A Summary of U.S. Effluent Trading and Offset Projects

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INTRODUCTION

This report briefly summarizes 37 effluent trading and offset activities that are occurring or have occurred around the country since the 1980s. We provide overview information on each activity addressing the nature of the activity, its stage of implementation, the environmental problem and pollutants addressed, the obstacles encountered, any noteworthy innovations, and, most importantly, a contact person or persons for learning more. The report does not provide an exhaustive description of each activity. Instead, we intend the report primarily as introductory source material for individuals who are considering or designing new water trading or offset projects. The report provides enough detail to point an interested reader to projects and contact persons that have likely already addressed many of the specific issues that a designer of a new project may be concerned about. The report is a starting point for tapping the experience of those involved in previous projects on a wide variety of design and implementation issues.

The trading activities that we report on vary in their structural design, geographic (or hydrogeographic) scope, and participants. In terms of structural design, trading can take the form of a "cap and trade" program for existing dischargers to meet limits; an offset program for new or expanding dischargers; or a program for industrial users of a sewerage system (a pretreatment trading program). The scope of the trading programs may involve an individual facility, a group of nearby facilities affecting the same water body, an entire watershed or basin (within or across state lines), or an entire state. Point sources and/or nonpoint sources may be involved. In addition, this report describes a few activities which fit none of these descriptions, including studies of potential trading programs and cooperative efforts at reducing pollution that do not closely resemble the "textbook" descriptions of trading. The common denominator for the activities described in this report is that they all provide flexibility in the allocation of pollution control responsibilities (while continuing to meet applicable technology-based requirements) so as to achieve water quality goals more cost-effectively. We do not include in this report several instances of trades across discharge points within a single source (e.g., within-plant trading allowed for iron and steel facilities), nor the trading-like activities encompassed in mitigating wetland losses (these typically do not involve effluent trading). Among the 37 trading and offset activities that we summarize:

- 11 are well along in being implemented, with trades under way or completed;
- 5 have had specific trading mechanisms approved and are very near implementation;
- 6 have completed the development and program approval process, but no specific trades have yet been identified;
- 12 activities are in various stages short of program approval, including study, discussion, planning and/or development;
- 1 activity is exclusively a study; and

- 2 are inactive or discontinued.

The 3-page table of contents beginning on the next page provides a tabular summary of the activities, including: the project name, the water body and location, the type of activity, and the stage it is in. The activities have been organized by State. A second version Following the table of contents is a second table that lists the projects alphabetically. Four appendices index the projects in other ways that may be useful to those interested in particular issues: by specific stage of implementation, by pollutant, by nature of the activity, and alphabetically by name of the contact person.

Following the table of contents, for each trading activity we summarize the:

- Nature of the Activity
- Environmental Problem
- Pollutant(s) or Pollution Type(s)
- Trade Type
- Stage of Implementation
- Relation to TMDL
- Number of Potential Participants
- Trading Ratios
- Estimated Cost Savings
- Available Written Information
- Innovative Aspects
- Obstacles
- Related Web Sites
- Contact Information

Further questions on each activity should be referred to the contact person listed. The web sites listed include a source that provides general information on the watershed in which the activity is located (from EPA's "Surf Your Local Watershed" compendium), as well as any web sites with information specifically on the effluent trading activity.

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[1]The appendix to this report lists the projects indexed in four other ways: by specific stage of implementation, by pollutant, by nature of activity, and alphabetically by name of contact person.

Project	Waterbody	State	Activity Description	Stage	Trades/ Offset Approved?	Savings Estimate Available?	Page
Michigan Water Quality Trading Rule Development	MI waters	MI	State-wide trading program	Nearing completion	N	Y	20
Minnesota River Nutrient Trading Study	Minnesota River	MN	Watershed trading study	Study completed	N/A	Y	21
Rahr Malting Permit	Minnesota River	MN	Offset for 1 discharger	Implementation	Y	N	22
Southern Minnesota Beet Sugar Cooperative Plant Permit	Minnesota River	MN	Offset for 1 discharger	Implementation	Y	N	23
Chesapeake Bay Nutrient Trading Program	Chesapeake Bay	multi	Large watershed trading program	Under development	N	N	24
Neuse River Nutrient Sensitive Water Management Strategy	Neuse River Estuary	NC	Watershed trading program	Program approved	N	Y	25
Tar-Pamlico Nutrient Reduction Trading Program	Pamlico River Estuary	NC	Watershed trading program	Implementation	Y	Y	26
Passaic Valley Sewerage Commission Effluent Trading Program	Hudson River	NJ	Pretreatment program	Implementation	Y	N	27
Truckee River Water Rights and Offset Program	Truckee River	NV	Offset for 1 discharger	Implementation	Y	N	28
New York City Watershed Phosphorus Offset Pilot Programs	Hudson River	NY	Offset pilot programs	Implementation	Y	N	29
Clermont County Project	Little Miami River, Harsha Reservoir	OH	Potential regional trading project	Under development	N	N	30
Delaware River Basin Trading Simulation	Delaware River	PA	Watershed pilot program	Early discussion	N	N	31
Henry County Public Service Authority and City of Martinsville Agreement	Smith River	VA	Single trade	Implementation	Y	N	32
Virginia Water Quality Improvement Act and Tributary Strategy	Chesapeake Bay, other VA waters	VA	State-wide trading program	Program approved	N	N	33
Wisconsin Effluent Trading Rule Development	WI waters	WI	State-wide trading program	Pilots active	N	N	34
Fox-Wolf Basin Watershed Pilot Trading Program	Green Bay	WI	Watershed pilot program	Program approved	N	Y	35
Red Cedar River Pilot Trading Program	Tainter Lake	WI	Watershed pilot program	Program approved	N	N	36
Rock River Basin Pilot Trading Program	Rock River Basin	WI	Watershed pilot program	Under development	N	N	37

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PROJECT DESCRIPTIONS

GRASSLAND AREA FARMERS TRADABLE LOADS PROGRAM (CA)

Nature of Activity: A group of irrigation and drainage districts within the San Luis & Delta-Mendota Water Authority formed a regional drainage entity and adopted a tradable loads rule in an effort to meet an aggregate discharge limit for selenium in an agricultural drain. The regional drainage entity established rules apportioning load targets among the districts. The rules created two incentive systems: a fee and rebate system and a trading system. Under the fee and rebate system, districts pay a fee or receive a rebate from the regional drainage entity if they discharge more or less than their allocation. The trading rules allow districts to trade load allocations for allocations at another time, for services, or for money. An example of a load-for-load trade would be where two parties arrange in one month for one to provide an offsetting decrease in load for the other party's increased load, and the arrangement is reversed in a subsequent month. An example of a load-for-services trade would be a commitment by the buyer of an allocation to provide equipment or labor to the selling district.

Environmental Problem: Selenium loads in the San Joaquin River and tributaries.

Pollutant(s) / Pollution Type(s): Selenium.

Trade Types: The trades are similar to point/point trades in that distinct entities with distinct discharges are involved. However, agricultural drainage is generally considered a nonpoint source. Moreover, the methods by which the districts reduce loads are expected to include various nonpoint source management techniques.

Stage of Implementation: The Grassland Basin Drainage Management Activity Agreement (July, 1995) created a regional drainage entity called the Grassland Area Farmers. The Agreement for Use of the San Luis Drain caps the total amount of selenium load the GAF may discharge, and was signed in November '95. The GAF adopted their first trading rule (for "water year" 1998) in June '98 and a second (for "water year" 1999) in January '99. Three trades have occurred thus far (one in water year '98 and two in water year '99) and others are underway or under consideration.

Relation to TMDL: A fifty-mile portion of the San Joaquin River does not meet water quality standards for selenium and is listed for eventual TMDL development. However there is no direct relation to the trading program.

Number of Potential Participants: Current rules allow for trading among the seven irrigation and drainage districts that participate in the Agreement. Additionally, various governmental agencies and farmers are directly or indirectly involved.

