

## **An Introduction to Water Quality Trading**

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## **Introduction**

Although the quality of the state's waterways has improved in recent decades (KDHE, 1997), much of this improvement was due to an aggressive control program targeting cleanup of point sources of pollution, such as municipal and industrial wastewater treatment. However, the state still has a long way to go in meeting clean water goals. In a recent assessment of Kansas surface waters, 76 percent of stream miles and 77 percent of lake acres assessed were deemed impaired for one or more of their designated uses, with much of the rest considered threatened (KDHE, 2002).

A significant share of the current water quality problems in Kansas stem from nonpoint source pollution, such as urban storm water and agricultural runoff (KDHE, 2002). Applying the same "command and control" regulatory approach to nonpoint source pollution would be problematic for a number of reasons. The widely distributed nature of nonpoint source pollution would make regulation and compliance costs frighteningly prohibitive. It's also likely there would be significant public opposition to broad regulation of the many activities contributing nonpoint source pollution.

Still, the public wants, and the Congress has mandated, cleaner waters. One of the more recent steps taken to get a handle on nonpoint source pollution has been the creation of Total Maximum Daily Load (TMDL) standards for the state's waterways. TMDLs establish a water body's capacity to assimilate pollution. It then assesses all of the sources contributing to that pollution, from both point and nonpoint sources. Finally, it sets goals for the use of that water body, and estimates what will be required from point and nonpoint sources to achieve that goal.

In addition to the traditional permitting of point source dischargers, additional EPA regulations are being applied to municipal storm water management. In responding to other nonpoint sources, most states continue to use education, incentives, and technical assistance to encourage better management practices.

While traditional approaches have made progress in the resolution of nonpoint source pollution problems, it is doubtful they will achieve full compliance with TMDL standards. Innovative policy solutions are needed to close the remaining gap. One such solution receiving considerable attention recently has been water quality trading (WQT).

## **An Introduction to Water Quality Trading**

The basic idea behind WTQ is to create a "market" in which all the sources of pollution are jointly charged with the task of meeting a water quality goal. How that goal is achieved is a matter for the participants in the market to determine. Given a set of rules for how the market operates and having a pollution load reduction allocated to each of the participants, participants are then free to find the least-cost method for achieving each of their respective goals – including bargaining among themselves.

The key to trading is that across a large number of pollution sources, the costs of pollution abatement will vary from relatively low to very high. For example, the total cost of a farmer altering operational procedures or installing certain structural remedies is very small compared to very large costs associated with installation of complex industrial pollution control technologies.

Assuming all sources are accountable to a certain minimal level of pollution prevention and that no “backsliding” is permitted, the trading program would allow the pollution source with a high abatement cost to purchase the same or greater level of pollution reduction from others with lower abatement costs. The source with high costs achieves a targeted level of pollution reduction at less overall cost, while the source with low abatement costs sells pollution “credits” in the process of reducing pollution. These credits may have a tangible monetary value.

### **An Example of How Trading Works**

The following example, taken from a publication prepared by the Center for Public Leadership Studies at Texas A&M University (1999), illustrates how it might work:

If pollution reduction by source A is more expensive than it would be for source B, then A and B should be able to make a bargain in which A’s required reductions are instead achieved by B such that the overall pollution reduction goal is still met. Suppose, for example, that reducing A’s phosphorous (P) load by 10 pounds would cost \$2,000, while reducing B’s P load by that same amount would cost only \$1,200. If A and B are located close to each other, then the same environmental benefit would be achieved regardless of which firm reduces its load. If A is required to reduce its load by 10 pounds, then paying B (more than \$1,200 but less than \$2,000) to reduce its load by that amount would be cheaper than implementing the reduction by itself. Because the total cost of the environmental improvement is \$800 less when implemented by B, such a trade is called *cost efficient*. (page 7)

Drawing on this example, suppose source A is the City of Pleasantville. Pleasantville discharges its treated wastewater into the river. Suppose source B is a large number of farm producers in the area surrounding Pleasantville who also contribute P to the waterway. Assume that Pleasantville is at its maximum allowed limit for the pounds of P it is allowed to discharge, but population growth projections suggest it will soon exceed its allocated amount. Assume further, that in order to remain within its allocation limit, would require a very expensive upgrade in its water treatment technology. What if, as an alternative to the technology upgrade, Pleasantville were to help a number of the farmers to implement practices that could reduce their P loading to the river by an amount

equivalent to the city's projected increased loading for the next 10 years, when it had otherwise expected to expand its treatment facilities, and to do so at half the cost of the current technology upgrade? Overall, society would achieve the same environmental benefit at half the total cost.

In this very simple example, two of the primary benefits of WQT are illustrated: it theoretically leads to a more *flexible* and *cost-effective* means of achieving the water quality goal. Overall, the EPA (2001) estimated that market-based approaches could save the nation \$900 million annually in the costs required to meet TMDL goals. Additionally, a World Resources Institute study found the cost of controlling phosphorous from point sources in Michigan, Minnesota and Wisconsin could be reduced 40 percent to 60 percent through trading with nonpoint sources (Faeth 2000).

### **Types of Trading**

Currently, there are five major types of trading programs (Center for Public Leadership Studies 1999):

- Intra-plant Trading. The first type of trading program would apply to a single point source with multiple discharge outlets. The firm would manage its overall level of discharge most cost effectively between its multiple outlets. Rather than each outlet pipe being managed to a single pollution standard, some pipes might discharge more and others less to achieve an overall goal across all of the discharges.
- Pretreatment. In the case where an industry discharges to a publicly-owned treatment works (POTW), the city might invest in pre-treating the industrial discharge instead of upgrading treatment technology at the PTOW.
- Point/Point Trading. This type of program applies only to multiple point sources. One point source could invest in other point sources to achieve a relatively greater level of control at a lower overall cost than would be required to achieve a given reduction for itself.
- Point/Nonpoint Trading. A point source arranges to reduce pollution among other nonpoint sources in the same watershed in lieu of upgrading its own treatment.
- Nonpoint/Nonpoint Trading. A nonpoint source arranges for a more cost effective reduction for another nonpoint source in the same watershed instead of installing or upgrading its own control.

