environmental performance standards that are needed for water quality trading to ensure improvements in water quality, as well as the potential strengths and limitations to using these environmental performance standards.

The discussion started with a clarification of how performance standards are defined. Performance standards are the measures used to determine whether or not a mitigation project is meeting its designed goals. Schary stated that how performance standards will be used depends on the design of the water quality trading program. In Boise, Idaho, for example, credits were tied to meeting performance standards. The risk was managed by making credits good for one month only. The NPDES permit holder was required to demonstrate that the BMP is still in place and installed to the defined specifications.

Klimek stated that performance standards for water quality trading must be tied to baseline watershed needs, which will depend on specific characteristics of the watershed. Demand in water quality trading will be generated by the degree and characteristics of water quality impairment. The baseline will need to be well understood to establish performance standards. This information must be shared with third party brokers so they know where project opportunities exist.

Hey stated that performance standards and design criteria are separate issues. Design criteria will determine performance. In water quality trading, performance standards are water quality based. They can be divided into concentration and load, and then divided into temporal distribution (seasonally/monthly/daily) and longevity of performance.

[23] See slide 23 at: http://www2.eli.org/pdf/wqtforum/presentations/Denisoff.pdf.

[24] See slide 35 at: http://www2.eli.org/pdf/wqtforum/presentations/Denisoff.pdf.

Urban stated that the performance standards used in banking are designed to produce a functional wetland. In the water quality context, the goal is to reduce a specific pollutant in a defined timeframe. Each practice will have its unique standards of performance and will be tied to an estimated pollution reduction.

Regas stated that with point/nonpoint source trading, the specificity and certainty of the performance standards that apply to the nonpoint source will need to be comparable to those that apply to the point source. Urban replied that in the banking context these risk issues are addressed though the definition of credits, credit ratios, and credit allowances.

Jones cautioned that NPDES permit limits are established to meet very specific water quality goals for specific pollutants. When point sources seek to buy credits, those credits will need to be expressed in exactly the same terms as those in the permit, e.g., pounds of a certain pollutant per year or per month. Point sources want to buy credits simply to offset permit requirements. They are not interested in meeting larger watershed goals. Parker responded that although she agreed with Jones's statement as it applies in most markets, in some areas there is a growing desire to manage all systems based on biological and ecological integrity. Water quality standards will be based on these attributes. For example, in EPA Region 9 states are developing nutrient criteria in a watershed context. Their nutrient standards incorporate ecological components, such as biological integrity and specific vegetation and aquatic life attributes. If these programs are monitoring and managing a system in a watershed context, then point and nonpoint sources are trying to meet the in-water body standard. Pollution reduction allocations will be based not on each source, but rather on the total watershed needs. Many of the permits in these areas include ecological attributes in their limits. Hey replied that maybe sources could hedge risk by buying more credits if they were still below the cost of meeting the permit. Jones said that WWTPs would not buy more credits than they had to unless it would lessen risk.

Noyes expressed concern that it may be difficult to generate demand based on lost function. Ettinger stated that in order to retain the certainty and monitoring transparence that is built into the NPDES program, trading programs need to provide monitoring data on a regular basis. Without this oversight, the assumption will be that people will try to game the system. Ideally there would be a monitoring system that allows the public to see the reductions. The second best option is to monitor regardless of whether BMPs are being implemented. However, the BMPs would need to have proven results and a report will need to be submitted in order to allow the public to take action if a BMP is not working. Finally, the wetland mitigation banking model is based on more qualitative measures than water quality trading, which is based on a pound reduction designed to meet a specific permit limit or TMDL.

Joyner agreed with Ettinger, and responded to Regas's comments regarding the desire to maintain the level of certainty from buyer to seller. In the regulatory arena, there are two different models. The first is the NPDES wastewater program that relies on effluent monitoring. The second is the stormwater regulatory program that relies upon BMPs. Joyner stated that many of the concerns raised about BMPs are currently being addressed through the NPDES stormwater program. Effluent from these BMPs is not monitored, nor can it be monitored. If BMPs are to be used in water quality trading, with little or no monitoring, design criteria must be outlined to reassure the environmental community. Models could then be developed to demonstrate the amount of pollution reduction and the number of credits that can be generated with the installation of specific BMPs.

Regas agreed with Joyner and suggested that water quality trading must be able to offer the same level of monitoring, risk, and certainty as the standard point source regulatory program. There is a level of certainty about the amount of pollution in the effluent coming from WWTPs that is currently reflected in discharge monitoring records. Stormwater monitoring offers a different level of certainty. She suggested that the participants should consider how to achieve comparable levels of certainty and risk between the buyer and seller in the water quality trading context. Developing a "one size fits all" approach to managing risk in the brokering arena will be difficult.

Ringhausen, building on the comments of Joyner and Regas, stated that when dealing with nonpoint sources on a watershed scale, there are many variables that can affect performance. It may be necessary to rely upon generally accepted and reliable engineering standards to estimate performance. Monitoring each nonpoint source would be virtually impossible.

Collier asked what incentive the private sector would have to install multiple buffer strips or conduct stream bank restoration projects across a large watershed. The BMPs would require monitoring at regular intervals to ensure they are still functional (e.g., a path cutting through a buffer strip can compromise its effectiveness), which may be considered too onerous for the private sector.

Korb first pointed out that participants had not yet addressed the need for nonpoint source effluent reductions to be contemporaneous with the required point source reductions. This would affect the ability to phase in credits as projects are completed. Second, he stated that water quality trading is most likely to develop in areas where pollution reductions cannot be achieved through point source reductions. Trying to meet water quality goals through nonpoint source reductions will involve a much lower confidence boundary. Therefore, point/nonpoint source trading performance standards will have to factor in some of this uncertainty through other means, such as trading ratios, average timelines for achieving reductions, and relying on research estimates for BMP pollution reductions instead of monitoring. Otherwise, water quality trading programs would be imposing requirements that cannot be met. In areas where it is more difficult to achieve water quality improvements through traditional means, regulators may be more willing to accept risk.

Schary stated that water quality trading does not raise new issues for TMDL implementation; it only serves to magnify them. In the Lower Boise example, there are not many point sources available to work with to meet pollution reduction goals. TMDLs will need to be met through nonpoint source reductions. In trying to meet TMDL goals, there is the same level of uncertainty surrounding BMPs with or without trading. Trading is supposed to create more certainty that the load allocation will actually be achieved. In the Lower Boise program, point sources are asked to buy credits that are based on a suite of approved BMPs. They are required to ensure that the BMPs are installed and maintained adequately. This leads to more certainty than when TMDLs are addressed through cost-share programs where there is little confidence that farmers will go beyond installing BMPs to maintain them.

Robertson emphasized that high standards are essential for the creation of a successful water quality trading program. Wetland mitigation banking always had very high standards for those entering the market, and it was these high standards that maintained credibility and allowed mitigation banking to succeed in most regions. The absence of high standards for banking in other regions caused those markets to fail. He questioned why there is an assumption that site-by-site monitoring would be so difficult or expensive in water quality trading. From the legal standpoint, he agreed with Ettinger's point that having clear liability so failure can be remedied will be decisive.

Schubauer-Berigan reminded everyone to think about the potential gains that can be made through management practices, rather than through the installation of BMPs. New technologies can be used to verify that specific management practices are applied.

Corbin stated a concern that the science is only as good as the science today and this will evolve over time. In the Chesapeake Bay, a TMDL dictates that specific standards need to be met by 2010. If these standards are not met through a trading program, it is unclear what the consequences would be. Corbin supported Ettinger's comment that it may not be in the best interest of an environmental advocacy organization to support a trading program if doing so means a reduced ability to monitor and enforce.

One participant suggested that flora can be used as a performance standard. Such a measure could be used to demonstrate overall program success, unlike individual BMPs. For example, an Index of Biotic Integrity (IBI) or Invertebrate Community Index (ICI) could be used as performance standards.

Another participant added that nonpoint monitoring is unappealing for sellers and buyers because of the high costs. Attempts to measure nonpoint sources to a high enough degree of accuracy will essentially lead them to be as regulated as point sources. It will be necessary to develop appropriate models and establish accepted BMP levels. Monitoring monthly discharge levels is not possible so there will always be uncertainty. Ratios can be used to guard against uncertainty.