Trading Ratios: 1:1

Estimated Cost Savings: Unknown

Available Written Information: The Basin Plan and staff reports are available from the California EPA Central Valley Regional Water Quality Control Board. The trading rules are available, and a report analyzing the program's effectiveness is expected in 2000. A 1994 report from the Environmental Defense Fund, Plowing New Ground, discusses economic incentives for pollution control in the Grasslands.

Innovative Aspects: This is the only existing trading program involving a group of irrigation and drainage districts. The combination of the trading system with the collective fee and rebate system is unique. The trading rules allow districts to trade load allocations for load allocations, money or services.

Obstacles: Unknown

Web Sites: San Joaquin: http://www.epa.gov/surf2/ahr/111/
http://www.epa.gov/surf2/hucs/18040001/
http://www.swrcb.ca.gov/~rwqcb5/

Contacts: Joe Karkoski, U.S. EPA Region 9, (916) 654-3049, karkoski.joe@epamail.epa.gov/
Susan Austin, consultant, (415) 584-8921, susanaustin@email.msn.com

SAN FRANCISCO BAY MERCURY OFFSET PROGRAM (CA)

Nature of Activity: The San Francisco Bay Regional Water Quality Control Board of the California EPA is in the process of developing a regional mercury offset program. The program would allow new or expanding point sources in the Bay to offset their additional mercury loadings by paying for remediation efforts at abandoned mines.

Environmental Problem: Accumulating toxics in San Francisco Bay exceed standards in fish tissue and in the water.

Pollutant(s) / Pollution Type(s): Mercury.

Trade Types: Point/nonpoint.

Stage of Implementation: The program has been under development since 1996. A draft of the trading plan was released in June 1998 and first discussed by the full Board in December 1998. The plan proposes a pilot project that would last seven years. In June 1999 the RWQCB defined a set of specific trading issues which it is beginning to examine in more detail.

Relation to TMDL: The trading program is being planned in coordination with a TMDL for the Bay. Environmental groups have insisted that a TMDL for mercury be in place before any mass offset program is implemented.

Number of Potential Participants: There are twenty POTWs and thirteen major industrial dischargers in the Bay, all of which could potentially be involved in an offset program. There are potentially hundreds of mines that could be included as well.

Trading Ratios: 3:1 or greater (5:1 has been discussed as well). The different forms of bio-available mercury reaching the Bay significantly complicate the calculations needed for devising acceptable and appropriate ratios.

Estimated Cost Savings: Unknown

Available Written Information: The draft report and various memoranda are available from the RWQCB.

Innovative Aspects: The Federal abandoned mine clean-up effort in the Sierras is being linked to the offset program in the Bay. POTWs appear willing to make some effort to control mercury from mines even though POTWs contribute only 2 % of the loadings. The Board is considering implementing trades with ten-year durations (the length of two NPDES permits) so as to minimize the uncertainty faced by point sources and encourage their participation. The Board is seeking ways to involve the Air Quality Board, since atmospheric deposition is a major factor in the Bay's mercury loadings.

Obstacles: Point source dischargers are wary of buying into Superfund-like liability. It is difficult to model the loadings from the mines, so the offsets may not be measured in strictly quantitative terms. Additionally, the extremely complex hydrological features of the areas between the mines and the Bay make modeling the delivery pathways of mercury very difficult. Moreover, the Board is concerned that only the same bio-available form of mercury be traded. It is therefore anticipated that the permit language may be especially difficult to write. There are jurisdictional complications that arise due to the fact that the Bay and the mines are in different California EPA regions.

Web Sites: San Francisco Bay: http://www.epa.gov/surf2/hucs/18050004/
http://www.swrcb.ca.gov/~rwqcb2/

Contact: Khalil Abu-Saba, California Environmental Protection Agency / San Francisco Bay Regional Water Quality Control Board (510)622-2300, ABU@rb2.swrcb.ca.gov

BEAR CREEK TRADING PROGRAM (CO)

Nature of Activity: The State of Colorado enacted a control regulation to implement a TMDL in Bear Creek for phosphorus. The regulation provides for a basin-wide trading program as one method of achieving water quality standards. Further, a local authority for water quality planning and management was established by the Colorado Legislature under Section 208 of the U.S. Clean Water Act. To date, no work has been done drafting guidance or outlining processes for trading, primarily because trading has not yet been needed.

Environmental Problem: The reservoir was hypertrophic and is now eutrophic-mesotrophic.

Pollutant(s) / Pollution Type(s): Phosphorus.

Trade Types: Point/nonpoint.

Stage of Implementation: The control regulation was put in place in 1990, but no trades have occurred yet. Trades may not be needed for another 5 - 10 years because dischargers are expected to be able to meet their reduction obligations through traditional controls.

Relation to TMDL: The control regulation is part of a TMDL.

Number of Potential Participants: There are six POTWs and several industrial dischargers in the area.

Trading Ratios: Unknown

Estimated Cost Savings: N/A

Available Written Information: Annual reports are available from the Colorado Department of Public Health and Environment.

Innovative Aspects: Unknown

Obstacles: There has not been sufficient need to develop a guidance for trading. There is not yet much interest because point source dischargers are still achieving mandated reductions at low costs through traditional means. As growth occurs and/or targets are tightened, trading may become a more viable option.

Web Sites: Bear: http://www.epa.gov/surf2/hucs/11040005/

Contact: Dick Parachini, Colorado Department of Public Health and Environment, (303) 692-3500, dick.parachini@state.co.us

BOULDER CREEK TRADING PROGRAM (CO)

Nature of Activity: The City of Boulder is implementing a program in which the City pays for various nonpoint source improvements rather than capital upgrades at its POTW. The City found that a large capital improvement project at the POTW would be more costly and less effective than a combination of more modest capital improvements with streambank stabilization, riparian corridor improvements, rerouting irrigation return flow through wetlands, and other measures.

Environmental Problem: Degraded habitat, nonpoint source pollution, ammonia toxicity and high temperature combined to prevent Boulder Creek from attaining its designated beneficial use of Warm Water Aquatic Life.

Pollutant(s) / Pollution Type(s): Ammonia, temperature, pH.

Trade Types: Point/nonpoint.

Stage of Implementation: The City has been implementing the program since 1990.

Relation to TMDL: The basin is on the State's list of waters not meeting water quality standards and for which TMDLs must be developed (the 303(d) list) and a TMDL study will be performed over the next two to three years.

Number of Potential Participants: The City of Boulder and various nonpoint sources.

Trading Ratios: N/A

Estimated Cost Savings: Through 1996, the City had spent approximately $1.4 million and saved between $3 – 7 million, resulting in a estimated net savings of $ 1.6 – 5.6 million.

Available Written Information: Brief summaries are available from U.S. EPA and from U.S. EPA Region 9.

Innovative Aspects: The objective of improving the aquatic ecosystem is being achieved more cost-effectively through a combination of source controls, in-stream and riparian restoration efforts than could be achieved through more intensive source controls alone.

Obstacles: Unknown

Web Sites: St. Vrain: http://www.epa.gov/surf2/hucs/10190005/
http://www.epa.gov/OWOW/watershed/trading/bould.htm

Contact: Greg Parsons, Colorado Department of Public Health and Environment, (303) 692-3500, greg.parsons@state.co.us

CHATFIELD RESERVOIR STUDY AND TRADING PROGRAM (CO)

Nature of Activity: Phosphorus standards were established for the Chatfield Reservoir in order to protect the quality and recreational value of the water. A State control regulation (Colorado's instrument to implement a TMDL) was established in 1993 that allows trading, although none has yet occurred. A 1996 study of phosphorus control options in the basin revealed that trading would only be cost-effective after POTWs institute fairly high levels of in-plant treatment. Significant population growth in the basin has created pressure for expansion of treatment facilities. Achievement of phosphorus limits in the face of this growth will likely require further controls, providing an impetus for a possible trading program. The dischargers in the area have signed a memorandum of understanding and have formed an association under Section 208 of the Clean Water Act to protect water quality in the reservoir. For trading to be instituted, specific guidelines must be added to the control regulation specifying the details of the program.