Probably the most effective type of watershed trading program, whether it involves only point sources or includes nonpoint sources, is known as a "cap and trade" program. A total cap on the level of allowable pollution is established, perhaps in accordance with a TMDL necessary to achieve a water body's designated use. The TMDL establishes the goal with the threat of regulatory intervention looming as a source of trading motivation. Whether by trading or the regulatory remedy, the water quality goal is met in a know timeframe. The trading program simply offers a period of greater flexibility and the prospect of potentially considerable total cost savings. In the end, the water quality goal

is achieved, total costs are reduced, and sources met their obligations voluntarily and with greater choice and flexibility.

### **Benefits of Trading**

All forms of trading produce a number of economic, social and environmental benefits, as shown in the following table reproduced from the Center for Public Leadership Studies 1999 publication.

<b>Benefits of Trading</b>		
<b>Economic Benefits</b>	<b>Environmental Benefits</b>	<b>Social Benefits</b>
<ul style="list-style-type: none"> <li>• Reduces the total social cost of achieving water quality goals.</li> <li>• Allows dischargers to take advantage of economic scale and treatment efficiencies that vary from source to source.</li> <li>• Reduces overall cost of addressing water quality problems in the watershed.</li> <li>• Provides incentives for innovations in pollution reduction technology.</li> </ul>	<ul style="list-style-type: none"> <li>• Achieves equal or greater reduction of pollution at equal or lower cost.</li> <li>• Creates an economic incentive for dischargers to go beyond minimum pollution reduction.</li> <li>• Can reduce cumulative pollutant loading, improve water quality and prevent future environmental degradation.</li> <li>• May lower political resistance to higher water quality goals over time.</li> </ul>	<ul style="list-style-type: none"> <li>• Encourages dialogue among stakeholders and fosters concerted and holistic solutions for watersheds with multiple sources of water quality impairment.</li> <li>• Construction of social capital and trust.</li> </ul>

Source: Center for Public Leadership Studies. 1999. Page 9.

Large total savings in the overall costs of pollution abatement is the primary economic benefit of trading programs. Buyers are able to purchase the same or greater amounts of pollution abatement from others with lower abatement costs than they would have to pay to achieve the same amount.

From an environmental perspective, greater amounts of pollution abatement are theoretically possible than under a regulatory program. Trading program rules are established to permit only trades with a net environmental benefit. And, finally, trading brings disparate groups of stakeholders together to a common objective related to environmental quality.

### **Common Elements of Trading Programs**

There are at least 37 water quality trading (WQT) programs currently active or under development in over 20 states (Environomics, 1999; Feath, 2000; Woodward and Kaiser,

2002). As Table 1 shows, they trade in a variety of pollutants. Further, the rules they employ to foster trading also vary.

There are a wide variety of factors that need to be considered in organizing a WQT program. Following are some of the more common elements of point/point and point/nonpoint source trading programs.

Program Goals/Drivers. There needs to be a clear articulation of the goals of the program and the underlying drivers that are put into place to encourage trading. In many cases, the objective is to restore impaired waters. Given the requirement to establish TMDLs for such waters, enforcement of the TMDL becomes the underlying force to “push” participants to trade. The WQT program becomes the alternative to having regulations handed down. In this way, it’s hoped the water quality goal can be achieved in a voluntary fashion that allows greater flexibility among the pollution sources in the watershed at lower overall cost.

In certain cases, additional program goals may be incorporated into the program. Instead of the need to act to restore impaired water, may be the desire to maintain high quality waters. In such cases, incentives need to be built into the program, such as attaching a monetary value to trading credits (explained below) that can be sold or exchanged to some advantage to the entity holding the credit. Similarly, ancillary benefits, such as wetlands restoration, creation of wildlife habitat or open space, carbon sequestration, or pursuit of “smart growth” objectives, can be incorporated into the trading program.

Watershed Characteristics. Trading programs are watershed-based. While the scale of the watershed may vary depending on the natural conditions that exist and the number and type of potential participants, the trading occurs in a defined watershed. This helps reduce the uncertainty regarding whether the supposed environmental benefits are being achieved. Ultimately, the cumulative impacts of the trades can be measured in terms of water quality. While some states have established state-wide rules to enable trading, the trades are restricted to the watershed where the changes occur. The trades are not swapped across the state with uncertain benefits. And, it might be expected that the rules governing the markets created might vary across watersheds to strengthen the probability of optimal outcomes.

Watershed Modeling. Before any large-scale trading program can be implemented, there is the need to have the capacity to accurately model watershed pollution loading. This typically requires fairly sophisticated modeling expertise for at least two reasons. First, it helps to reduce the uncertainty regarding the beneficial nature of the trades. In a complex watershed with many sources of multiple types, predicting the interaction of multiple loading events and ensuring a positive outcome is no small feat.

Secondly, traders are being asked to make agreements with financial implications – sometimes large financial implications, based on expected levels of value bought and

sold. Traders need some mechanism to establish levels of value that are mutually trustworthy.

Creation of Trading Rules. The creation of trading program rules is typically done with extensive and very close involvement of potentially affected stakeholders. The stakeholders are the ones who help determine what will work within the broad parameters of “effective program design.” Without such stakeholder involvement, there is likely to be opposition to program development and the probability of ever creating a functional program is very low. While the EPA (2003) has established guidelines that help to ensure an effective program, the specific details are left for the stakeholders and the states to determine.

Trading Participants. As implied by the variety of WQT program types, the participants in the trading program can vary. In a point/point trading program, there might only be POTWs, or perhaps industrial dischargers subject to National Pollution Discharge Elimination System (NPDES) permitting. In a point/nonpoint program, agricultural interests might be brought in as well.

The keys in identifying participants are that they must be in the same watershed; they must be in reasonably close proximity to one another; and they must be contributing the same type of pollutants. These requirements, again, help to reduce the uncertainty in the effects of trading, and helps avoid the exacerbation of problems in any one area.

Pollutants to be Traded. Trading programs typically target nutrients, such as nitrogen (N) or phosphorous (P). However, trading programs also have been established to deal with problems associated to dissolved solids, ammonia, temperature, pH, biological oxygen demand, and selenium. In general, trading works best where the pollutant in question is generally widespread rather than highly localized. Trading does not work well with certain classes of pollutants such as pesticides or mercury because of the potential of creating concentrated localized problems, or “hot spots.”