A participant stated that watersheds are too complex to measure accurately. It is of concern that the legal community will not accept non-numeric measurements, which will lead to litigation over models and formulas. The science for measuring ambient water quality and BMPs needs to improve. A participant responded that there are alternative ways to audit and ensure quality besides simply measuring every nonpoint source. TMDLs themselves are based on models that are logical to use.

Bank Review and Certification Requirements

A THIRD PARTY AUDITOR PERSPECTIVE

Hank Habicht, *Global Environment & Technology Foundation*

Habicht focused on the role that third parties can play in certification to accelerate banking and trading approaches in the water sector. He suggested that third parties can help advance innovative and market-based approaches to bring water quality trading to the next level.

The Global Environment & Technology Foundation (GETF) is a not-for-profit organization that was established in 1988. Its mission is to mainstream sustainable development with information networks, tools, and technologies. GETF serves as a bridge between the energy and environmental sectors at the federal, state, and business level, focusing on partnerships in the fields of energy, climate, water, and environmental security. GETF leverages these partnerships and resources to deploy cleaner technology and forms environmental management systems that reduce doubt and create the conditions that allow ideas to flourish.

GETF recognizes the compelling need to try new approaches. The Chesapeake Bay experience, for example, demonstrates that limited funding can lead to new and innovative solutions. Farming is part of our culture and economy and must be a part of the solution. Communities and regulators at the state and federal level are critical components as well. Together, these players contribute dynamism and overcome many challenges. There are credibility issues with high stakes and credible third parties can help break up the inevitable logjams.

Habicht offered several examples of the role played by third party auditors. An Environmental Management System (EMS) is a set of processes and practices that an organization can adopt to reduce its environmental impacts and increase its operating efficiency.[25] Third parties have become involved in registering EMSs under ISO 14001, the international standard for EMSs. Third parties also provide verification that organizations conform to the ISO 14001 standard.[26] However, a 2001 report[27] found that, while there are economic benefits to third party certification, the system still needs a lot of work. Although certification has value, there remain credibility issues in the EMS field.

In the sulfur dioxide and carbon dioxide trading markets, verification is extremely complex. Continuous Emissions Monitoring (CEM) data can be used to monitor direct emissions. Because CEM data can be used to monitor stationary sources, such as sulfur dioxide, third parties may play less of a role in these markets. However, carbon dioxide emissions offer far more challenges, since most carbon dioxide emissions are from non-stationary sources. WRI is currently trying to develop a role for third parties in verifying carbon dioxide emissions.

In the brownfields context, American Society for Testing and Materials (ASTM), a non-profit organization that provides "a forum for the development and publication of voluntary consensus standards for materials, products, systems, and services,"[28] has developed a standard guide for sustainable brownfields redevelopment.[29] The guide was developed to provide protocols for how to develop brownfields through a process that actively engages property owners, developers, government agencies, and the community.

Another example of a third party role, the Biosolids Partnership, was formed in 1997 as a not-for-profit alliance with the National Association of Clean Water Agencies, Water Environment Federation, and EPA. The organization works to "advance environmentally

[25] U.S. Environmental Protection Agency. "Environmental Management Systems." U.S. Environmental Protection Agency. http://www.epa.gov/ems/.

[26] National Academy of Public Administration. "Third-Party Auditing of Environmental Management Systems: U.S. Registration Practices for ISO 14001." May 2001. http://www.dep.state.pa.us/dep/deputate/pollprev/Iso14001/NAPA.pdf

[27] *See id.*

[28] *See:* http://www.astm.com.

[29] *See:* "Standard Guide for Process of Sustainable Brownfields Redevelopment," at: http://www.astm.com.

sound and accepted biosolids management practices."[30] This was a pioneering effort by the federal government to promote third party certification.

Industry standard programs that have third party certification include Responsible Care, the chemical industry's performance initiative, as well as ecoadventure certification programs, air purifiers, and livestock BMPs developed by the American National Standards Institute (ANSI).

There is a real role for third parties in certifying water quality trading programs. Certification is worthwhile when it will help advance public benefits and statutory goals, when it can provide an economic value (e.g., compensated transfer of responsibility), and when certification is based on agreed-upon, reasonably objective evaluation criteria. Third party certification programs must also be provided with standards or accreditation and must be sanctioned by the regulators overseeing the programs. Stakeholders must believe that the process yields positive net value.

The bottom line is that the stakes are too high to delay the implementation of third party certification in water quality trading. There is an immediate need to talk to the communities of interest and the experts, including the insurance and finance sectors. Third party certification should then be implemented in a pilot program and evaluated and improved based on feedback from the pilot.

[30] *See:* http://www.biosolids.org.

Bank Review and Certification Requirements

A WETLAND MITIGATION BANKING PERSPECTIVE

David Urban, *Land and Water Resources, Inc.*

Urban stated that wetland mitigation banking can offer helpful experience on how to achieve the overall goal of advancing point/nonpoint source trading on a watershed scale. First, however, it is necessary to understand the role played by the Mitigation Banking Review Team in certifying credits and transactions, the role of the Wetland Mitigation Banking Instrument (MBI) in certifying mitigation banks, and how the MBRT process has affected the wetland mitigation banking market.

The MBRT is an interagency group of federal, state, tribal and/or local regulatory and resource agency representatives that are signatories to banking instruments and oversee the establishment, use, and operation of mitigation banks. The MBRT helps develop the MBI, which is the document that establishes bank goals and objectives, outlines financial assurances, contingency plans, responsibilities, compensation ratios, and provisions for long term management of the bank. The MBI also spells out the agreed-upon performance standards, by which the bank will be measured.

Chart 1: Comparison of Wetland Banking and Water Quality Trading

	Wetland Banking	Water Quality Trading
Action Requiring Permit	One time activity	Ongoing operation
Coordination and Jurisdiction	Agreement among multiple agencies having jurisdiction	One lead agency
Goals	Consolidation of mitigation areas	Dispersion of mitigation areas
Permit Duration	In "perpetuity"	Defined period (e.g. five years)
Liability for Permit Requirements	Transferable to provider	Non- transferable
Credits	Acres/ linear feet/ functional lift	Pounds of pollutants reduced

The MBRT process ensures that the bank will be designed to meet its stated goals. However, mitigation bankers complain bitterly about this process. The three main grievances are that there are no timelines, it is extremely difficult to obtain consensus, and the regulatory agencies are often unwilling to commit to anything because of the complexity of technical issues and financial assurances. However, once the parties have participated in this process several times, future bank reviews and approvals go more smoothly.

Another problem the MBRT must overcome is satisfying a variety of regulatory requirements, including those in Clean Water Act §404, Rivers and Harbors Act §10, USDA Food Security Act, Endangered Species Act, National Environmental Policy Act, and others. There are often additional state regulations that must also be considered. This adds another hurdle to receiving an approved MBI. In Chicago, for example, federal agencies do not include state agencies in banking agreements, so the mitigation banks must secure two MBIs, one with the state and one with the federal agencies.

Urban presented a chart comparing some of the differences between wetland mitigation banking and water quality trading (see Chart 1).

Mitigation bankers provide a product that meets regulatory requirements. The MBRT certifies that the banker has created this product acceptably. In water quality trading, third parties could provide a similar product.

The purpose of a wetland mitigation bank is to make the regulatory process easier for the permittee and the permit reviewer. In water quality trading, dischargers are required to secure an NPDES permit from one primary regulatory agency. Securing an MBI requires bankers to negotiate with numerous regulatory agencies. The permittee can receive the permit faster because each agency does not need to review as much.It is harder to transfer liability in water quality trading because of the continuous activity. Also, there is no real need for a "water quality review team" because only one agency is involved.

Facilitated Discussion

This session's facilitated discussion focused on soliciting participants' thoughts on what mechanisms could be used to certify credits and transactions in water quality trading. Participants were also asked to identify the strengths and limitations of these approaches, as well as the roles that can be played by third parties in the process.

One participant stated that the production of water quality credits *must* be monitored in order to verify reductions. A third party could be responsible for verification, but the NPDES permit holder must review the results. A third party could verify credits, much like the Food and Drug Administration stamps a side of beef. It would save a lot of grief for smaller entities. In wetland mitigation banking, banks are monitored for an average of five years. It was suggested that the potential water quality trading market is huge and the funding is available to produce the necessary data.