Environmental Problem: Eutrophication.

Pollutant(s) / Pollution Type(s): Phosphorus.

Trade Types: Point/nonpoint trading was examined in the study and authorized by the control regulation.

Stage of Implementation: The control regulation was first enacted in the early 1980s. The regulation was updated and included a clause allowing trading, but without much guidance regarding the specifics of the program. Revisions to the regulation that provide for the development of trading guidelines were approved in July '99.

Relation to TMDL: A TMDL has been in place since the 1980's and is updated every three years. The control regulation is the instrument to implement the TMDL.

Number of Potential Participants: There are six POTWs, one industrial discharger and various nonpoint sources in the basin.

Trading Ratios: N/A

Estimated Cost Savings: N/A

Available Written Information: A brief report is available from EPA Region 9. The results of the study were published in the proceedings of Watershed '96.

Innovative Aspects: Unknown

Obstacles: The study concluded that nonpoint source improvements and point/nonpoint trading are not necessarily the most cost-effective means to reduce pollution. In the Chatfield Basin, the study determined that a high level of point source control is necessary before nonpoint source controls are justified.

Web Sites: Upper South Platte: http://www.epa.gov/surf2/hucs/10190002/

Contact: Dick Parachini, Colorado Department of Public Health and Environment, (303) 692-3500, dick.parachini@state.co.us

CHERRY CREEK BASIN TRADING PROGRAM (CO)

Nature of Activity: A basin-wide trading program was implemented for the Cherry Creek Reservoir Basin as part of the State's control regulation (Colorado's mechanism for implementing a TMDL) in 1997. The program allows trading within the framework of a TMDL. The trading program is administered by the Cherry Creek Basin Water Quality Authority. The Authority was created by the Colorado legislature and operates under State law to undertake various water quality projects and charges fees and assessments to support the programs. Trading may occur if a source implements measures to reduce its phosphorus load below the reduced levels mandated by the TMDL. After the efficacy and the efficiency of a proposed excess reduction has been reviewed, the Authority can approve the excess reduction as a credit that may be sold. The credit may then be purchased as an offset by a discharger seeking to increase its load. The program allows both Basin Authority trades (in which the credits are bought through the Authority) and private project trades (in which the user and generator of the credits interact directly). Credits from Basin Projects are put in a reserve pool of credits. Three trades have occurred since the program's inception. One trade involved a phosphorus credit purchase by a mid-size POTW from another POTW. Purchases of 20 lbs. of phosphorus by a small POTW from the Authority's reserve pool of credits account for the other two trades.

Environmental Problem: Eutrophication of the Reservoir.

Pollutant(s) / Pollution Type(s): Phosphorus.

Trade Types: Point/point and point/nonpoint.

Stage of Implementation: Offsets had been allowed in principle via the control regulation since 1985, however the final trading guidance was approved in 1997. Three trades have occurred since the program's inception.

Relation to TMDL: The trading is part of the TMDL. The control regulation was revised in 1998 to implement trading.

Number of Potential Participants: There are twelve wastewater treatment plants and various nonpoint sources in the area.

Trading Ratios: Credits are traded with ratios ranging from 1.3:1 to 3:1, depending on the uncertainty of the effectiveness of the control measure.

Estimated Cost Savings: Unknown

Available Written Information: A brief report is available from U.S. EPA. A full report is forthcoming from the Water Environment Research Foundation.

Innovative Aspects: The program allows both Basin Authority trades (in which the credits are bought through the Authority) and private project trades (in which the user and generator of the credits interact directly). Credits from Basin Projects are put in a reserve pool of credits. The authority has taxing power established in State law.

Obstacles: Unknown

Web Sites: Middle South Platte - Cherry Creek: http://www.epa.gov/surf2/hucs/10190003/
http://www.epa.gov/OWOW/watershed/trading/cherry.htm

Contact: Dick Parachini, Colorado Department of Public Health and Environment, (303) 692-3500, dick.parachini@state.co.us

CLEAR CREEK TRADING PROGRAM (CO)

Nature of Activity: Clear Creek had been discussed extensively as a possible site for a trading program to help clean up "orphaned" mine sites. The many abandoned mines in the area caused significant levels of metals in the waters via runoff and drainage. It had been proposed that dischargers might "adopt" the mines and control their discharge in exchange for discharge credits. Multi-media trades had also been discussed. Possible violations of the Clean Water Act, as well as the daunting task of creating the program kept the idea from moving beyond its conceptual stages.

Environmental Problem: Abandoned mine runoff and drainage.

Pollutant(s) / Pollution Type(s): Heavy metals.

Trade Types: Mine clean up could be described as point/nonpoint. Multimedia trades (involving air permits) had also been discussed.

Stage of Implementation: Discontinued.

Relation to TMDL: N/A

Number of Potential Participants: Unknown

Trading Ratios: N/A

Estimated Cost Savings: N/A

Available Written Information: None

Innovative Aspects: The discussions included considerations of cross-media trading and cross-parameter trading.

Obstacles: The multi-media trading and cross-parameter trading were very complicated issues. The lack of clear authority in the Clean Water Act ultimately halted discussion.

Web Sites: Upper South Platte: http://www.epa.gov/surf2/hucs/10190002/
Clear: http://www.epa.gov/surf2/hucs/10190004/
Colorado Headwaters: http://www.epa.gov/surf2/hucs/14010001/
Blue: http://www.epa.gov/surf2/hucs/14010002/

Contact: Carl Norbeck, Colorado Department of Public Health and Environment, (303) 692-3500, carl.norbeck@state.co.us

LAKE DILLON (DILLON RESERVOIR) TRADING PROGRAM (CO)

Nature of Activity: The Nation's first point/nonpoint effluent trading program was implemented for the Dillon Reservoir. The reservoir serves as a source of drinking water for the Denver area and is also a recreational spot. The local communities believed that a growing population would threaten water quality in the Reservoir. A group of governmental and private stakeholders developed a phosphorus control program that included ambient water quality standards for phosphorus, phosphorus effluent load allocations for sources, and a provision for instituting trading program. Two trades have occurred and more than ten nonpoint source projects have generated credits that have been banked but not yet used or sold. The two completed trades involved terminating household use of septic systems and connecting them to sewers for treatment at POTWs. The banked credits have involved projects to collect, detain and filter surface and subsurface storm water, thereby reducing sediment and associated nutrient loads. The Frisco sanitation district POTW has been accumulating credits and is seeking a way to apply the credits to allow increased discharge by the Carver Mountain district POTW, but there is currently no provision for point/point trading. The program may grow more active if population growth or other water quality stressors increase.

Environmental Problem: General water quality and eutrophication.

Pollutant(s) / Pollution Type(s): Total phosphorus

Trade Types: Point sources may obtain offsets by controlling loads from nonpoint sources that existed prior to 1984.

Stage of Implementation: The State of Colorado established the phosphorus control regulation for the area in 1984. Trading has been allowed since 1984. The most recent trade was in 1996; the first trade was in the early 1990's.

Relation to TMDL: The water quality standard, point source allocations and trading provisions established for the program were the basis for a TMDL submitted in 1997.

Number of Potential Participants: There are four major POTWs, several minor WWTPs and various nonpoint sources in the area.

Trading Ratios: Point sources can trade with nonpoint sources at a ratio of 2:1.

Estimated Cost Savings: Unknown

Available Written Information: Brief reports are available from U.S. EPA Region 8 and from the Great Lakes Trading Network. The Summit Water Quality Committee has various reports and data available.

Innovative Aspects: The Dillon Reservoir program is the Nation's first point/nonpoint effluent trading program. The Summit Water Quality Committee has strict standards regarding what activities are eligible for trading.

Obstacles: Improved POTW operations have reduced phosphorus discharges significantly, resulting in minimal incentive to trade. Moreover, the Summit Water Quality Committee has been fairly strict in defining the reductions or operating improvements that may be eligible for trading. Participants are very reluctant to allow trading unless they believe that the improvement is truly "additional", i.e., it would not have occurred anyway, in the absence of the trading program.