Trading Credits. Trading credits are created when a source reduces pollution loading to a greater level than the minimum required. Such might be the case when a POTW installs new pollution control technology. Frequently, the nature of the capital investments required in such technology does not simply yield a marginal load reduction, but a large one that creates a substantial margin for future growth. In such cases, the new excess capacity to handle additional treatment without exceeding the loading limit could be sold or exchanged with another source.

Trading Markets. There are several options available to create a trading market. Generally, if trading is restricted to only certain entities, the market is a “closed” market. If the trading is open to anyone wishing to participate, it is an open market. Beyond this distinction, there are four basic forms of WQT programs (Center for Public Leadership Studies 1999).

- **Commodity Market.** In a commodity market the pollution credit becomes a fully transferable right. Credits generated in a commodity market come in the form of a certificate that can be sold to any source with a need to reduce its pollution loading.
- **Contractual Market.** Credits generated in a contractual market are not directly transferable. Rather, each transaction involves an agreement contract between the producer and the user of a credit. Contractual markets are used when the credits generated by the two parties are not directly comparable, or when a liability obligation remains between the parties.
- **Supply of Pollution Credits through a Fund.** In cases where a source may exceed its loading allocation, the source would pay into a government-run fund. The payment would be much like a pollution tax. The fund would, in turn, be used to help pay for reduction of loading from other sources.
- **Single-source Management.** No trading between sources occurs under this option. Rather, a source is given the choice of directly reducing its own pollution loading or taking some other action that that reduces pollution by an equivalent amount.

In the commodity and contractual markets alternatives, incentives are created to reduce pollution loadings below the minimum required amount in order to generate credits that have fungible or monetary value.

Trading Ratios. Trading ratios are simply a mechanism for creating a margin of error. Due to uncertainties as to whether trading the actions of one for another will actually lead to the intended beneficial effect, a margin of error is typically built in to ensure improvement occurs. The less similar or proximate two sources are, the less certainty exists that an improvement will occur. Trading ratios across programs vary from 1:1 to 9.2:1 in a sample of programs reviewed.

### **Limitations of WQT Programs**

The story on WQT, so far, seems quite positive. But, it's not a simple thing to achieve and is not without its own costs. Creating an effective trading market for water pollution is a very complex endeavor. Most of the efforts to implement WQT programs have not resulted in high levels of trading activity. While the reasons may vary, it generally boils down to the difficulties of creating an effective and smoothly-operating market place for buyers and sellers to find information, engage in negotiations, and structure enforceable agreements. Considerable research and applied experience in constructing such markets is yet needed.

A second concern with WQT programs is that they need to be supervised and monitored. Someone needs to provide information, verify agreements, monitor implementation and

evaluate the results. Thus, the state agency charged with overseeing the program will likely need more rather than fewer resources that may have been required under a strictly regulatory approach.

There frequently are concerns about implementing a new and unknown policy in exchange for that which has been known and in use for many years. Many people remain skeptical that WQT can, indeed, achieve its theoretical potential. Still others believe there isn't something quite "moral" about allowing a "polluter" to continue polluting rather than cleaning it up.

Finally, WQT programs are not suited for all types of pollution and places. At best, WQT becomes an additional management alternative to be used in conjunction with education, technical assistance, incentives and regulatory programs.

### **Case Studies of WQT Programs**

Following is a somewhat more detailed look at several of the programs around the United States.

#### Lower Boise River, Idaho

In July of 1997, the Lower Boise River Demonstration Project received funding to begin research and design of a water quality trading program. This was seen as a cost-effective approach to meet forthcoming TMDLs. The nutrient of concern was phosphorous.

The first phase of the program concentrated on estimating the costs of phosphorous reduction among the potential market participants. Municipalities' predicted cost of an 80 percent reduction in phosphorous ranged from \$20/pound up to \$175/pound. Agriculture exhibited much lower abatement costs ranging from \$3/pound to \$12/pound. These results convinced the stakeholders that phosphorous trading had strong potential and further research should be performed.

Phase two of the program involved setting up the framework for the market. This included: trading components, reporting requirements, trade reviews and best management practices.

The trading components include both point and nonpoint source dischargers. Point to point and point to nonpoint are the two trade types generally accepted. They are allowed to set up direct private contracts with each other specifying the terms of the trade. The specifics of the contract do not have to be made public. Nonpoint source participation through BMPs is entirely voluntary.

Trading ratios are integrated into trades involving nonpoint sources to account for measurement uncertainty as well as ensuring an overall reduction in pollutant loads. Watershed specific trading ratios can also be applied to any trade to ensure that the overall quality of the water body is not degraded. Hydrological modeling is employed to

guarantee that there is equity across credits. Pollutant trading has the potential to create localized water quality problems. To account for this, any trade that would result in localized water degradation above a set limit is not allowed.

The trading parties must fill out "Trade Notification Forms" which officially registers the trade and transfers the pollutant credits. By signing this form, authority is given to a regulatory agency to monitor and report on the validation of the trade. This project is still in its infancy.

### Kalamazoo River Basin, Michigan

The Kalamazoo River Watershed, located in southwest Michigan, encompasses over 2,000 square miles. In the mid-1990s, the watershed was characterized by high phosphorous levels resulting in dissolved oxygen violations downstream, particularly in Lake Allegan. Increased interest in water quality trading began in late 1996 and by mid-1997 the interest had evolved into a fully-funded, 2.5 year, pilot study. The goal of the study was to evaluate the effectiveness of a water quality trading program that could then be applied to the state of Michigan as a whole as well as other locations around the country.

At the time of this project, there were over fifty NPDES dischargers in the watershed. The dischargers were primarily municipal wastewater treatment plants and paper mills. The nonpoint source dischargers consisted of industrial, municipal, and agricultural sources. This project would allow point source dischargers to use voluntary nonpoint source phosphorous reductions to meet their permit limits. Important emphasis was placed upon the word "voluntary."

A major policy issue that had to be satisfied in dealing with the agricultural sector was equity. The amount of credit generated by a farmer was based upon their current management practice along with their potential to reduce phosphorous loads. Since some farmers had already implemented generally accepted agricultural management practices (GAAMPs) prior to the introduction of this program and others had not, the program would be biased in favor of those who had not used GAAMPs up to this point. To correct this potentially unfair situation, trading ratios were developed. Farms that had previously implemented GAAMPs were allowed to receive one pound of credit for every two pound reduction. On the other hand, those who had not already been using GAAMPs received one pound of credit for every four pound reduction. These ratios achieved equity from farmer to farmer while preserving the incentive to reduce phosphorous loads further. In addition to the trading ratio just discussed, others took into account distance, seasonality and equivalence.