Another participant suggested that a third party credit certification agency, rather than a broker, could certify credits, such as crop advisors in the agricultural realm. Water quality trading should find more established parties like these to help with the process. Relying upon already established groups will increase the public's confidence in the program.

A participant suggested that the permit holder should determine who takes the lead in conducting monitoring. Third parties will enter the market if it is in their best financial interest. Another participant wondered if there are actually two separate roles for third parties – that of auditor and that of broker.

One participant stated that in a market-driven scenario, the NPDES program can create buyers but not sellers. The participant questioned what seller would want to participate in the market if there are extensive monitoring requirements. Sellers will only enter the market if the price is right.

Another participant commented that conservation agencies could be involved in verification of trading, rather than water quality agencies. A participant noted that monitoring for performance could be impractical on a site-specific basis. Monitoring might be better addressed through annual performance and tracking, modeling BMP efficiencies, and factoring in risk through credit allowances. Permittees could pay for further research efforts instead of actual monitoring.

A participant stated that monitoring and direct measurements could be used as an incentive for sellers to receive additional credits. Another participant added that monitoring all the BMPs in a water quality trading program is cost-inefficient. The law of large numbers needs to be addressed specifically in the watershed program design. For example, a discharger could get more value for reduction if they self-monitor. Buyers would pay more for credits with more certainty. This applies especially to riverine areas.

A participant suggested that the government's role should be to regulate the market for the purpose of protecting public health and safety. There should be regulatory consequences for the seller if they sell a counterfeit product. A contract between the third party and the seller is necessary to transfer liability

Schary explained that in the Lower Boise program, permittees said they did not want to rely on third party certification of credits. The permittees preferred to take direct responsibility for verification. For their own satisfaction, the permittees could hire a third party to verify the reductions. The program follows the Massachusetts Environmental Results Program. EPA Region 10 and Idaho Department of Environmental Quality have agreed to look at a statistical number of examples. In the beginning of the project they will probably monitor 100 percent of the BMPs to verify that the nonpoint source reductions are actually meeting their stated objectives. However, the regulatory agencies are likely to stop auditing every single trade once they have confidence that the program is running smoothly. The agencies will likely work through the local Soil and Water Conservation Districts to verify BMP reductions. Because the districts are already out in the field inspecting for their own cost-share projects, they can easily provide the regulatory agencies with valuable information in the interim to help them

prioritize their auditing. Finally, EPA employs another third party, a stakeholder cooperative, to record trades and make sure forms are filled out properly.

Regas supported earlier comments by Mehan and Habitch that government can inadvertently be a bottleneck. The capacity of government is extremely limited. The staff of state water quality and agricultural agencies has shrunk dramatically in the past several years. The issue of capacity deserves particular attention; government may be a limiting factor for the development of water quality trading markets if the programs are structured in such a way that government agencies are designated as credit certifiers. For this reason, it is important to consider the role that third parties can play in certification, as well as the potential conflicts of interest that might arise. In addition, Regas noted the issue of transfer of liability may have been mixed with the question of whether or not a certifier or broker can take on any liability as well. She cautioned that these are two separate issues and she expressed confidence that legal mechanisms could be established to transfer liability to third party brokers. Broad statements that liability cannot be transferred to third parties may constrain creativity.

Ettinger remarked that addressing water quality through the development of trading programs is a zero-sum game for the environment. Although nonpoint sources may be a large part of the program, adopting water quality trading programs involves relinquishing controls on point sources. The debate is over how to allow point sources to remove nitrogen and phosphorus at a lower cost by giving them an alternative. The dischargers are not going to voluntarily strive to reach any reductions beyond what is required of them. Relying upon water quality trading programs to address this nutrient removal involves asking state agencies to divert scarce funds away from managing the environment to managing trading programs that make it cheaper for point sources to treat nutrients. Most states do not have enough resources to manage the environment in addition to managing trading schemes that reduce point source costs. Environmentalists will fight this unless states identify additional sources of funding for managing these programs.

Ettinger also pointed out that the forum has been focusing on two different pollution reduction models. He noted that Hey's program is essentially designed to eliminate pollution through the installation of large treatment wetlands. This type of program is manageable, could be self-certified, and the input and output of pollution could be easily monitored. The other model involves individual farmers installing BMPs. Monitoring the output of effluent in these programs is not realistic. For the environmental community to be comfortable with the BMP approach, the programs will need to demonstrate with certainty how much pollution specific BMPs can remove. The monitoring challenge under the BMP scenario will require verification that BMPs are installed. POTWs will not be capable of monitoring and overseeing numerous deals brokered with farmers to install BMPs. Third party certification will be necessary to ensure that BMPs are installed and maintained. If third parties provide positive verification for BMPs that are not installed, criminal prosecution for falsifying information would be an option. Legislation could be developed for third party civil or criminal liability. With third parties playing the role of certification and verification, the only government role would be receiving and reviewing reports and carrying out enforcement. It is unrealistic to expect state agencies to invest any additional resources above and beyond that which they currently commit to NPDES enforcement.

Kieser agreed with many of Ettinger's points. He added that some states, such as Michigan, are already addressing some of the concerns he raised. The state has established an electronic board of trade. If someone wants to generate a trade, they are required to post it. Buyers, sellers, and notices of intent to trade must also posted and the state has a period to review the proposed trades. Michigan's legislative rules include penalties for credit generators that do not honor their obligations. In addition, NRCS certified planners must be used to design and verify agricultural BMPs.

Raffini agreed with Urban that the majority of the liability is between the buyer and the seller. He added that third party credit certification can help ease any trepidation point sources may have in purchasing credits from nonpoint sources and may help get water quality trading programs off the ground.

Joyner added that point sources in Florida have stated that the existence of a contract between a buyer and a seller is insufficient for addressing their concerns over liability from civil and criminal penalties. The point sources want to see all of the liability transferred to the seller. Joyner also responded to Ettinger's concern about the allocation of scarce state resources. He stated that he had not heard anyone at the forum discuss the allocation of state resources to address TMDLs, which is a tremendous issue. Water quality trading may, in fact, save state resources and address water quality in a manner that is the most cost effective.

Lucero stressed that the current science behind BMPs is very solid. The value of BMPs has been determined through modeling. The reduction potential of BMPs is calculated in order to quantify credits. The modeling approach can be an incentive to bring sellers to the table. However, it must be understood that annual performance will be the minimum amount of time over which BMP performance can be measured. He agreed with Ettinger that the role of a third party should be to ensure BMPs are installed. However, he does not agree that trading is a zero-sum game. Trading is a learning or teaching tool, such as cost-share programs. The landowners who receive money to install BMPs will learn the practice and recognize the economic and environmental benefits, their neighbors will see the benefits, and the practices will eventually become an accepted part of their businesses.

Coan said that in the Tar-Pamlico trading program, the point source covers the administrative responsibilities and state resources are not used. Nonetheless, the point source still saves money. The point source agreement can require that the entity pay a third party, such as local soil and water conservation districts, to collect data and verify BMPs. The point source also pays a set amount to maintain the program, regardless of whether or not trades are taking place. As a result, if a trade takes place, a new program does not need to be created to handle it.

Hall stated that most of the water quality trading programs to date and the EPA trading policy contemplate that trading will not be a zero-sum game. Trading will provide an incentive for nonpoint source pollution sources to contribute to the water quality goal *before* they start selling credits. There in an expectation that nonpoint sources must reach a baseline before credits are generated.

Noyes stressed that there needs to be a standard of eligibility for sellers entering the market. Furthermore, market dynamics will lead the market toward BMPs that are more resilient, efficient, and certain.

Multiple Credit Types for a Single Project Site

NUTRIENT TRADING PILOT, MULTICREDIT TRADING, & REVERSE AUCTION PROJECTS: CONESTOGA RIVER WATERSHED, PENNSYLVANIA

Andrew McElwaine, *Pennsylvania Environmental Council*

McElwaine began by outlining the current environmental setting. Under the Clean Water Act there is an assumption that point source permitting will lead to improved water quality. The assumption holds that technological improvements will result in a decrease in nutrients from publicly owned treatment works. However, a third of American waters currently do not meet the standards specified by CWA. Most pollution comes from nonpoint sources and nutrients are one of the top causes of water quality impairment. Nonpoint sources can be farms, urban developments, or septic systems. In Pennsylvania, 88 percent of their polluting nutrients come from nonpoint sources.