Web Sites: Blue River: http://www.epa.gov/surf2/hucs/14010002/
http://www.epa.gov/OWOW/watershed/trading/lakedil.htm

Contacts: Bill McKee, Colorado Department of Public Health and Environment, (303) 692-3500, bill.mckee@state.co.us
Lane Wyatt, Summit Water Quality Committee, (970) 468-0295, qqlane@Coocolorado.net

LONG ISLAND SOUND TRADING PROGRAM (CT)

Nature of Activity: The State of Connecticut is developing a watershed-based effluent trading program for the Long Island Sound that will be implemented in conjunction with a TMDL. The program's primary structure will be a trading association and a credit bank to buy and sell reductions.

Environmental Problem: Hypoxia in the Long Island Sound.

Pollutant(s) / Pollution Type(s): Nitrogen.

Trade Types: Point/point and potentially also point/nonpoint.

Stage of Implementation: A TMDL and the trading program have been in development since 1996-1997. The trading program will be formally established upon completion of the TMDL. The trades will ultimately reduce the costs of meeting a 15-year goal for reducing nitrogen.

Relation to TMDL: The trading program is being developed in conjunction with a TMDL for the entire Long Island Sound and is considered a fundamental part of TMDL implementation.

Number of Potential Participants: 84 point source dischargers (mostly POTWs) in the Connecticut portion of the Sound, and potentially more in New York, as well as various nonpoint sources.

Trading Ratios: Trading ratios will vary, based on the differential impact that a pound of nitrogen abated by different projects will have on the Sound's water quality. The differential impact will be determined by modeling.

Estimated Cost Savings: The State of Connecticut estimated that reaching the 15 year nitrogen reduction goal without trading would cost $960 million, while costs with trading would decline to $760 million. Thus trading is expected to save nearly $200 million over 15 years.

Available Written Information: A full report is forthcoming from the Water Environment Research Foundation. An earlier study is described in the proceedings of the Watersheds '96 conference.

Innovative Aspects: The Clean Water Fund -- a credit bank managed by the trading association -- will buy credits from those who create them and sell them to those needing them. The program may mandate that sources not in compliance must buy credits from the Fund. Sources that generate credits will sell them to the Fund, which will make the credits available for purchase in following periods.

Obstacles: The trading association must find ways to encourage trading. Writing enforceable and sound permits will be a challenge. Whether trading will be allowed only for the ultimate 15-year nitrogen reduction target, or for annual targets as well, is a major factor in the success of the project.

Web Sites: Saugatuck: http://www.epa.gov/surf2/hucs/01100006/
Bronx: http://www.epa.gov/surf2/hucs/02030102/
Northern Long Island: http://www.epa.gov/surf2/hucs/02030201/
http://dep.state.ct.us/wtr/lis/ntrrmv.htm

Contact: Mark Tedesco, EPA Long Island Sound Office. (203) 977-1541, tedesco.mark@epamail.epa.gov

BLUE PLAINS WWTP CREDIT CREATION (DC)

Nature of Activity: The Blue Plains Waste Water Treatment Plant (a POTW in Washington, DC) and the State of Virginia have agreed in principle to an interstate purchase of effluent reductions in order to help Virginia meet its Chesapeake Bay goals for the year 2000. A few POTWs in Virginia are slightly behind schedule in upgrading facilities to meet the Chesapeake Bay goals. Blue Plains currently employs biological nutrient reduction (BNR) on approximately half of its flow. Virginia will pay Blue Plains to implement BNR for the remainder of its flow so as to achieve more nutrient reduction than is required of Blue Plains. Virginia will pay the cost associated with the additional BNR. Since Blue Plains already has some BNR in place, it is easier for the DC plant to expand BNR than for the Virginia plants to install BNR de novo. The duration of the purchase would be until the Virginia POTWs upgrade their own systems.

Environmental Problem: Eutrophication of the Potomac River and the Chesapeake Bay.

Pollutant(s) / Pollution Type(s): Nitrogen

Trade Types: Point/point.

Stage of Implementation: As of late 1999, the agreement is near finalization. The costs of the additional nitrogen reduction are being evaluated by a consulting firm. Virginia has set aside money for the purchase of the credits that may be used beginning January 1, 2000. Virginia's POTWs are expected to be upgraded by 2003.

Relation to TMDL: There is no direct relation to the Chesapeake Bay TMDL

Number of Potential Participants: The State of Virginia, several POTWs, the District of Columbia, and the Blue Plains WWTP.

Trading Ratios: 1:1

Estimated Cost Savings: Virginia has set aside $3.35 million through the Water Quality Improvement Fund for purchasing reductions at Blue Plains. It has been estimated that every mg/L reduction in nitrogen concentration from the Blue Plains flow reduces approximately one million lbs. of nitrogen loadings to the Potomac. If payment of $3.35 million over two years achieves six million lbs. of reduction (going from 7.5 mg/L to 4.5 mg/L for two years), the resulting cost would be $0.58/lb. reduced, a very inexpensive reduction. The Virginia POTWs would not have been able to achieve the reductions themselves by 2000.

Available Written Information: The Annual Report of the Water Quality Improvement Fund (1/99), Annual Report of Nutrient Reduction Strategies for Virginia's Tributaries to the Chesapeake Bay (11/98), and a forthcoming report by a consulting firm (DMG Maximus) on the costs of additional nitrogen removal.

Innovative Aspects: The trade would be an interstate trade.

Obstacles: The trade must be approved by the U.S. EPA. With Virginia paying for additional reductions, Blue Plains will meet a 4.5 mg/L standard. Once VA no longer needs the credits, DC will meet a 7.5 mg/L standard, thus Blue Plains is concerned about potential violation of anti-backsliding requirements.

Web Sites: Washington, DC: http://www.epa.gov/surf2/states/DC/

Contacts: Walter Bailey, DC Water and Sewer Authority (202) 645-6299.
John Kennedy, Virginia DEQ . (804) 698-4312, jmkennedy@deq.va.state.us

TAMPA BAY COOPERATIVE NITROGEN MANAGEMENT (FL)

Nature of Activity: Stakeholders in the Tampa Bay region have formed a cooperative consortium for nitrogen management. The consortium is composed of federal, state and local governments, regulatory agencies and several private interests. The participants commit to meeting nitrogen reduction goals set in an action plan that the consortium created for each of the Bay's five segments. Individual participants' performance is monitored, but the consortium's performance is measured collectively. In many regards, the consortium's efforts are similar to those of a trading program: participants work cooperatively to meet a shared goal of pollution reduction; loading caps were developed and adopted based on studies and negotiations; and the actions are an alternative to traditional regulation. Unlike traditional trading programs, however, no "exchanges" or trades actually take place, no monetary or in-kind payments are made, and neither credits nor debits are made on individual accounts.

Environmental Problem: Eutrophication and reduction of submerged aquatic vegetation (sea grasses) in the Bay.

Pollutant(s) / Pollution Type(s): Nitrogen, several other pollutants.

Trade Types: There is no explicit trading. Allocations and control measures address both point and nonpoint sources.

Stage of Implementation: The Tampa Bay National Estuary Program (TBNEP or TBEP) was established in 1991. The nitrogen management plan was approved in 1997; partners of TBEP pledged commitment to the plan in 1998. Controls are now being implemented consistent with the plan.

Relation to TMDL: A TMDL was developed by the Florida Department of Environmental Protection based on the loading caps developed under the management plan, but has not yet been implemented. Prior to making a determination that the TMDL be implemented, the FDEP is required to determine if other programs, such as TBEP activities, are sufficient to achieve water quality standards. If other programs are sufficient, full TMDL implementation is not required.

Number of Potential Participants: There are 24 consortium members, including 9 private-sector partners, three counties, three cities and three regulatory agencies.

Trading Ratios: N/A

Estimated Cost Savings: The consortium's actions may help participants avoid TMDL costs and legal and administrative costs associated with a formal trading program.