Farmers that had interest in participating in the program started out by contacting NRCS or their local soil conservation office. Voluntary assistance was given to the farmer in the form of evaluation of current practices and phosphorous loading. Management practices were recommended along with the amount of phosphorous reduction associated with each practice. Farmers were then allowed to implement whatever practices they felt best

suiting their operations and receiving credits accordingly. The NRCS was the agency responsible for providing the farmers with on-going assistance as well as holding them accountable.

Some valuable conclusions, concerning water quality trading as a whole, can be derived from the results of this project. First of all, nonpoint source dischargers exhibited much lower costs of phosphorous reduction techniques when compared to point sources. Therefore, trading between the two sources made economic sense. BMPs implemented by the agricultural producers did result in lower phosphorous loads. Also the use of hydrologic modeling to estimate loading was fairly accurate. The 2:1 point/nonpoint ratio reasonably accounted for the uncertainty of nonpoint contribution and resulted in greater water quality improvements than projected.

As with any program, timetables must be created and followed in order to avoid confusion and dissatisfaction. This is especially critical in the beginning phases of implementation. Along with this, another rule of thumb when dealing with the agricultural sector is the issue of anonymity for site owners.

Farmers were also very receptive when shown that implementing BMPs could increase the efficiency of their operation, and as a result, profits. They didn't show near as much interest in BMP implementation for the purpose of generating credits for later sale. Uncertainty and risk may be to blame.

During the span of this project, six nonpoint sources voluntarily banked phosphorous credits. However, no point/nonpoint trades were executed. The downturn of the paper industry could be a possible explanation for the lack of trading activity. Credits not used by the end of this project were retired from use.

### Tar-Pamlico, North Carolina

In 1989, the Tar-Pamlico Basin was designated a Nutrient Sensitive Water due to low oxygen levels, algal blooms and increased fish kills. Initially the North Carolina Environmental Management Commission suggested point source technology-based control limits to solve the problem. In response, the point source dischargers formed an association and, along with two environmental groups, proposed a nutrient trading program. In December of 1989, the Association, the State and the two environmental groups signed an agreement to begin the first phase of a nutrient trading program.

The first phase of the agreement spanned 1990-1994 and concentrated solely on point source dischargers. This phase required that the association perform water quality modeling to determine the location and the concentrations of pollutants. The association also did an efficiency study on their current facilities. Minor changes were then made to optimize their current treatment and abatement systems. Lastly, the association was responsible for providing up-front funding for nonpoint source BMPs.

Much progress resulted from Phase One of the agreement. Total phosphorous and

nitrogen loads were reduced 20 percent, despite an increase in water flow of 7 percent. This was largely due to the efficiency study. The water quality modeling gave insight to pollution distribution and enabled the agreement to move easily into Phase Two (which involved nonpoint sources). The association provided \$1 million funding toward BMPs (the majority of this money was part of a federal EPA grant). The Association included fourteen dischargers that represented 90 percent of all point sources at that time.

The second phase of the program incorporated nonpoint sources into the equation. Phase Two spanned from 1995-2004 and set goals of a 30 percent reduction in nitrogen loads from 1991 levels and no increase in phosphorous loads. Environmental groups were not satisfied with the 30 percent reduction in the nitrogen goal, and opted out of Phase Two of the agreement.

Rules were drafted for agriculture, nutrient management, urban storm water and riparian buffer protection. These rules consist of goal setting, registration, management training, monitoring and program implementation. The goal of these rules was the 30 percent nitrogen reduction.

With both phases of the agreement in place, trading can now occur among point sources, nonpoint sources and the State. A cap is put into place by the State, which puts a set limit on pollutant loads. Point sources within the Association are allowed to cooperate (informally trade) in order to meet the cap. If the association, as a whole, cannot meet the cap then they are required to purchase offset permits at a set price from the State. This money goes into the State's cost-share program and is applied toward BMPs. As a result, the State is responsible for finding trade partners and ensuring that the offsets be made valid.

Non-Association members follow separate rules. They must meet a technology limit and offset any new discharges. New dischargers to the basin must purchase offsets.

The Division of Water Quality has labeled the Tar-Pamlico program a success up to this point. Caps have not been exceeded and costs have been significantly reduced. One of the innovative aspects of this program is the reduction of transaction costs incurred by the point sources. By placing the burden of offsetting on the State, there is a reduction in risk and cost to the point sources.

The Tar-Pamlico program cannot be considered a "true" water quality trading program for the fact that there exists only point-point cooperation and there is no direct connection between point and nonpoint sources. This program may best be described as a load exceedance tax on point sources with the proceeds going to more cost effective abatement methods.

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Table 1. Summary of Water Quality Trading Programs in the United States.