Under the current conventional effluent management regime, the regulator sets discharge limits for point sources. Point sources then install technology in the form of end-of-pipe measures. This approach involves high compliance costs and offers little flexibility.

Nutrient trading programs, on the other hand, provide point sources with two options. They can adapt their facility to eliminate nutrient discharges, or they can pay for the reductions elsewhere. Under the latter option, the buyer pays another entity to meet or exceed its effluent limit and the seller exceeds its environmental obligations by selling its "credits." This approach can be described as the re-allocation of effluent loads (nutrients) among sources to meet water quality goals. The bottom line is cleaner water at a cheaper price.

Nutrient trading is a market driven approach to environmental management that can increase the available options for reducing pollutant loadings. It also takes advantage of the fact that some pollution sources find it easier (and less expensive) to reduce than others. Nutrient trading offers several economic advantages. It offers increased flexibility by increasing compliance options and generates market demand for new, innovative technologies. In addition, it reduces compliance costs. A recent WRI study found that, relying on best available technology, a 24 percent reduction in phosphorous can be achieved at a cost of $26 per pound, while a 50 percent reduction can be achieved through trading at a cost of $10 per pound. Nutrient trading also offers numerous environmental benefits. It encourages point and nonpoint sources to reduce discharges to create credits that can be sold, banked for future use, or retired. Trading programs can be designed to target reductions in priority areas. Finally, they offer potential for broader environmental benefits through ecological restoration.

The University of Pennsylvania identified 49 trading programs in 2004. However, only 16 of these were considered "active" and even then there have not been many trades. In Pennsylvania there are a few water quality trading policies that have promoted active trading. These include the Chesapeake Bay Program Nutrient Trading Fundamental Principles & Guidelines (March 2001); EPA Office of Water's Water Quality Trading Policy (January 2003); Pennsylvania Department of Environmental Protection's (PA DEP) Water Quality Trading Policy Discussion Paper (April 2003); PA DEP's Nutrient Trading Program Assumptions (Spring 2004); and Pennsylvania's Chesapeake Bay Tributary Strategy (December 2004).

McElwaine highlighted the Conestoga Pilot Project, which was among the first such programs to apply trading as an incentive to assist farmers, communities, and industry to meet and exceed state and federal water quality goals. This was accomplished by establishing a voluntary pollution credit trading program on the Conestoga River watershed in Pennsylvania. The goals of pilot project are to facilitate development of the state nutrient trading policy; serve as a model for a full-scale, statewide nutrient trading program and similar programs nationwide; reduce nutrient loadings from both nonpoint and point sources; lower compliance costs; avoid the need for additional regulation; and improve water quality.

The Conestoga River watershed was an ideal site for a pilot trading project. It is within the Chesapeake Bay watershed and the Bay Agreement includes voluntary nitrogen targets. The watershed also has a diverse mix of point and nonpoint sources, as well as potential for significant community involvement. The point sources in the watershed already have phosphorous limits. Finally, the Conestoga is a severely nutrient-impaired river.

The Conestoga Project sponsors and partners are very diverse. They include multiple state agencies, environmental organizations, consulting firms, local governments, federal agencies, and academic and research institutes. A steering committee and various subcommittees were established to facilitate policy development. There were, however, several key policy challenges. The first related to establishing a threshold for eligibility. The program needed to determine when reductions would be deemed credits. The nonpoint source scenario in the watershed is very complex. Under the Pennsylvania Tributary Strategy, 95 percent of farms within the Chesapeake Bay need BMPs to reach nutrient goals. The second challenge related to establishing an uncertainty discount. If a nonpoint source commits to reducing one pound of nutrients, should they be credited with one pound of reduction or should an uncertainty factor be applied? If so, should the ratio be 2:1, 4:1, or should it vary based on the BMP installed?

The Pennsylvania Tributary Strategy, developed by PA DEP in December 2004, presented a framework for reducing the nitrogen and phosphorous pollution that runs off the land into the Potomac and Susquehanna Rivers. The initiative is the state's official plan to meet the Chesapeake 2000 Agreement goals for nutrient and sediment reduction in the Chesapeake Bay watershed. The watershed permit is for the Susquehanna, Potomac, and various subwatersheds, and involves 13 watershed teams and a Tributary Strategy Steering Committee. The Conestoga is located on the eastern side of the lower Susquehanna.

The tributary strategy establishes a cap on point sources. There are 142 significant dischargers in the tributary. A watershed permit was issued that established a cap and trade program for the Susquehanna, Potomac, and subwatersheds. The strategy found Pennsylvania nonpoint sources contribute 89 percent of the nitrogen and 82 percent of the phosphorous that reaches the Chesapeake Bay. Agricultural BMPs could account for 75 percent of the nitrogen reductions called for at 7.2 percent of the total cost. The strategy's point/nonpoint source trading policy is still under development, but is expected to generate additional nutrient reductions at reduced costs.

There are a variety of other challenges. First, reconciling upstream hotspots with downstream hotspots presented an issue. Although the enforcement of point sources is laid out in the permit, it is still unclear how nonpoint source discharges will be enforced. The strategy must also determine a baseline for agriculture. Finally, point sources can be monitored through self-monitoring and reporting, but the project has yet to determine how nonpoint sources will be monitored.

McElwaine provided an example of a voluntary trade that involved Pfizer, which sought to curb sediment loss and restore the Santo Domingo Creek in Lititz, Pennsylvania. A private contract was established between the company and landowners surrounding the stream to transfer pollutant reductions from the Borough of Lititz to Pfizer. Credits were held and "retired" by Pfizer. The 1,300 square foot restoration project cost $80,000. Monitoring showed that in four months the stream lost 28 tons of sediment. Modeling was used to determine reductions. The estimated credits generated were 387 pounds of nitrogen per year, 74 pounds of phosphorus per year, and 66 tons of sediment per year.

Multi-credit markets recognize the full range of ecological values in the watershed (water, wetlands, habitats, riparian forests, etc.), support trading the same range of environmental credits using watersheds as the basis for trades, and provide multiple incentives for restoration and improvement of ecosystem functions. The building blocks of environmental markets are environmental goals and market transactions connected by credible measurements. Credible measurements must be consistent, transparent, and verifiable. Traditional market infrastructure consists of legal, financial, economic/accounting, anti-trust legislation, and public scrutiny components.

Pennsylvania has created innovative policies to accomplish their environmental goals. The aim of these policies is to reduce the release of nutrients (nitrogen and phosphorus) in the Chesapeake Bay, encourage a greenhouse gas emissions reduction initiative, and stimulate the renewable energy market. They have established a multi-pollution accounting framework which consists of reverse auctions, calculation tools, monitoring reporting and verification protocols, and a multi-pollutant registry.

Multi-credit markets consider the full range of ecological values by creating a value tent. A value tent directs people towards the highest credit by identifying the areas where one could receive the most benefits from their project. It is built by overlaying GIS layers of watershed values. Each layer is scored by how "creditable" the location is within the layer. The layers are added together to obtain the final value or tent score. Examples of layers are phosphorous loading, nitrogen loading, wetland restoration potential, carbon sequestration scores, aquatic habitat, vertebrate habitat, and terrestrial habitat.

McElwaine offered a hypothetical, but reality-based example of a multi-credit trade. First, a possible credit portfolio would be created for the site. The credits could include wetland restoration, habitat, carbon, nitrogen loading, and phosphorus loading. Bundling these values in a multi-credit market increases the incentives to act. Next, assume that a landowner wants to improve their property by installing BMPs, but needs financial incentives. The seller applies his nitrogen credits towards his nutrient management plan. One buyer helps the seller establish an easement on part of his land adjacent to some of their other conservation projects. This buyer buys the habitat credits from the seller and retires them. Another buyer needs offset credits for wetland mitigation and purchases the wetland credits from the seller. The county, a third buyer, purchases the phosphorus credits and banks them toward a potential future TMDL, helping to implement the statewide program locally. PA DEP maintains the statewide registry, helps bring the players together, and focuses on policy development and trade enforcement.

In this example stakeholder input helped create the value-tent to direct potential traders to areas with the highest credit potential. The credit potential in the value-tent is based solely on environmental benefits.