Available Written Information: Tampa Bay Estuary Program management plan, TBEP web site, full reports available from TBEP. Apogee/Hagler Bailly paper on the TBEP.

Innovative Aspects: The consortium reached consensus on a set of measures that would be effective in meeting goals. All participation is voluntary and is regarded as a potential way to avoid command and control regulation.

Obstacles: The participants felt that goals could be achieved without having to deal with the legal and administrative obstacles of a formal trading program, thus there are no trades per se.

Web Sites: Tampa Bay: http://www.epa.gov/surf2/hucs/03100206/
http://www.tbep.org

Contact: Richard Eckenrod, Tampa Bay Estuary Program, (727) 893-2765, reckenrod@tbep.org

CARGILL AND AJINOMOTO PLANTS PERMIT FLEXIBILITY (IA)

Nature of Activity: The State of Iowa arranged for two neighboring industrial plants discharging into the Des Moines River to meet effluent limits jointly. The Cargill facility's permit had allowed Cargill (a wet corn milling plant with a waste water treatment facility) to discharge up to the stream's maximum capacity for CBOD. A new Ajinomoto food preparations facility required a CBOD discharge in order to operate, but the stream had no capacity to accept new discharge. The Ajinomoto plant is situated very near the Cargill plant. The Cargill plant agreed to accept and treat Ajinomoto's effluent stream, partly because the qualities of the Ajinomoto waste stream helped Cargill with its nutrient control. The Cargill plant was able to accept the Ajinomoto effluent stream and not exceed their water quality-based effluent limit. The plants also have other business together – Ajinomoto buys steam and power from Cargill.

Environmental Problem: General water quality in Des Moines river.

Pollutant(s) / Pollution Type(s): Ammonia, CBOD.

Trade Types: Point/point.

Stage of Implementation: The permits were issued in the early 1990s.

Relation to TMDL: None.

Number of Potential Participants: 2

Trading Ratios: 1:1

Estimated Cost Savings: While savings have not been reported, the Ajinomoto plant could not have operated without some discharge. Additionally, the qualities of Ajinomoto's effluent facilitate nutrient control in Cargill's plant.

Available Written Information: The permit is available.

Innovative Aspects: The arrangement regarding wastewater treatment is one of a number of several business relationships between the facilities.

Obstacles: Unknown

Web Sites: Lower Des Moines: http://www.epa.gov/surf3/hucs/07100009/

Contact: Ralph Turkle, Iowa Environmental Protection Agency. (515) 281-7025

LOWER BOISE RIVER EFFLUENT TRADING DEMONSTRATION PROJECT (ID)

Nature of Activity: The Idaho Department of Environmental Quality and the U.S. EPA are developing a watershed-wide trading program for the lower Boise River. Several important program design issues remain to be resolved.

Environmental Problem: Conditions for nuisance aquatic growth in the Boise River, and actual nuisance aquatic growth in the Snake River's Brownlee Reservoir, to which the Boise is the largest source of phosphorus loadings.

Pollutant(s) / Pollution Type(s): Phosphorus.

Trade Types: Point/point and point/nonpoint.

Stage of Implementation: The project started in November 1997. A project design was presented to EPA for review in December,1999. The project developers expect to have a finalized framework by March, 2000. The project developers also expect that the not-for-profit organization that will administer the trading program will be incorporated and funded by the end of summer 2000. Some demonstration trades may take place before the TMDL is implemented. The goal is to implement trading within the TMDL for the Lower Boise – which was rescheduled for completion by the end of 2001 – so as to coincide with the Brownlee TMDL.

Relation to TMDL: The project is coordinating development of trading within the framework of a TMDL. Oregon also has a TMDL for the Brownlee Reservoir, due by 2005.

Number of Potential Participants: Seven POTWs, three industrial dischargers, and eight irrigation districts.

Trading Ratios: The program is considering three kinds of ratios or discounts: "delivery" ratios, "location" ratios and "uncertainty"discounts. All three are intended to relate the upstream (or up-drain) reduction to the actual downstream (or drain outfall) effect. Delivery ratios would be employed for reductions from agricultural sources discharging into a drain to reflect the fate and transport of phosphorus through the drain to the outfall to the river. Location ratios would be employed for NPDES permit holders and tributaries/drains, in order to relate the reduction at the point of discharge to the actual effect at Parma (the mouth of the Boise River). An uncertainty discount would be applied to credits generated by a nonpoint source practice for which monitoring or actual measurements are impractical or infeasible, to account for variability in the effectiveness of the practice.

Estimated Cost Savings: Municipalities were asked to consider what their 20-year plan would be in the face of a mandated 20%, 40% or 80% phosphorus reduction, given a low population growth scenario and a high population growth scenario. The municipalities responded that the cost range for an 80% reduction would be $12 -$178/lb. of phosphorus. For nonpoint sources, the stakeholders determined that the costs of phosphorus BMPs would be in the range of $2 - $20/lb. of phosphorus. The implied expected cost savings are therefore $10 - $158/lb. of phosphorus reduced.

Available Written Information: A brief description of the project is available on EPA Region 10's web site.

Innovative Aspects: Three types of trading ratios are being discussed. The program might form a not-for-profit association to record the trades rather than the State or EPA. The system is being designed with adequate safeguards to support frequent, "on demand" trades without requiring case-by-case agency review.

Obstacles: Project development has been expensive and resource-intensive. Water rights are an issue for the irrigation districts and the farmers. Nonpoint sources are wary that their participation in generating credits by reducing loads may encourage their being subjected to regulations requiring load reductions. Whether trading can occur against interim targets within a phased TMDL is a legal issue under investigation.

Web Sites: Lower Boise: http://www.epa.gov/surf2/hucs/17050114/
http://www.epa.gov/r10earth/innovation.htm
http://www2.state.id.us/deq/water/water.htm

Contacts: Claire Schary, EPA Region 10. (206) 553-8514, schary.claire@epamail.epa.gov
Larry Peterson, Idaho DEQ. (208) 373-0252, or lpeterso@deq.state.id.us

ILLINOIS PRETREATMENT TRADING PROGRAM

Nature of Activity: The Illinois State legislature passed a law requiring the IL Environmental Protection Agency to develop a program for pretreatment trading at wastewater treatment facilities throughout the State. The IEPA developed various proposals for a pretreatment trading program, including allowing indirect dischargers to trade among themselves in order to meet technology-based limits. This provision was at odds with U.S. EPA's interpretation of the Clean Water Act, and thus the development of the program has slowed.

Environmental Problem: The program could potentially address various water quality problems.

Pollutant(s) / Pollution Type(s): Multiple.

Trade Types: Pretreatment trades.

Stage of Implementation: The Illinois Environmental Protection Agency first proposed a pretreatment rule in 1996. The Illinois legislature passed a law in August of 1998 requiring IL EPA to develop a pretreatment trading program. U.S. EPA and IL EPA held a number of discussions on the topic while the rules were being developed.

Relation to TMDL: A pretreatment program could theoretically help POTWs meet their load allocations under a TMDL.

Number of Potential Participants: 45 POTWs with delegated pretreatment programs and hundreds of significant industrial users.

Trading Ratios: Unknown

Estimated Cost Savings: N/A

Available Written Information: 1995 and 1996 discussion papers and studies by the IEPA.

Innovative Aspects: Trading was proposed as a tool to meet categorical standards. Cross-parameter trading using U.S. EPA's toxic equivalencies was proposed.

Obstacles: The design of the program conflicted with U.S. EPA's interpretation of the Clean Water Act.

Web Sites: Illinois: http://www.epa.gov/surf2/states/IL/

Contact: Jim Park, Illinois Environmental Protection Agency. (217) 782-1654, epa1158@epa.state.il.us

SPECIALTY MINERALS, INC. PLANT IN TOWN OF ADAMS (MA)

Nature of Activity: Specialty Minerals, Inc. is seeking to increase its high temperature discharge to the Hoosic River. One possible plan is for the company to help finance in-stream temperature reduction measures upstream in an Army Corps of Engineers flood control project. The company would pay the Town of Adams to support the Town's local match requirements for the project.