Project	State	N	P	Pollutant/Pollution Type				Activity Description	Stage
				TSS/TDS	NH3	Temp.	pH		
Bear Creek Trading Program	CO		x					Watershed trading program	Program approved
Boulder Creek Trading Program	CO				x	x	x	Watershed trading program	Implementation
Chatfield Reservoir Study and Trading Program	CO		x					Watershed trading program	Program approved
Cherry Creek Basin Trading Program	CO		x					Watershed trading program	Implementation
Lake Dillon Trading Program	CO		x					Watershed trading program	Implementation
Long Island Sound Trading Program	CT	x						Large watershed trading program	Under development
Blue Plains WWTP Credit Creation	DC	x						Single trade	Under development
Tampa Bay Cooperative Nitrogen Management	FL	x						Regional cooperation	Implementation
Cargill and Ajinomoto Plants Permit Flexibility	IA				x			NPDES permit flexibility	Implementation
Lower Boise River Effluent Trading Demonstration Project	ID		x					Watershed trading program	Under development
Town of Acton POTW	MA		x					Offset for 1 discharger	Under development
Wayland Business Center Treatment Plant Permit	MA		x					Offset for 1 discharger	Implementation
Maryland Nutrient Trading Policy	MD	x	x					State-wide trading program	Under development
Kalamazoo River Water Quality Trading Demonstration	MI		x					Watershed pilot program	Implementation
Michigan Water Quality Trading Rule Development	MI	x	x					State-wide trading program	Nearing completion
Minnesota River Nutrient Trading Study	MN		x					Watershed trading study	Study completed
Rahr Malting Permit	MN		x					Offset for 1 discharger	Implementation
Southern Minnesota Beet Sugar Cooperative Plant Permit	MN		x					Offset for 1 discharger	Implementation
Chesapeake Bay Nutrient Trading Program	multi	x	x					Large watershed trading program	Under development
Neuse River Nutrient Sensitive Water Management Strategy	NC		x					Watershed trading program	Program approved
Tar-Pamlico Nutrient Reduction Trading Program	NC	x	x					Watershed trading program	Implementation
Truckee River Water Rights and Offset Program	NV	x	x	x		x		Offset for 1 discharger	Implementation
New York City Watershed Phosphorus Offset Pilot Programs	NY		x					Offset pilot programs	Implementation
Clermont County Project	OH		x					Potential regional trading project	Under development
Delaware River Basin Trading Simulation	PA	x	x	x		x		Watershed pilot program	Early discussion
Henry County PSA and City of Martinsville Agreement	VA				x			Single trade	Implementation
Virginia Water Quality Improvement Act and Tributary Strategy	VA	x	x					State-wide trading program	Program approved
Fox-Wolf Basin Watershed Pilot Trading Program	WI		x					Watershed pilot program	Program approved
Red Cedar River Pilot Trading Program	WI		x					Watershed pilot program	Program approved
Rock River Basin Pilot Trading Program	WI		x					Watershed pilot program	Under development
Wisconsin Effluent Trading Rule Development	WI		x					State-wide trading program	Pilots active

# UNITED STATES ENVIRONMENTAL PROTECTION AGENCY



## Office of Water Water Quality Trading Policy January 13, 2003

### I. Background and Purpose of the Policy

The Clean Water Act (CWA)<sup>1</sup> was enacted in 1972 to restore and maintain the chemical, physical, and biological integrity of the nation's waters. It established a national policy that called for the discharge of pollutants to be eliminated and established interim goals for protecting fish, wildlife and recreational uses. The CWA also established a national policy for development and implementation of programs so the goals of the Act could be met through controls of point and nonpoint sources of pollution. Congress recognized and preserved the primary responsibilities and rights of the States to prevent, reduce and eliminate pollution.

The application of technology and water quality based requirements through the National Pollutant Discharge Elimination System (NPDES) permit program has achieved and remains critical to success in controlling point source pollution and restoring the nation's waters. Despite these accomplishments approximately 40% of the rivers, 45% of the streams and 50% of the lakes that have been assessed still do not support their designated uses<sup>2</sup>. Sources of pollution such as urban storm water, agricultural runoff and atmospheric deposition continue to threaten our nation's waters. Nutrient and sediment loading from agriculture and storm water are significant contributors to water quality problems such as hypoxia in the Gulf of Mexico and decreased fish populations in Chesapeake Bay. Population growth and development place increasing demands on the environment making it more difficult to achieve and maintain water quality standards.

Finding solutions to these complex water quality problems requires innovative approaches that are aligned with core water programs. Water quality trading is an approach that offers greater efficiency in achieving water quality goals on a watershed basis. It allows one source to meet its regulatory obligations by using pollutant reductions created by another source that has lower pollution control costs. Trading capitalizes on economies of scale and the control cost differentials among and between sources.

The United States Environmental Protection Agency (EPA) believes that market-based approaches such as water quality trading provide greater flexibility and have potential to achieve water quality and environmental benefits greater than would otherwise be achieved under more traditional regulatory approaches. Market-based programs can

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1 Federal Water Pollution Control Act (Public Law 92-500, as amended), 33 U.S.C. Sec. 1251, *et. seq.*

2 About 33 percent of the nation's waters have been assessed by States and tribes pursuant to Section 305(b) of the Clean Water Act (National Water Quality Inventory: 2000 Report, EPA). The proportion of non-assessed water that do not meet designated uses is likely lower since assessments tend to be focused in known problem areas.

**Water Quality Trading Policy Statement**

achieve water quality goals at a substantial economic savings. EPA estimates that in 1997 annual private point source control costs were about \$14 billion and public point source costs were about \$34 billion<sup>3</sup>. The National Cost to Implement Total Maximum Daily Loads (TMDLs) Draft Report estimates that flexible approaches to improving water quality could save \$900 million dollars annually compared to the least flexible approach (EPA, August 2001). Nitrogen trading among publicly owned treatment works in Connecticut that discharge into Long Island Sound is expected to achieve the required reductions under a TMDL while saving over \$200 million dollars in control costs. Market-based approaches can also create economic incentives for innovation, emerging technology, voluntary pollution reductions and greater efficiency in improving the quality of the nation's waters.

The purpose of this policy is to encourage states, interstate agencies and tribes to develop and implement water quality trading programs for nutrients, sediments and other pollutants where opportunities exist to achieve water quality improvements at reduced costs. More specifically, the policy is intended to encourage voluntary trading programs that facilitate implementation of TMDLs, reduce the costs of compliance with CWA regulations, establish incentives for voluntary reductions and promote watershed-based initiatives. A number of states are in various stages of developing trading programs. This policy provides guidance for states, interstate agencies and tribes to assist them in developing and implementing such programs.

This policy addresses issues left open by and limitations encountered implementing projects and programs under EPA's January 1996 Effluent Trading In Watersheds Policy and May 1996 Draft Framework for Watershed-Based Trading ("Draft Framework"). This policy should be given precedence over any inconsistencies with the Draft Framework.

This policy draws upon lessons from a number of recent pilot trading projects and state experiences in developing water quality trading programs. These initiatives demonstrate how trading can occur under the CWA and existing federal regulations. They illustrate the importance of voluntary watershed-based partnerships, inter-agency cooperation and public participation in implementation of trading programs. They show that flexible market-based approaches can facilitate states and tribes finding solutions to complex and diverse water quality and socioeconomic issues. These efforts have also highlighted the importance of keeping transaction and administrative costs manageable while retaining accountability. The lessons learned from these efforts have informed the development of this policy.