The next step is to create a mock trading platform. Several questions arise within the context of the Conestoga. These include how potential sellers (farmers) find buyers to fund BMP projects, and how buyers judge which projects are the most cost effective for reducing nutrients, e.g., creating credit. NutrientNet, an online tool[31] developed and implemented by the World Resources Institute, can host a "reverse auction" trading platform. This reverse auction platform for BMPs helps buyers and sellers find each other.

The Conestoga River Reverse Auction was created with support from the USDA NRCS's Environmental Quality Incentives Program (EQIP). The grant supported the development, customization, testing, and evaluation of an online tool for conservation districts and farmers. The online tool will be used to estimate and register nutrient reductions for specific BMPs. It provides a mechanism to direct EQIP and other conservation funding to the most cost-effective nutrient reduction projects.

[31] See: www.nutrientnet.org

The goal of the Reverse Auction is to conduct two auctions, one in the summer of 2005 and one in the winter of 2006. It will award money to farmers with successful bids to install BMPs. Pennsylvania Environmental Council (PEC) will act as the buyer. PEC received a $980,000 grant from NRCS to fund the purchase and retirement of nutrient reduction credits. Credits will be tracked to help Pennsylvania understand how it can comply with the Tributary Strategy. PEC is interested in securing the maximum quantity of nutrient reductions from a limited budget. Farmers will compete for this budget.

The process of the Reverse Auction begins when the farmer identifies the BMP and its location. Eligible farms are those that qualify for EQIP. Eligible BMPs include cover crops, buffer strips, manure storage, streambank fencing, terraces, waterways, and barnyard runoff control. NutrientNet provides these farmers with information such as BMP cost estimates, and quantifies nutrient reductions. The farmer then submits a final bid for the project and NutrientNet ranks the bids according to nutrient reduction. The winning bids will go to those farmers who can produce the maximum reductions at the lowest cost.

PEC still has some unanswered questions. They are unsure how the phosphorus reductions will be tracked in light of the Chesapeake Bay Tributary Strategy Goals. It is also not fully understood who will be responsible for reporting total nutrient reductions to PA DEP. Furthermore, although NutrientNet provides data on BMP installation, it is unclear how maintenance costs will be handled. It is also unclear how the BMPs will be monitored and how enforcement could be carried out against farmers. Despite these uncertainties, PEC hopes that this nutrient pilot project will serve as a model. The progression of this nutrient trading program will provide an important tool to help Pennsylvania meet its goals for reducing nutrient and sediment loads in the Conestoga watershed and the Chesapeake Bay.

Questions & Answers

Robertson asked McElwaine how they chose the six functions under the value tent and how they ensure the functions are fully segregated and not dependent on each other. McElwaine replied that the entity managing the registry and banking functions would ensure that the practices are installed and that that there is not multiple selling of different values. He added that this system is not in place yet.

Ettinger asked if NutrientNet has already determined the nutrient removal rates for the BMPs and, if so, whether or not these numbers could be applied elsewhere. McElwaine replied that the BMP calculations have been developed, but that they can only be applied in the Chesapeake Bay.

Kempka asked who paid for the GIS work and analysis and whether or not these costs were factored into the cost of any of the credits that resulted from the work. McElwaine responded that these costs were not factored into the price of the credits. The analysis was supported by EPA, private foundations, and others.

Corbin asked McElwaine to explain how the farmer bidding process works. McElwaine responded that a request to install BMPs is issued throughout the county. Farmers can log which BMPs they are proposing into NutrientNet and see how much it will cost. WRI generates the environmental benefits of the BMP and PEC compares pounds of phosphorus and nitrogen removed versus dollars spent. Those BMPs that get the greatest environmental bang for their buck are the ones that PEC will purchase. It does, however, count against the farmers' total EQIP allocation. The program will make several million dollars worth of BMPs available. Maryland water quality standards are about to be adopted and other organizations will be looking for BMPs. PEC will have a bank full of BMPs on NutrientNet ready to sell.

Raffini stated he was happy to hear that the program will be retiring the credits. He added that he would not be comfortable with the program if the NRCS funding could be used to implement BMPs in the absence of the program. He asked how the program achieves nutrient reductions beyond what could be accomplished with traditional NRCS funding. McElwaine responded that this program results in

additional reductions because it targets the EQIP dollars to achieve the most environmentally effective practices in the areas that need them most.

Dowell addressed Ettinger's question by explaining that EPA and NRCS are working on a national database of BMP efficiencies based on existing research.

Sokulsky asked if a broker manages the Reverse Auction or if they will issue a Request for Proposal (RFP). McElwaine responded that Lancaster County Conservation District and NRCS issued the RFP to producers and the bids are currently loaded onto NutrientNet. This first round is small because it is not tied to the growing season. The next RFP will be issued in February 2006. Lancaster County Conservation District and NRCS technicians were extensively trained on using WRI's product.

Jones noted that the program's baseline for trading, the existence of a nutrient management plan and sediment control plan on the farm, seems to be a lower threshold than the program's goal of installing BMPs on 90 percent of the farms in the basin. He questioned whether or not this is a meaningful baseline for trading. McElwaine responded that providing information on the management activities already installed allows the point sources to evaluate the current baseline and determine what they might buy, or if there is anything to trade at all.

Kieser asked what incentives exist for the farmers to maintain the BMPs once their EQIP contracts expire. McElwaine responded that the hope is that there will be additional buyers, particularly if a statewide water quality trading program evolves. The buyers will hopefully provide financial assistance for BMP upkeep.

Lucero asked if property is available for other credit types once a specific credit type is purchased. McElwaine responded that the goal is to maximize income to the landowner through several, simultaneous trades that come out of an ecosystem restoration project. In some cases there will be one buyer for two benefits, or two types of credits that are available on one property. In other cases, there may be multiple buyers for each credit type. The challenge is to ensure that there is no double counting. They hope to prevent landowners from seeking both terrestrial and aquatic habitat credits for one restoration action. However, McElwaine did not see a conflict with a landowner who installs a forested buffer receiving both nutrient and carbon dioxide credits for the same project.

Hough, referring to a chart in McElwaine's presentation,[32] asked if there is spatial overlap between the nitrogen credits and the wetland restoration acreage. In other words, is some of the nitrogen removal happening in the wetland? McElwaine said that presumably some of the nitrogen removal is occurring in the wetland, but he does not feel this is double counting because while one buyer may need wetland credits, another may need nutrient reduction credits. Hough replied that §404 requires compensation for lost functions and acreage. Impacted wetlands provide multiple services, including floodwater storage, water quality enhancement, streamflow attenuation, as well as wildlife habitat. When the Corps issues a permit to impact a wetland, a bundle of functions are lost and the permittee is required to compensate for the entire bundle of wetland services. If nitrogen reduction is part of that bundle, there will need to be a complex accounting scheme to avoid double counting. Doing so will put a large burden on the §404 program.

Urban noted that stacking and bundling credits recognizes that any parcel of land has multiple values. Bankers would like to split out these values without double counting. The §404 program, although it references functions and values, does not specifically separate them.

Denisoff asked McElwaine if the price paid to sellers is based on EQIP prices or market-based prices. McElwaine responded that producers were concerned about being paid less than the EQIP posted price. The program does have the authority to pay what the market will bear, rather than the EQIP price.

[32] See slide 44 at: http://www2.eli.org/pdf/wqtforum/presentations/McElwaine.pdf.

Facilitated Discussion

The goal of the facilitated discussion that followed was to identify the environmental, legal, and financial strengths and limitations of establishing water quality trading projects that can sell multiple credit types.

The session began with an extensive discussion about the difference between *stackable* and *multiple* credit types. It was generally agreed that stackable credits are generated when one restoration project, such as a wetland mitigation project or a riparian buffer, receives multiple types of credits, such as habitat credits and nutrient reduction credits. Stackable credits are those that overlap spatially. Multiple credits are generated when several different restoration projects are conducted on one parcel of land and each separate project receives credits for distinct purposes. The credits in this instance do not have any spatial overlap.

Urban acknowledged that the §404 program bundles functions and values, but added that Hey's program, for example, measures the amount of nutrients entering and leaving a treatment wetland. The projects are not being constructed for §404 purposes, but each of the parameters measured is regulated. In this instance, water quality credits could be stacked, although the credits cannot be stacked along with §404 because it is already inherently bundled with the nutrient reduction function.