Environmental Problem: The Hoosic River is designated a (Class B) warm water fishery, yet the presence of spawning wild trout (cold water fish) has been documented. An NPDES permit for Specialty Minerals that authorizes a flow increase for non-contact cooling water must adequately protect both designated *and* existing uses in the river.

Pollutant(s) / Pollution Type(s): Temperature.

Trade Types: Point/nonpoint

Stage of Implementation: An NPDES permit was published for public notice on September 30, 1999.

Relation to TMDL: Portions of the Hoosic have been placed on the State's list of waters not meeting water quality standards and for which TMDLs must be developed (the 303(d) list) for pathogens, siltation, suspended solids and priority organics. However, the offset involves temperature, which need not be addressed by the TMDL effort. TMDLs must address non-attainment of designated uses, but the river's quality with regard to temperature is sufficient to meet designated uses.

Number of Potential Participants: Specialty Minerals, the Town of Adams, environmental groups, the Army Corps of Engineers, the US EPA and the Massachusetts EPA.

Trading Ratios: 2:1. The trade design assumes that the flood control project would achieve a reduction in temperature in the receiving water twice as large as the reduction that would be achieved by the chillers.

Estimated Cost Savings: The company would avoid an estimated capital cost of $300,000 for installing effluent chillers at its plant. This maximum potential savings will be reduced by the amount the company will eventually pay the Town.

Available Written Information: The draft NPDES permit is available.

Innovative Aspects: The project is possibly the first offset or trade involving the Army Corps of Engineers. The company would contribute to the Town's local matching share of costs to modify the upstream Corps project so as to reduce ambient water temperatures. Since the Town is not wealthy and since the plant is one of the major employers, the project will contribute to local economic vitality. Specialty Minerals must submit a contingency plan for reducing temperature if the flood control project cannot be implemented. The flood restoration effort is part of a memorandum of understanding among numerous parties to formalize a Hoosic River Watershed Ecosystem Partnership to preserve the river.

Obstacles: There are multiple responsible parties implementing various actions, which makes coordination difficult.

Web Sites: Hudson/Hoosic: http://www.epa.gov/surf2/hucs/02020003/

Contact: Jane Downing, EPA Region 1 (617)918-1571, downing.jane@epa.gov

TOWN OF ACTON MUNICIPAL TREATMENT PLANT (MA)

Nature of Activity: The Town of Acton needs sewers and a wastewater treatment plant to replace failing septic systems in portions of the town, however, new discharges into the Assabet River are prohibited because of high phosphorus levels. A plan has been proposed that would allow a new point source to discharge into the river if the municipality were to obtain offsets via nonpoint source reductions.

Environmental Problem: Eutrophication in the Assabet River.

Pollutant(s) / Pollution Type(s): Phosphorus.

Trade Types: Point/nonpoint. The Town is evaluating a broad range of possible offset sources, including road sanding, landscaping and more traditional BMPs. Notably, the reduction in septic system loads that will result if households are connected to a new POTW will not be counted as offsets, as the regulatory authorities have determined that offsets must derive from entirely unrelated sources.

Stage of Implementation: The town currently has no POTW and proposals to build one have surfaced regularly for decades. The current modeling and monitoring efforts have been ongoing since 1998. The Town hopes to have an EPA-approved plan by late 2000.

Relation to TMDL: Portions of the Assabet River, including the segment from Acton to the confluence downstream with the Sudbury and Concord Rivers, do not attain water quality standards for nutrients, organic enrichment / DO, and pathogens. A TMDL is under development.

Number of Potential Participants: The Town of Acton, US EPA, Massachusetts EPA and multiple nonpoint sources.

Trading Ratios: A preliminary target of 3:1 has been proposed.

Estimated Cost Savings: Because it will offset all of its phosphorus discharge, the planned POTW may be authorized to achieve a phosphorus effluent limit of 0.2 mg/ L as opposed to 0.1 mg/ L, which will result in significant O&M savings. The offset activities are expected to cost the town $100,000 - $200,000 annually. The POTW is expected to obviate the need for approximately 150 septic tank reconstructions annually, at an estimated cost of $15,000 per home, thus residents can be expected to save $2.25 million annually. Capital and operating costs for the $7 million POTW will be financed entirely by user fees.

Available Written Information: Various studies have been published and more are underway. Several studies and reports are available from the Acton Public Health Department.

Innovative Aspects: The Town is using a very detailed GIS to pinpoint the sources of phosphorus loadings within the watershed that have the greatest impact on water quality. Additionally, the Organization for the Assabet recruited 150 volunteers to take part in a survey of 25 miles of the river's shoreline conditions. The volunteers identified areas where BMPs could be implemented. Title V of the Massachusetts' Environmental Code has stringent requirements regarding sale of homes with faulty septic systems. Sewerage is thus likely to increase the value of many homes.

Obstacles: The project has had difficulty in identifying sufficient nonpoint sources to offset the entire planned discharge from the new POTW. EPA insists that the offsets must be additional, i.e., that they would not have happened anyway in the absence of the trading program. Establishing what constitutes "additionality" has been a point of some debate. It is unclear whether and to what extent the reduced phosphorus loads when failing septic systems are replaced by sewers and a POTW will count toward the offsets.

Web Sites: Concord: http://www.epa.gov/surf2/hucs/01070005/
http://www.ultranet.com/~oar/

Contacts: Jane Downing, EPA Region 1. (617)918-1571, downing.jane@epa.gov
Doug Halley, Acton Public Health Department, (978) 264-9634, dhalley@net1plus.com

WAYLAND BUSINESS CENTER TREATMENT PLANT PERMIT (MA)

Nature of Activity: The Wayland Business Center, an office building complex under new ownership, sought to discharge effluents from its waste water treatment plant into the Sudbury River. The facility had been owned by the Raytheon Corporation, and the new owners originally sought to renew (or roll over) the existing permit. The Massachusetts Department of Environmental Protection and the U.S. EPA ruled that the Raytheon permit could not be rolled over to the new owners of the Wayland Business Center, and hence the facility's discharge was to be construed as a new discharge. As a condition for allowing the discharge, the NPDES permit specified that the facility needed to obtain an offset for its discharge. The facility will obtain offsets by linking faulty septic systems on 24 neighboring properties to the facility's WWTP.

Environmental Problem: General water quality and eutrophication of Sudbury River.

Pollutant(s) / Pollution Type(s): Phosphorus.

Trade Types: Point/nonpoint.

Stage of Implementation: The process began in early 1998; the permit was issued in September 1998. The municipality is currently finalizing plans for the sewer hook-ups and will implement them. The business center will pay for the hook-ups.

Relation to TMDL: Parts of the Sudbury River are on the State's list of waters not meeting water quality standards and for which TMDLs must be developed (the 303(d) list) for metals, and parts of neighboring rivers are 303(d) listed for nutrients. The offset does not have a direct relation to a TMDL, but the actions will result in an 80% decrease in phosphorus loadings to the Sudbury.

Number of Potential Participants: The Wayland Business Center, the Town of Wayland and 24 property owners with septic tanks.

Trading Ratios: The facility is permitted to discharge 0.125 pounds per day of phosphorus, and must reduce loadings via septic tank connections by at least 0.375 ppd, thus the trading ratio is 3:1.

Estimated Cost Savings: The facility will save approximately $700,000. The municipality will avoid potential significant future capital investments that would be necessary if the town's sewer system were to be extended from the municipal POTW to the 24 properties.

Available Written Information: The NPDES permit, including the trading clauses, is available.

Innovative Aspects: A clause in the NPDES permit specifying the offset provision and the septic tank sewerage is believed to be the first of its kind. The municipality will eventually assume responsibility for the business center's WWTP, effectively making it a POTW. A contingency plan is specified if the sewer connection option cannot be implemented, including the possibility of harvesting excess algal growth in the river.