This policy describes various requirements of the CWA and implementing regulations that are relevant to water quality trading, including: requirements to obtain permits (Sections 402 and 404), antibacksliding provisions (Section 303(d)(4) and Section 402(o)), the development of water quality standards including antidegradation policy (Section 303(c)), federal NPDES permit regulations (40 CFR Parts 122, 123 and 124), TMDLs (Section 303d(1)) and water quality management plans (40 CFR Part 130).

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<sup>3</sup> A Retrospective Assessment of the Costs of the Clean Water Act: 1972 – 1997 (EPA October, 2000).

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These CWA provisions and regulations contain legally binding requirements. This policy does not substitute for those provisions or requirements. In addition, this policy identifies general elements and provisions that EPA believes are important for creating credible water quality trading programs.

When EPA makes a decision with regard to any particular permit, TMDL, water quality standards or water quality management plan that includes provisions for trading to occur, it will make each decision on a case-by-case basis guided by the applicable requirements of the CWA and implementing regulations and the specific facts and circumstances involved.

### II. Trading Objectives

EPA supports implementation of water quality trading by states, interstate agencies and tribes where trading:

- A. Achieves early reductions and progress towards water quality standards pending development of TMDLs for impaired waters.
- B. Reduces the cost of implementing TMDLs through greater efficiency and flexible approaches.
- C. Establishes economic incentives for voluntary pollutant reductions from point and nonpoint sources within a watershed.
- D. Reduces the cost of compliance with water quality-based requirements.
- E. Offsets new or increased discharges resulting from growth in order to maintain levels of water quality that support all designated uses.
- F. Achieves greater environmental benefits than those under existing regulatory programs. EPA supports the creation of water quality trading credits in ways that achieve ancillary environmental benefits beyond the required reductions in specific pollutant loads, such as the creation and restoration of wetlands, floodplains and wildlife and/or waterfowl habitat.
- G. Secures long-term improvements in water quality through the purchase and retirement of credits by any entity.
- H. Combines ecological services to achieve multiple environmental and economic benefits, such as wetland restoration or the implementation of management practices that improve water quality and habitat.

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### III. Water Quality Trading Policy Statement

- A. CWA Requirements. Water quality trading and other market-based programs must be consistent with the CWA.
- B. Trading Areas. All water quality trading should occur within a watershed or a defined area for which a TMDL has been approved. Establishing defined trading areas that coincide with a watershed or TMDL boundary results in trades that affect the same water body or stream segment and helps ensure that water quality standards are maintained or achieved throughout the trading area and contiguous waters.
- C. Pollutants and Parameters Traded. EPA supports trading that involves nutrients (e.g., total phosphorus and total nitrogen) or sediment loads. In addition, EPA recognizes that trading of pollutants other than nutrients and sediments has the potential to improve water quality and achieve ancillary environmental benefits if trades and trading programs are properly designed. EPA believes that such trades may pose a higher level of risk and should receive a higher level of scrutiny to ensure that they are consistent with water quality standards. EPA may support trades that involve pollutants other than nutrients and sediments on a case-by-case basis where prior approval is provided through an NPDES permit, a TMDL or in the context of a watershed plan or pilot trading project that is supported by a state, tribe or EPA.

EPA also supports cross-pollutant trading for oxygen-related pollutants where adequate information exists to establish and correlate impacts on water quality. Reducing upstream nutrient levels to offset a downstream biochemical oxygen demand or to improve a depressed in-stream dissolved oxygen level are examples of cross-pollutant trading.

EPA does not currently support trading of pollutants considered by EPA to be persistent bioaccumulative toxics (PBTs). EPA would consider a limited number of pilot projects over the next two to three years to obtain more information regarding trading of PBTs. EPA believes pilot projects may be appropriate where the predominant loads do not come from point sources, trading achieves a substantial reduction of the PBT traded and where trading does not cause an exceedance of an aquatic life or human health criterion. Based on the findings of these pilot projects, EPA will consider making revisions to its policy.

Where state or tribal water quality standards allow for mixing zones, EPA does not support any trading activity that would exceed an acute aquatic life criteria within a mixing zone or a chronic aquatic life or human health criteria at the edge of a mixing zone using design flows specified in the water quality standards.

- D. Baselines for Water Quality Trading. As explained below, the baselines for generating pollution reduction credits should be derived from and consistent with

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water quality standards. The term pollution reduction credits (“credits”), as used in this policy, means pollutant reductions greater than those required by a regulatory requirement or established under a TMDL.

For example, where a TMDL has been approved or established by EPA, the applicable point source waste load allocation or nonpoint source load allocation would establish the baselines for generating credits. For trades that occur where water quality fully supports designated uses, or in impaired waters prior to a TMDL being established, the baseline for point sources should be established by the applicable water quality based effluent limitation, a quantified performance requirement or a management practice derived from water quality standards. In these scenarios the baseline for nonpoint sources should be the level of pollutant load associated with existing land uses and management practices that comply with applicable state, local or tribal regulations.

### E. When Trading May Occur.

1. Trading to Maintain Water Quality Standards. Trading may be used to maintain high water quality in waters where water quality standards are attained, such as by compensating for new or increased discharges of pollutants.

2. Pre-TMDL Trading In Impaired Waters. EPA supports pre-TMDL trading in impaired waters to achieve progress towards or the attainment of water quality standards. EPA believes this may be accomplished by individual trades that achieve a net reduction of the pollutant traded or by watershed-scale trading programs that reduce loadings to a specified cap supported by baseline information on pollutant sources and loadings.

EPA also supports pre-TMDL trading that achieves a direct environmental benefit relevant to the conditions or causes of impairment to achieve progress towards restoring designated uses where reducing pollutant loads alone is not sufficient or as cost-effective.

If pre-TMDL trading does not result in the attainment of applicable water quality standards, EPA expects a TMDL to be developed. After a TMDL has been approved or established by EPA, the reductions made to generate credits for pre-TMDL trading may no longer be adequate to generate credits under the TMDL. This will depend on the remaining level of reduction needed to achieve water quality standards and, where applicable, the allocation of point and nonpoint source pollutant loads established by the TMDL.