Sokulsky stated that water quality trading may be more analogous with renewable energy credits than with wetland mitigation banking. In the renewable energy market, renewable energy credits may be bundled, such as in the §404 program with wetlands credits. The different components (CO2, SOX, NOX) may also be sold separately. He suggested that those working on developing water quality trading policy would benefit from learning more about renewable energy trading programs.

Bleichfeld addressed the stackable issue. He stated that it was his understanding that the 1995 federal guidance on mitigation banking allows credits generated as part of wetland restoration projects conducted under §404 to receive conservation credits, endangered species habitat credits, and pollutant reduction credits under §402. (NOTE: The 1995 Federal Banking Guidance prohibits the use of the same credit to compensate for impacts associated with more than one activity (e.g., "double dipping"). The guidance states, "Credits from mitigation banks may also be used to compensate for environmental impacts authorized under other programs [e.g., state or local wetland regulatory programs, NPDES program, Corps civil works projects, Superfund removal and remedial actions]. In no case may the same credits be used to compensate for more than one activity; however, the same credits may be used to compensate for an activity which requires authorization under more than one program." [33])

Denisoff responded that the National Mitigation Banking Association feels very strongly that bankers should be able to sell stackable credits. If a banker can show value added, they should be able to get credit for the value. Denisoff added that the multiple credit model, where several different types of credits are available on the same parcel of land *without* spatial overlap, is currently used in California and Washington State. He added that flood retention and air quality credits can be sold from a wetland mitigation site where there is spatial overlap.

Klimek agreed with Bleichfeld. In North Carolina under the §404 and §401 programs, they have been considering separating out the mega-functions that are provided in stream and wetland mitigation projects, such as hydrology, water quality, and habitat. The program may provide replacement credits for all of these functions in the same physical location. She concluded that this approach may promote greater flexibility by allowing the programs to move toward true watershed restoration.

Kadyszewski suggested that allowing stackable credits may have some negative consequences. Wetlands have multiple functions and the purpose of the §404 program is to replace the full complement of wetland functions. However, because a carbon sequestration project may have negative consequences for specific wetland functions, trying to assign carbon sequestration credits to a §404 wetland restoration project would lead to a net loss of wetland functions. Just because credits can stack does not mean the ecosystem gains will always be positive for all types of trades.

[33] *Federal Guidance for the Establishment, Use and Operation of Mitigation Banks.* Federal Register 60, no. 228. (Nov. 28, 1995): 58611.

Coan addressed the water quality trading and stacking issue. She suggested that BMPs can provide low, medium, and high levels of service. They could be assigned additional credits if they provide a higher level of service. For example, if a riparian buffer used warm season grasses or wildlife plantings, rather than fescue, it should be eligible for more credits because it may be providing a wildlife habitat function.

Robertson voiced his support for the acre as a holistic measure. He stated that functions should not be unbundled and sold separately. An ecosystem cannot be viewed as the sum of its parts, which can be distributed across the landscape. Vertebrate habitat, for example, cannot be separated from terrestrial habitat. If there is an attempt to divorce functions as if they were commodities, there will be significant measurement problems. The number of ecological functions at a particular site is limited only by language and the imagination of ecologists. The number of functions that are recognized at a site is purely a policy decision. He warned that separating functions is not likely to be backed by ecologists.

Parker agreed with Roberson and stated that an ecosystem is greater than the sum of its parts. She added that there is no way that policy can decide what an ecosystem's functions are. The role of policy is to determine which of those functions are valued enough to be codified into a trading program.

Joyner stated that cross-media trading, for example carbon dioxide for nitrogen, is far less palatable than stackable credit trading.

Urban stated that water quality trading programs designed to comply with the §402 program should allow for stackable credits because one project can generate credits for multiple nutrients. However, under §404, the regulatory program requires the replacement of a bundle of functions, so credits should not be stackable in this context.

Regas observed that the discussion represents a synthesis of thinking from a number of different disciplines. The economist's perspective does not take away from the ecologist's perspective. She referenced Faeth's presentation, which suggested that in different parts of the country the ability to bundle and unbundle credits may determine if the supply and demand curves cross in water quality trading programs.

Schubauer-Bergian supported Robertson's comments. He cautioned that stackable credits will require consideration of the landscape mosaic and may create species winners and losers.

Mehan agreed with Regas's comments. Although the environment is indivisible, economic value can be denominated by humans. Water quality trading requires incentives to support the development of markets. As such, he stated that there is no downside to unbundling for this kind of trading. He suggested that if trading can discern the economic value derived from restoring lost values and functions of a "laser-leveled" parcel of farmland, the field has everything to gain and nothing to lose.

Hurld added to Shubauer-Berigan's comments. When an ecosystem is managed for a certain credit type, one function may be enhanced at the cost of another function. This triggers legal responsibilities that must be addressed by regulatory agencies.

Schary suggested looking at other financial markets for models of how various financial services are split up, such as mortgages. She stated that baselines must be considered when determining how many credits should be allocated. Credit should only be assigned when it is clear that value has been added.

Kieser stated that there are multiple environmental benefits that would accrue from water quality trading. Market forces can help drive more comprehensive restoration projects. There should be incentives for farmers to bundle values, rather than trying to reduce only one nutrient. He noted that mitigation bankers are trying to enhance their projects and add value through multiple credits and values. He supports the unbundling of functions if the result is a more comprehensive restoration project.

Schubauer-Berigan advised that mitigation providers should not try to replace the same wetland type everywhere, even if a specific type provides more functions than another. It is necessary to consider both the cost-effectiveness and the biological integrity of functions. The market should not be the only factor that drives this process.

Stimulating Creation of a Point/Nonpoint Source Trading System on a Watershed Scale

Donald Hey, *The Wetlands Initiative*

Hey's presentation focused on stimulating the establishment of point/nonpoint source trading programs. He noted that the conference participants had not discussed the magnitude of the water quality problem. Studies have determined that 700,000 tons of nitrogen must be removed from the Mississippi River and 100,000 tons must be removed from the Illinois River per year. The cost of achieving these reductions through point source control is billions of dollars. Hey believes regulatory agencies can find the money to oversee water quality trading programs if they can achieve water quality goals in a more cost effective manner. In addition, conference participants did not seem to feel the water quality problem is particularly urgent. However, it is critical and possible for action to occur *now.* There is enough understanding about watershed hydrology to move forward. Perhaps there are not enough engineers at the conference to endorse this claim, but it is indeed very possible to monitor, measure, and proceed with water quality trading programs today.

The most significant hurdle to overcome in implementing trading programs is economics. The only thing that drives water quality in this country is economic concerns. Water quality programs cannot rely upon the good nature of farmers; these programs cannot be voluntary. The cost of fertilizer is minimal compared to the costs of operating a farm, and fertilizer guarantees the farmer revenue. There is a need to pay attention to the economics and scale of the proposed solutions. The value of nutrients being "flushed down our agricultural and urban sewers" is worth about $250 million per year in Illinois alone. The question becomes how to turn this waste/money into a valued product. The answer can be found by implementing large-scale pilot projects. Hey suggested the establishment of several large-scale nutrient "farming" projects (installing wetlands, instead of growing corn and soy beans, to harvest nitrogen, phosphorus and carbon) in each state.

For large-scale projects to succeed we need a better understanding of how to design BMPs. The only effective practice is one that controls grade and creates detention time. In order to sequester carbon and phosphorus, remove nitrogen, and settle sediment, projects must include detention times around 8-10 days. Farming should continue, but large parts of the watershed or stream corridor need to be converted to a controllable grade.

Hey offered Goose Pond as an example of a pilot project that is successfully managing nutrients. The 4,000-acre site was designed to provide grade and water depths that result in detention times of 6-8 days. This project determined the appropriate flow rate, draw down sequence, and filling sequence. There is an inverse relationship between methane and draw down that must also be considered, along with water, carbon, and nitrogen budgets, air flux, and the exchange between sediments and soils. This project is designed to allow for the measurement of inflow and outflow. After these design elements are considered, the project can quantify the value and number of credits that will be generated. Full cost accounting for these types of relationships is imperative, and more importantly, possible. These relationships *can* be measured and the economic magnitude of the problem makes such measurements cost-effective. Hey stated that modeling will not work and it is financially feasible to monitor nutrient farms.