Obstacles: The corporate owners of the Wayland Business Center did not have legal authority to perform sewerage work so the municipality had to play an unanticipated implementation role.

Web Sites: Concord: http://www.epa.gov/surf2/hucs/01070005/
http://www.sudburyvalleytrustees.org/

Contact: Jane Downing, EPA Region 1. (617)918-1571, downing.jane@epa.gov

MARYLAND NUTRIENT TRADING POLICY

Nature of Activity: The State of Maryland is developing a State-wide trading rule. It is anticipated that trading will provide a cost-effective way for the State to improve water quality generally, as well as meet its commitments under the Chesapeake Bay Agreement.

Environmental Problem: Eutrophication in the State's waters.

Pollutant(s) / Pollution Type(s): Nitrogen and Phosphorus.

Trade Types: Point/point, point/nonpoint.

Stage of Implementation: The Chesapeake Bay Agreement was signed in 1987 and the Tributary Strategy Agreement was signed in 1992. The State of Maryland drafted a concept paper on trading in August, 1997. A new effort on the policy and the paper was started in late 1998 and is expected to be completed by early 2000.

Relation to TMDL: There are many waterbodies within the Chesapeake Bay watershed that have been placed on the States' lists of waters not meeting water quality standards and for which TMDLs must be developed.

Number of Potential Participants: Many, unknown

Trading Ratios: The 1997 draft paper proposed a 2:1 ratio for point/non-point trades.

Estimated Cost Savings: Unknown

Available Written Information: The draft concept paper is available, as well as a paper from the proceedings of the Watersheds '98 conference. A full report is forthcoming from Water Environment Research Foundation.

Innovative Aspects: The draft proposes to allow buyers and sellers of offsets to interact directly with each other or to buy and sell offsets via a central fund. Entities seeking to buy offsets would be able to negotiate with and purchase them directly from the generators of the offsets, or the buyers would be able to buy the credits from a central fund administered by the State. The central fund would buy offsets from offset generators, bank the offsets, and make them available for sale.

Obstacles: One of the expected difficulties is coordination with the Chesapeake Bay Program on trading and with other States that are party to the Bay Agreement.

Web Sites: Maryland: http://www.epa.gov/surf2/states/MD/

Contact: Virginia Kearney, Maryland Department of the Environment. (410) 631-3574, vkearney@mde.state.md.us

KALAMAZOO RIVER WATER QUALITY TRADING DEMONSTRATION PROJECT (MI)

Nature of Activity: The Michigan Department of Environmental Quality is implementing a pilot, watershed -based trading program for the Kalamazoo River. The program aims to improve water quality in the area in a cost-effective manner, as well as to inform development of a statewide Michigan water quality trading rule. A fund administered by the project's steering committee has been used to support installation of nonpoint source control measures by some farmers in the watershed. These and additional measures to be implemented generate credits that are available for purchase by point sources or others that may need them to comply with water quality-based effluent limitations. None of the credits generated thus far have yet been purchased. The fund is financed by grants and by matching contributions from the point source dischargers in the watershed. Receipts from credit sales will be added to the fund.

Environmental Problem: Nuisance algae conditions in Lake Allegan are the basis for development of a TMDL.

Pollutant(s) / Pollution Type(s): Phosphorus

Trade Types: Point/nonpoint.

Stage of Implementation: Discussions began in 1996. The project is now under way – three farms have started to install BMPs. No point sources have yet bought credits from the central fund. The demonstration is scheduled to be completed by June, 2000.

Relation to TMDL: A TMDL for Lake Allegan is under development.

Number of Potential Participants: In addition to the nonpoint sources already implementing the BMPs, the Kalamazoo POTW and a number of paper companies are potential point source participants. Additionally, a number of local not-for-profit organizations such as the Forum for Kalamazoo County, Kalamazoo River Partners, Kalamazoo Environmental Council, and a host of State, local, and federal governmental agencies are involved.

Trading Ratios: 2:1 (or 4:1, see innovative aspects.)

Estimated Cost Savings: Unknown

Available Written Information: A brief report is available from the Michigan Department of Environmental Quality, a full report by the MI DEQ and the Water Environment Research Foundation is expected soon, and another report is expected from the Great Lakes Protection Fund in June, 2000.

Innovative Aspects: Two levels of credit exist for reductions from agricultural sources depending on the nature of baseline practices. A distinction is made between farmers whose practices fall short of generally accepted agricultural management practices (GAAMPs), i.e., basic practices expected of farmers, and farmers whose practices are already at or better than GAAMP. Farms that already implement GAAMPs or more and choose to implement new pollution control measures would receive one pound of credit for every additional two pounds reduced (a 2:1 ratio). Farms that have not yet implemented GAAMPs would receive one pound of credit for every four pounds reduced (a 4:1 ratio). The program aims for BMPs that are sustainable, profitable, and highly tailored to each farm.

Obstacles: There was debate over establishing the baseline from which to calculate credits generated by farming operations – current practices, BMPs or GAAMPs?

Web Sites: Kalamazoo River http://www.epa.gov/surf2/ahr/75/
Kalamazoo http://www.epa.gov/surf2/hucs/04050003/
http://www.deq.state.mi.us/swq/trading/htm/kzo.htm
http://www.theforum.org/WQDemo.html

Contact: David Batchelor, MI DEQ, (517) 373-2677, batcheld@state.mi.us

MICHIGAN WATER QUALITY TRADING RULE DEVELOPMENT

Nature of Activity: The Michigan Department of Environmental Quality is developing a rule for a Water Quality Trading Program, a statewide, voluntary program aimed at improving water quality through trading. A participating source could generate credits to trade with other sources by reducing its effluent load below levels required by water quality-based effluent limitations. Trading could occur among sources in a watershed under one of two general scenarios, termed by the State as "closed trading" or "open trading." "Closed trading" may occur in situations after a loading cap and allocations have been established for sources in a watershed, either through a TMDL or through a TMDL-equivalent watershed management plan. "Open trading" may occur in situations where a source faces a water quality-based effluent limitation, but where an overall cap and allocations to watershed sources (through a TMDL or a TMDL-equivalent watershed management plan) have not yet been established. Open trading may occur either in an area where water quality standards are being attained (in which case the source likely faces a water quality-based limitation because of anti-degradation concerns) or in an area where standards are not yet attained (in which case the water quality-based limit probably exists so as to obtain progress toward attainment in advance of a TMDL or equivalent). Under any of these situations, some fraction of the credits generated when a source implements reductions below required levels must be retired and will be unavailable for trading.

Environmental Problem: The program would protect water quality in areas where standards have been attained, or contribute to attainment (often in conjunction with TMDLs or watershed management plans) in areas where standards have not yet been achieved.

Pollutant(s) / Pollution Type(s): The rule is designed for nutrient trading. However, trading for other types of pollutants and cross-pollutant trading may be approved on a case-by-case basis.

Trade Types: The rule is designed for point/nonpoint and point/point trading, however intra-plant trades would be allowed on a case-by-case basis.

Stage of Implementation: The rule has been under development since the mid-1990's. The latest draft of the rules was presented to the MI DEQ Surface Water quality Division management in September, 1999. Formal rulemaking is expected to begin by early 2000. The program is expected to be fully operational by mid 2000.

Relation to TMDL: MI DEQ is proposing to allow two kinds of "closed" trading -- when a cap and allocations for the sources have been established either through a TMDL or through a TMDL-equivalent watershed management plan.

Number of Potential Participants: Many under this State-wide program.

Trading Ratios: 10% of point source reductions and 50% of nonpoint reductions will be retired. An additional percentage of each trade may be retired depending on factors such as distance from the receiving waters.

Estimated Cost Savings: Modeling of the Saginaw Basin predicts savings of $10 - $20/lb of phosphorus reduced.

Available Written Information: A 1998 report by the Great Lakes Trading Network and a feasibility study by the MI DEQ Surface Water Quality Division. The MI DEQ web site on trading contains a full text of the draft rule. The next Great Lakes Trading Network report is expected in December, 1999.