3. TMDL Trading. Trades and trading programs in impaired waters for which a TMDL has been approved or established by EPA should be consistent with the assumptions and requirements upon which the TMDL is established. EPA encourages the inclusion of specific trading provisions in the TMDL itself, in NPDES permits, in watershed plans and the continuing planning process.

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EPA does not support any trading activity that would delay implementation of a TMDL approved or established by EPA or that would cause the combined point source and nonpoint source loadings to exceed the cap established by a TMDL.

4. **Technology-Based Trading.** EPA does not support trading to comply with existing technology-based effluent limitations except as expressly authorized by federal regulations. Existing technology-based effluent guidelines for the iron and steel industry allow intraplant trading of conventional, nonconventional and toxic pollutants between outfalls under certain circumstances (40 CFR 420.03).

EPA will consider including provisions for trading in the development of new and revised technology-based effluent guidelines and other regulations to achieve technology-based requirements, reduce implementation costs and increase environmental benefits.

5. **Pretreatment Trading.** EPA supports a municipality or regional sewerage authority developing and implementing trading programs among industrial users that are consistent with the pretreatment regulatory requirements at 40 CFR Part 403 and the municipality's or authority's NPDES permit.

6. **Intra-Plant Trading.** EPA supports intra-plant trading that involves the generation and use of credits between multiple outfalls that discharge to the same receiving water from a single facility that has been issued an NPDES permit.

F. **Alignment With The CWA.** Provisions for water quality trading should be aligned with and incorporated into core water quality programs. EPA believes this may be done by including provisions for trading in water quality management plans, the continuing planning process, watershed plans, water quality standards, including antidegradation policy and, by incorporating provisions for trading into TMDLs and NPDES permits.

When developing water quality trades and trading programs, states and tribes should, at a minimum, take into account the following provisions of the CWA and implementing regulations:

1. **Requirements to Obtain Permits.** Sources and activities that are required to obtain a federal permit pursuant to Sections 402 or 404 of the CWA must do so to participate in a trade or trading program.

2. **Incorporating Provisions For Trading Into Permits.** In some cases, specific trades may be identified in NPDES permits, including requirements related to the control of nonpoint sources where appropriate. EPA also supports several flexible approaches for incorporating provisions for trading into NPDES permits: i) general conditions in a permit that authorize trading and describe appropriate conditions and restrictions for trading to occur, ii) the use of variable permit limits that may be adjusted up or down based on the quantity of credits generated or

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used; and/or, iii) the use of alternate permit limits or conditions that establish restrictions on the amount of a point source's pollution reduction obligation that may be achieved by the use of credits if trading occurs. EPA also encourages the use of watershed general permits, where appropriate, to establish pollutant-specific limitations for a group of sources in the same or similar categories to achieve net pollutant reductions or water quality goals through trading. Watershed permits issued to point sources should include facility specific effluent limitations or other conditions that would apply in the event the pollutant cap established by the watershed permit is exceeded.

3. **Public Notice, Comment and Opportunity For Hearing.** Notice, comment and opportunity for hearing must be provided for all NPDES permits (40 CFR 124). NPDES permits and fact sheets should describe how baselines and conditions or limits for trading have been established and how they are consistent with water quality standards. EPA does not expect that an NPDES permit would need to be modified to incorporate an individual trade if that permit contains authorization and provisions for trading to occur and the public was given notice and an opportunity to comment and/or attend a public hearing at the time the permit was issued.

4. **Consistency With Standard Methods.** Where methods and procedures (e.g., sampling protocols, monitoring frequencies) are specified by federal regulations or in NPDES permits, they should continue to be used where applicable for measuring compliance for point sources that engage in trading. EPA believes this is necessary to provide clear and consistent standards for measuring compliance and to ensure that appropriate enforcement action can be taken.

5. **Protecting Designated Uses.** EPA does not support any use of credits or trading activity that would cause an impairment of existing or designated uses, adversely affect water quality at an intake for drinking water supply or that would exceed a cap established under a TMDL.

6. **Antibacksliding.** EPA believes that the antibacksliding provisions of Section 303(d)(4) of the CWA will generally be satisfied where a point source increases its discharge through the use of credits in accordance with alternate or variable water quality based effluent limitations contained in an NPDES permit, in a manner consistent with provisions for trading under a TMDL, or consistent with the provisions for pre-TMDL trading included in a watershed plan.

These antibacksliding provisions will also generally be satisfied where a point source generates pollution reduction credits by reducing its discharge below a water quality based effluent limitation (WQBEL) that implements a TMDL or is otherwise established to meet water quality standards and it later decides to discontinue generating credits, provided that the total pollutant load to the

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receiving water is not increased, or is otherwise consistent with state or tribal antidegradation policy.

7. Antidegradation. Trading should be consistent with applicable water quality standards, including a state's and tribe's antidegradation policy established to maintain and protect existing instream water uses and the level of water quality necessary to support them, as well as high quality waters and outstanding national resource waters (40 CFR 131.12). EPA recommends that state or tribal antidegradation policies include provisions for trading to occur without requiring antidegradation review for high quality waters. EPA does not believe that trades and trading programs will result in "lower water quality" as that term is used in 40 CFR 131.12(a)(2), or that antidegradation review would be required under EPA's regulations when the trades or trading programs achieve a no net increase of the pollutant traded and do not result in any impairment of designated uses.

G. Common Elements of Credible Trading Programs. EPA believes that, in addition to including provisions to be consistent with the CWA, trading programs should include the following general elements to be credible and successful:

1. Legal Authority and Mechanisms. Clear legal authority and mechanisms are necessary for trading to occur. EPA believes the CWA provides authority for EPA, states and tribes to develop a variety of programs and activities to control pollution, including trading programs. The CWA and federal regulations provide authority to incorporate provisions for trading into NPDES permits issued to point sources and for trading under TMDLs that include provisions for trading to occur.

In addition, states and tribes should use specific legal mechanisms to facilitate trading. Provisions for trading may be established through various mechanisms, including: legislation, rule making, incorporating provisions for trading into NPDES permits and establishing provisions for trading in TMDLs or watershed plans. These provisions may incorporate or be supplemented by private contracts between sources or third-party contracts where the third party provides an indemnification or enforcement function.

2. Units of Trade. Clearly defined units of trade are necessary for trading to occur. Pollutant specific credits are examples of tradable units for water quality trading. These may be expressed in rates or mass per unit time as appropriate to be consistent with the time periods that are used to determine compliance with NPDES permit limitations or other regulatory requirements.