Financing the aforementioned pilot projects will be a challenge. Hey suggested that the wastewater treatment industry finance these projects. An economic analysis of the seven wastewater treatment plants in Greater Chicago's Water Reclamation District found that it will cost $2.5 billion for point sources to meet the water quality criteria. The same amount of nutrients could be treated by using 200,000 acres of land, which would save the point sources $1.5 billion in total, or $110 million per year. If the treatment plants are forced to install advanced wastewater treatment technology they will consume considerable energy, which is senseless from an environmental perspective. The wetland pilot projects will demonstrate that nutrients can be removed with considerable energy savings and a net carbon loss.

For wastewater treatment plants to finance these pilot projects they need some consideration from the EPA. The plants should be given a five to ten-year "pass" on having to build new treatment plants until more research is completed. If these pilot projects were implemented now, by the time Illinois passes strict water quality standards the first five-year permit cycle will already have passed and there will be no losers.

Hey stated that the environmental community is generally in support of his proposal. At the end of this five to ten-year pilot period there will be a lot more information available regarding the market structure and contractual relationships between buyers and sellers of credits. These ideas will have been tested so that when it is time to implement a larger-scale program the required information will be available.

Questions & Answers

Biorn-Hansen asked Hey about the cost of the hypoxia problem. Hey responded that no economic estimates have been defined for the water quality problem, nor have the economic values associated with recreation or freshwater quality been addressed. These issues need to be better defined before the economic factors can be fully considered.

Jones asked what the wastewater treatment facilities would get out of participating in such a program after investing $1.5 billion over five years. Hey responded that the funds would buy nutrient credits. The Chicago Water Reclamation District is proposing to contribute $10 million for the physical infrastructure and own 40 percent of the nutrient credits. The target site is 150 miles downstream from their discharge, so they will sell credits to entities downstream or upstream.

Noyes asked for clarification about the proposed physical structures. Hey explained that they are proposing the installation of a series of wetlands to provide grade control along the Illinois River or tributaries. The wetlands would allow for inflow and outflow to be measured. Noyes expressed his skepticism with the plan because there is a carbon deficiency on the land that can only be solved by putting carbon at the headwaters on the farmland. This will prevent it from moving and eliminate the need for catchment structures downstream. Hey argued that this point could be resolved by placing nutrient farms at the headwaters. He suggested that the nutrient farms should not be regulated under §404 so that they can be converted back to farmland if the price of corn and soy beans increases. Noyes argued that reducing or eliminating tillage will keep the carbon on the land and prevent the loss of nutrients and sediment. The answer is not to catch nutrients and sediment after they have started to move, but prevent them from moving in the first place.

Wilson expressed interest in additional information on nutrient farming. Hey responded that this idea has been developing for several years. Ecological Engineering, Restorational Ecology, and the Hydrologic Institute of America have published papers on the practice. The most recent study has been conducted by Water Environment Research Foundation (WERF). Many of these papers can be found on The Wetlands Initiative's website.[34]

Gookin wondered how many acres of wetlands would be needed for a large pilot project. Hey responded that for the Illinois River they have estimated that around 400,000 acres of wetlands would be needed to treat the nutrients that are discharged by point sources. There is a temporal demand for wetlands; January is the most critical month for treating point sources. The rest of the year the land can be used to address inputs from nonpoint sources. The project would require monitoring at several hundred inflow and outflow sites. These sites could be linked to already-existing levies or pumping stations. WERF's economic study showed that between $200 and $300 per acre of net profit can be earned by nutrient farming, which would save the water reclamation districts 50 percent of their costs.

Joyner asked about the location of the wetland in relation to the river. Hey responded that the wetlands could be adjacent to the river. The water would be pumped out of the river into the wetland and then back into the river, or they could be located upstream, like beaver dams. Joyner expressed concern that in Florida these treatment wetlands would be required to have an NPDES permit. Hey said the Illinois EPA did not require them to secure an NPDES permit because they are not mechanically adding anything to the water.

Facilitated Discussion

The goal of the final facilitated discussion was to identify the assurances or other incentives that are needed to help stimulate the establishment of a point/nonpoint water quality trading system on a watershed scale. Participants offered the following suggestions for stimulating water quality trading programs:

1. There is a need for good nonpoint source assessment and monitoring tools that are tailored regionally and are transparent, replicable, and science-based (Coan, Kadyszewski).
2. EPA should provide guidance on the role of third parties (brokers or traders) in water quality trading and on liability issues (Schary).
3. There is a need to impose an enforceable requirement on a watershed scale (Korb, McElwaine).
4. Permit standards and limits need to be viewed as permanent to avoid confusion and non-compliance (Biorn-Hansen).
5. The economic impacts of the nutrient problems must be quantified, such as the Gulf hypoxia problem, so players cannot contest the legitimacy of a trading program (Biorn-Hansen).
6. Water quality standards based on sound science must drive water quality trading programs (Lanyon).
7. Transaction costs should incorporate liability issues; unlimited buyer liability will limit trading (McElwaine).
8. It is necessary to more fully develop and articulate the legal argument for what it would take to get the environmental community to support water quality trading, perhaps through development of a paper (O'Grady).
9. Regulatory staff need to have performance targets that are measurable to make trading work (O'Grady).
10. EPA and USDA should work with states to identify and promote ten-year pilot projects;

[34] See: http://www.wetlands-initiative.org/.

USDA should reassure the agriculture community that water quality trading programs will not be a gateway to the NPDES program (Alderman, Denisoff, D. Hall, Lanyon).

11. The risk of failure should be distributed among the buyer, seller, and regulatory agencies (Jones).
12. Water quality trading programs may not be able to solve the water quality problems of watersheds that are dominated by nonpoint source pollution; we should not create unrealistic expectations among watershed stakeholders about what water quality trading programs can accomplish (Jones, Joyner).
13. We need EPA guidance on how to allocate reductions to nonpoint sources that is more specific than that provided in TMDLs (Joyner).
14. If reductions cannot be met through nonpoint source reductions, future reductions should be spread between point and nonpoint sources. Alternatively, nonpoint sources can be assigned a separate reduction goal that the agricultural community can meet collectively (Coan, Joyner).
15. There is a need for more clarity on the nonpoint source baseline for generating a credit (L. Hall, Joyner).
16. An option would be to get money from the farm bill to tackle nonpoint source problems (Lanyon).
17. The National Mitigation Banking Association recommends the development of flexible guidance to encourage trading, with restrictions that could be tightened in the future. We also need to develop generally accepted credits or units related to achieving the desired water quality goals, which should be concise and uniform (Alderman, Denisoff, Lucero).
18. There is a need for a driver or economic incentives to initiate water quality trading, whether through stronger regulations or more teeth in enforcement (Alderman, Denisoff).
19. Liability must be transferred away from the permittee (Alderman, Denisoff).
20. USDA is in the final stages of developing an environmental credit trading policy that will increase the opportunities for agriculture to become involved in trading (Lucero).
21. Point to point trading is also important and will require rules and guidance (Joyner).
22. TMDLs are important drivers for restoration, but they are also caps that prevent facility expansion. TMDLs will be a huge driver in Florida because facilities will need to buy credits if they want a pollution allocation and water quality trading is a way to handle their rapid growth (Joyner).

Diane Regas, *U.S. Environmental Protection Agency*

Regas provided a summary of what she heard from participants and where she sees EPA moving in the future on the issue. There was a lot of agreement among forum participants that we need water quality trading as a tool for achieving better environmental results for less money. There are many different approaches that can accomplish this goal. EPA is not aiming to have a "one size fits all" strategy but to foster a variety of effective approaches. EPA needs to make it easier to initiate new trading programs by reducing some of the barriers discussed earlier. This forum has shown that there is great potential for resolving water quality challenges through private, for-profit trading involving a credit banker or broker.

This forum also highlighted the differences between wetland mitigation banking and water quality trading. Urban's chart[35] illustrates the differences between these two practices, including spatial and temporal differences, distributing the projects versus consolidating them, credit counting in perpetuity for mitigation banking versus the limited-term credits for water quality trading, and finally, the Clean Water Act liability issues for the two different approaches.

The forum discussion has clarified some important issues that EPA needs to consider. Some of these issues include ensuring legitimacy, managing risk and uncertainty/liability, incentives and disincentives, valuation of credits, and roles.