3. Creation and Duration of Credits. Credits should be generated before or during the same period they are used to comply with a monthly, seasonal or annual limitation or requirement specified in an NPDES permit. Credits may be generated as long as the pollution controls or management practices are functioning as expected.

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4. **Quantifying Credits and Addressing Uncertainty.** Standardized protocols are necessary to quantify pollutant loads, load reductions, and credits. States and tribes should develop procedures to account for the generation and use of credits in NPDES permits and discharge monitoring reports in order to track the generation and use of credits between sources and assess compliance.

Where trading involves nonpoint sources, states and tribes should adopt methods to account for the greater uncertainty in estimates of nonpoint source loads and reductions. Greater uncertainty in nonpoint source estimates is due to several factors including but not limited to variability in precipitation, variable performance of land management practices, time lag between implementation of some practices and full performance, and the effect of soils, cover and slope on pollutant load delivery to receiving waters.

EPA supports a number of approaches to compensate for nonpoint source uncertainty. These include monitoring to verify load reductions, the use of greater than 1:1 trading ratios between nonpoint and point sources, using demonstrated performance values or conservative assumptions in estimating the effectiveness of nonpoint source management practices, using site- or trade-specific discount factors, and retiring a percentage of nonpoint source reductions for each transaction or a predetermined number of credits. Where appropriate, states and tribes may elect to establish a reserve pool of credits that would be available to compensate for unanticipated shortfalls in the quantity of credits that are actually generated.

The site-specific procedures and protocols used in water quality trading programs that involve agriculture and forestry operations should be developed by states and tribes in consultation with United States Department of Agriculture (USDA) agencies. Those procedures should estimate nutrient or sediment load delivery to the stream segment, water body or watershed where trading occurs. Numerous methods and procedures to determine nutrient and sediment load reductions associated with conservation practices on agricultural and forest land have been developed or used by the USDA agencies, including the Natural Resources Conservation Service, Forest Service, Agricultural Research Service and the Cooperative State, Research, Education and Extension Service. Some of these methods may be applied to water quality trading.

As an example, the Revised Universal Soil Loss Equation (RUSLE) may be used in some locations to estimate the sediment yield at the end of a slope in agricultural settings. The sediment yield at the end of a slope coupled with an appropriate method to estimate sediment delivery to the receiving waters can provide a reasonable estimate of sediment load and load reductions. Representative soil sampling to determine the phosphorus content of soils can be used with this approach to estimate non-soluble sediment-bound phosphorus loads and load reductions. Different methods are appropriate to estimate soluble phosphorus and nitrogen loads and load reductions.

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EPA and the USDA are working with other agencies to evaluate existing methods and to develop improved methods and procedures for estimating loads from agricultural and forestry lands. More precise estimations will be possible as technologies improve and new technologies are developed.

For storm water runoff other than agriculture, EPA recommends monitoring or modeling to estimate pollutant loads and load reductions. EPA believes this may be based on local hydrology and actual data or pollutant loading factors that relate land use patterns, percent imperviousness or percent disturbed land and controls or management practices in a watershed to per acre or per unit pollutant loads, where other methods are not specified in a permit or regulation.

5. **Compliance and Enforcement Provisions.** Mechanisms for determining and ensuring compliance are essential for all trades and trading programs. These may include a combination of record keeping, monitoring, reporting and inspections. Compliance audits should be conducted frequently enough to ensure that a high level of compliance is maintained across the program. States and tribes should establish clear enforceable mechanisms consistent with NPDES regulations that ensure legal accountability for the generation of credits that are traded. In the event of default by another source generating credits, an NPDES permittee using those credits is responsible for complying with the effluent limitations that would apply if the trade had not occurred. EPA also recommends that states and tribes consider providing periodic accounting and reconciliation periods and establishing appropriate enforcement provisions for failure to generate the quantity of credits that are traded.

EPA recommends that states and tribes consider the role of compliance history in determining source eligibility to participate in trading.

EPA recommends that states and tribes consider including provisions to address situations where nonpoint source controls and management practices that are implemented to generate credits fail due to extreme weather conditions or other circumstances that are beyond the control of the source.

6. **Public Participation And Access To Information.** EPA supports public participation at the earliest stages and throughout the development of water quality trading programs to strengthen program effectiveness and credibility.

Easy and timely public access to information is necessary for markets to function efficiently and for the public to monitor trading activity. EPA encourages states and tribes to make electronically available to the public information on the sources that trade, the quantity of credits generated and used on a watershed basis, market prices where available, and delineations of watershed and trading boundaries. This information is necessary to identify potential trading

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opportunities, allow easy aggregation of credits, reduce transaction costs and establish public credibility.

7. Program Evaluations. Periodic assessments of environmental and economic effectiveness should be conducted and program revisions made as needed. Environmental evaluations should include ambient monitoring to ensure impairments of designated uses (including existing uses) do not occur and to document water quality conditions. Studies should be performed to quantify nonpoint source load reductions, validate nonpoint source pollutant removal efficiencies and determine whether the anticipated water quality objectives have been achieved. Economic evaluations should include the number and type of trades, the price paid for pollutant reduction credits, transaction costs, the costs incurred to administer the program, and where possible any net cost savings resulting from trading.

The results of program evaluations should be made available to the public. An opportunity for comment should also be provided on changes to the program as necessary to ensure that water quality objectives and economic efficiencies are achieved, and that trading does not result in an impairment of designated uses (including existing uses).

H. EPA's Oversight Role. States and tribes are encouraged to consult with EPA throughout development of trading programs to facilitate alignment with the CWA. EPA has various oversight responsibilities under the CWA, including approval or establishment of TMDLs, approval of revisions to state or tribal water quality standards, review of NPDES permits and provisions for reviewing and making recommendations regarding revisions to a state's or tribe's water quality management plans through the continuing planning process. In general, EPA does not believe that the development and implementation by states and tribes of trading programs consistent with the provisions of this policy necessarily warrant a higher level of scrutiny under these oversight authorities than is appropriate for activities not involving trading. However, where questions or concerns arise, EPA will use its oversight authorities to ensure that trades and trading programs are fully consistent with the CWA and its implementing regulations.