Ensuring the legitimacy of credit brokers/bankers is a key issue. There must be high standards for market participation. Third parties must be required to meet a high threshold if they want to participate as brokers. There needs to be adequate accountability, monitoring, and modeling. The scale and landscape context of the project, however, will help dictate the options for using site-by-site monitoring or modeling. There is also a need for certification, auditing, and avoiding conflicts of interest. This forum has helped significantly to clarify the need to ensure legitimacy in the credit broker role.

Managing risk and uncertainty were repeated points of discussion during the course of the forum. Addressing the liability issue will remain first and foremost as EPA considers how to enable this process. The challenge is to determine how to distribute risks while satisfying the needs of both the regulator and credit buyer for confidence that permit limits will be met. The discussion has presented a variety of possible solutions that will be examined. Another issue is the need to find a balance between additional measuring and monitoring of pollutant reductions and the trade-offs in terms of costs and certainty. The forum participants raised many ideas for states to consider as they seek to address issues of liability, measuring, and modeling for their trading programs. These options include contract insurance, indemnification, and excess credit banking by brokers. Trading ratios can also be used to manage risk and the uncertainty between point and nonpoint source pollution reductions, as well as help to produce greater environmental benefits. Managing risk includes issues related to certification and the very important concerns regarding transparency.

Another theme of the forum is the need to focus on the incentives and disincentives of developing water quality trading programs. We need a better understanding of the extent to which the NPDES program, §303(d) listing, and TMDLs are sufficient to drive trading. The wetland mitigation bankers have demonstrated the importance of establishing a level playing field. Having strict standards in one part of the field and less strict standards elsewhere will affect the size of the market. The ability to bundle and stack credits may also create incentives and disincentives. However, we need to be mindful that allowing credit bundling and stacking may lead to the development of "Byzantine rules" for tracking multiple credits or double counting. EPA must address the agricultural industry's fear of the NPDES system, possibly by relying upon a broker to provide some distance from the regulatory program. Another potential disincentive in the system is the limitations of government staff and budgets to administer these programs. We do not want government to become a bottleneck in the implementation of these programs.

[35] See slide 18 at: http://www2.eli.org/pdf/wqtforum/presentations/Urban.pdf.

The valuation of credits is another issue that must be addressed. There are scientific and economic models that have been used successfully to value credits and create tradable credits, but there is more work needed to reduce the uncertainty surrounding these models.

A final theme of the forum was the roles of different players. It is very important for EPA and the states to consider who can play different, critical roles most effectively and efficiently. These roles include that of buyer, seller, credit certifier (third party or government), and regulator. The regulator is the entity that creates and enforces agreed-upon objectives and standards. It can be either a government entity or another institution or association.

The forum discussions have emphasized that each of these themes must be further addressed to ensure that water quality trading advances. There are already pilot projects underway, but there is enormous potential for water quality trading beyond these projects. EPA will take several steps in the near future to further this goal. First, ELI will publish a report based on this forum that will be available on ELI's web site along with presentations and audio recordings. Second, EPA will continue to provide training and information to states and other stakeholders on the agency's two existing guidance documents related to trading (2003 trading policy and 2004 guidance on evaluating the readiness of watersheds for trading). Third, EPA and USDA are co-sponsoring a national water quality trading conference scheduled for May 2006. A link to information about this conference may be found at: http://www.epa.gov/owow/watershed/trading.htm.

EPA will review the issues raised by this forum and determine if there are additional steps needed. Most importantly, EPA must consider whether a framework should be developed for potential brokers to clarify the boundaries for dealing with liability and other issues. Regas stated that the forum made clear that there is a lot of interest in the development of such guidance, and the wetland mitigation banking experience has demonstrated that such guidance could be helpful in fostering the development of more trading programs. Finally, EPA will continue to work with states to develop drivers in the form of numeric nutrient standards.

AGENDA:
National Forum on Synergies Between Water Quality Trading and Wetland Mitigation Banking

July 11 – 12, 2005
Carnegie Endowment for International Peace
Washington, DC

DAY ONE: July 11, 2005

8:30–9:00 am — **REGISTRATION & CONTINENTAL BREAKFAST**

9:00–9:15 am — **WELCOME**
Benjamin Grumbles
Assistant Administrator for Water
U.S. Environmental Protection Agency

9:15–9:30 am — **INTRODUCTIONS**
Jessica Wilkinson
Environmental Law Institute
(Facilitator)

9:30–9:45 am — **Review of Agenda, Objectives, & Ground Rules**
Jessica Wilkinson
Environmental Law Institute

9:45–10:25 am — **Background: The History and Status of Wetland Mitigation Banking and Water Quality Trading**

9:45–10:05 am
Palmer Hough
U.S. Environmental Protection Agency, Wetlands Division

10:05–10:25 am
Lynda Hall
U.S. Environmental Protection Agency, Assessment & Watershed Protection Division

10:25–10:40 am — Questions & Answers

10:40–10:55 am — **BREAK**

10:55 am–12:10 pm — **The Challenges of Point/Non-Point Source Trading**

10:55–11:15 am
■ PRESENTATION
Dennis King
University of Maryland

11:15 am–12:10 pm — Questions & Facilitated Discussion

12:10–12:35 pm — **BREAK**

12:35–1:10 pm — **LUNCH PRESENTATION:**
The Use of Water Quality Trading and Wetland Restoration to Address Hypoxia in the Gulf of Mexico

12:35–12:55 pm
G. Tracy Mehan, III
Cadmus Group
Paul Faeth
World Resources Institute

12:55–1:10 pm — Questions & Answers

1:10–1:25 pm — **BREAK**

1:25–3:15 pm — **Lessons Learned from Point-Nonpoint Source Trading**

1:25–1:55 pm
■ CASE STUDY
Dennis O'Grady
South Nation Conservation

1:55–2:25 pm
■ CASE STUDY
Alley Ringhausen
Great Rivers Land Trust

2:25–3:15 pm — Questions & Answers

3:15–3:30 pm — **BREAK**

3:30–4:30 pm — **Legal and Financial Liability – Issues in Mitigation Banking and Water Quality Trading**

3:30–3:45 pm
■ PRESENTATION:
A Wetland Mitigation Banking Perspective
George I. Platt
Wetlandsbank, Inc.

3:45–4:00 pm
■ PRESENTATION:
A Water Quality Trading Perspective
Cyrus Jones
Washington Suburban Sanitary Commission

4:00–4:45 pm — Questions & Facilitated Discussion

4:45 pm — **ADJOURN**

6:00–7:30 pm — **RECEPTION – Cosmos Club**
Sponsored by the
National Mitigation Banking Association
Hosted by former ELI President, **Bill Futrell**

Agenda
(Continued)

DAY TWO: July 12, 2005

8:30–9:00 am **CONTINENTAL BREAKFAST**

9:00–9:05 am **Review of Ground Covered and Remaining Discussions**
Jessica Wilkinson
Environmental Law Institute

9:05–10:25 am **The Banking Experience: Environmental Performance Standards & Credit Release**

9:05–9:25 am ■ PRESENTATION:
Craig Denisoff
Wildlands, Inc.

9:25–10:25 am Questions & Facilitated Discussion

10:25–10:40 am **BREAK**

10:40 am–12:20 pm **Bank Review and Certification Requirements**

10:40–11:00 am ■ PRESENTATION:
A Wetland Mitigation Banking Perspective
David Urban
Land and Water Resources, Inc.

11:00–11:20 am ■ PRESENTATION:
A Third Party Auditor Perspective
Hank Habicht
Global Environment & Technology Foundation

11:20 am–12:20 pm Questions & Facilitated Discussion

12:20–1:20 pm **LUNCH**

1:20–2:40 pm **Multiple Credit Types for A Single Project Site**

1:20–1:40 pm ■ PRESENTATION
Andrew McElwaine
Pennsylvania Environmental Council

1:40–2:40 pm Questions & Facilitated Discussion

2:40–2:55 pm **BREAK**

2:55–4:15 pm **Stimulating Creation of a Point/Non-Point Source Trading System on a Watershed Scale**

2:55–3:15 pm ■ PRESENTATION
Donald Hey
The Wetlands Initiative

3:15–4:15 pm Questions & Facilitated Discussion

4:15–4:35 pm **Feedback from Participants**

4:35–4:55 pm **Wrap-Up and Closing Statements**
Diane Regas
Director
Office of Wetlands, Oceans & Watersheds, U.S. Environmental Protection Agency

4:55 pm **ADJOURN**

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