Innovative Aspects: The rule would allow both "closed" and "open" trading. A trading registry would be established and made public. The rule would establish strict and dual liability for generators and users of credits, and penalties for failure to generate promised reductions. A large portion of traded credits would be retired, contributing to environmental progress.

Obstacles: Lack of information, misperceptions about trading, and differences between the State and EPA over what may be legally permissible.

Web Sites: Michigan: http://www.epa.gov/surf2/states/MI
http://www.deq.state.mi.us/swq/trading/temp5x.htm

Contact: David Batchelor, MI DEQ, (517) 373-2677, batcheld@state.mi.us

MINNESOTA RIVER NUTRIENT TRADING STUDY (MN)

Nature of Activity: The World Resources Institute conducted a policy/ economic study of basin-wide trading for the Minnesota River. The study examined several scenarios for achieving nutrient reductions – limits on point source discharges; State subsidies for agricultural BMPs; a combination of point source limits and a point/point and point/nonpoint trading program; and a combination of point source limits, trading, and performance-based ("targeted") subsidies for agricultural BMPs. The final scenario proved to be the optimal one. The study's author hypothesized the development of a sophisticated program to target funds for BMP implementation to the particular farms and practices that would produce the most cost-effective pollution reductions. Most State programs that provide subsidies for BMP implementation do so in a less targeted manner. Under the plan envisioned by WRI, farmers closest to streams, or with highly-erodible soils, or who have not undertaken conservation practices would be the first to receive the subsidies.

Environmental Problem: Eutrophication in the Minnesota River Basin.

Pollutant(s) / Pollution Type(s): Phosphorus

Trade Types: Point/point and point/nonpoint

Stage of Implementation: The study was completed in 1998. No trading program has been developed.

Relation to TMDL: A TMDL exists for the lower Minnesota River.

Number of Potential Participants: 212 point sources and a number of nonpoint sources.

Trading Ratios: 3:1

Estimated Cost Savings: The study projects that the cost of controlling phosphorus could be reduced from $18 / lb. for point source controls alone to $4-5 / lb. for the combination of subsidies for nonpoint source BMPs targeted to the most cost-effective locations and a trading program. Most of these savings relate to targeting the BMPs rather than to trading.

Available Written Information: The WRI report describing their study of the Minnesota River, as well as similar studies of the Saginaw Bay Watershed in Michigan and the Rock River Watershed in Wisconsin, is available from WRI.

Innovative Aspects: Rather than fund any BMP by any nonpoint source, the study revealed that "targeting" the BMPs to specific farms based on their ability to reduce loadings for the lowest cost would be much more cost-effective for the program as a whole.

Obstacles: It is typically difficult to target BMPs to the extent envisioned in the study.

Web Sites: Minnesota River Basin: http://www.epa.gov/surf2/ahr/30/
http://www.pca.state.mn.us/water/basins/mnriver/index.html
http://www.igc.org/wri/incentives/faeth.html

Contact: Paul Faeth, World Resources Institute. (202) 729-7688. Paul@wri.org

RAHR MALTING PERMIT (MN)

Nature of Activity: Rahr Malting, an existing facility on the Minnesota River, had been an indirect discharger to a local POTW, but calculated that they could reduce costs by becoming a direct discharger and constructing and operating their own WWTP. The Rahr plant is situated along a portion of the river for which waste loads are allocated to point sources under a TMDL. The plant's proposed WWTP was interpreted as a new discharge that could be permitted only if the plant provided offsetting, upstream reductions. Both a stringent discharge limit and an offset clause were written into the facility's NPDES permit. The plant has financed upstream reductions in nonpoint source phosphorus loadings in exchange for CBOD discharges from their new WWTP. Rahr established a trust fund with an oversight board to implement the trades. Rahr gives funds to the trust fund to implement the BMPs, though Rahr is ultimately responsible for their implementation. Five types of nonpoint source projects are allowed under the terms of the permit: soil erosion BMPs, livestock exclusion from waterways, rotational grazing, set-aside of critical areas, and wetland treatment systems.

Environmental Problem: Algae growth, low dissolved oxygen and eutrophication in the Minnesota River.

Pollutant(s) / Pollution Type(s): The Rahr plant must reduce upstream phosphorus discharges to offset CBOD discharges from their WWTP.

Trade Types: Point/nonpoint

Stage of Implementation: The TMDL waste load allocations were assigned in 1988. The Rahr permit was issued in January, 1997. The plant has contracted for trades with three nonpoint sources thus far.

Relation to TMDL: The permit was designed to comply with TMDL limits.

Number of Potential Participants: Thus far, the trading participants include Rahr Malting plant and three nonpoint sources. Rahr may seek more nonpoint sources in the future. Rahr works with the Coalition for Clean Minnesota River (a member of which sits on the board of directors of the trust fund) and with American Rivers to identify trading opportunities.

Trading Ratios: The trading ratio is 2:1 nonpoint to point. There is an additional cross-parameter ratio of 8 lbs. CBOD : 1 lb. P. The trading ratio accounts for uncertainty and provides a net environmental benefit. The cross-parameter ratio reflects a scientific assessment of the relative impacts on chlorophyl from phosphorus runoff and from CBOD discharge.

Estimated Cost Savings: The impetus for building the WWTP was to realize savings in wastewater treatment costs and avoid uncertainty regarding industrial user fees to the POTW.

Available Written Information: Several brief reports, as well as the NPDES permit, are available from the Minnesota Pollution Control Agency.

Innovative Aspects: The trades are cross-pollutant trades (P for BOD). Five categories of BMPs were specified as permissible under the terms of the permit. After Rahr has met its requirements, the company hopes to build the trust fund into a separate corporate sponsorship for the river and attract money for additional projects.

Obstacles: Negotiations between the plant, environmental groups and the State over setting trading ratios were difficult. Establishing an acceptable ratio between BOD and P was a significant scientific undertaking.

Web Sites: Minnesota River Basin: http://www.epa.gov/surf2/ahr/30/
http://www.pca.state.mn.us/water/basins/mnriver/index.html
http://www.pca.state.mn.us/hot/es-mn-r.html

Contact: Wayne Anderson, Minnesota Pollution Control Agency (651) 296-7323, wayne.p.anderson@pca.state.mn.us

SOUTHERN MINNESOTA BEET SUGAR COOPERATIVE TRADING PROGRAM (MN)

Nature of Activity: The Southern Minnesota Beet Sugar Cooperative plant sought to increase its wastewater discharge to the Minnesota River in order to accommodate a planned 40% increase in production. Any increased discharge would have normally been prohibited because the river is severely impacted by excess phosphorus. The Minnesota Pollution Control Agency issued SMBSC a permit allowing an increased discharge but specifying that the facility must obtain offsetting reductions from nonpoint sources in the basin. SMBSC will seek reductions via BMPs from farmers, some of whom are members of the cooperative. SMBSC itself is ultimately responsible for the reductions.

Environmental Problem: Nutrients in Minnesota River.

Pollutant(s) / Pollution Type(s): Phosphorus.

Trade Types: Point/nonpoint

Stage of Implementation: The permit was issued in April, 1999, and requires SMBSC to obtain 2600 lbs. of phosphorus credits before February, 2000, and additional amounts by future dates.

Relation to TMDL: There is a TMDL for the lower Minnesota River for dissolved oxygen. Excess phosphorus entering the watershed leads to eutrophication and increased oxygen demand.

Number of Potential Participants: Southern Minnesota Beet Sugar Cooperative and multiple farmers

Trading Ratios: 2.6:1. For each additional pound of phosphorus to be discharged by SMBSC, 2.6 pounds of upstream reductions must be obtained: 1 lb for the offset, 0.6 lb for uncertainty, and 1 lb for environmental improvement.

Estimated Cost Savings: Unknown

Available Written Information: The NPDES permit and a brief summary are available from the Minnesota Pollution Control Agency.

Innovative Aspects: The fact that the SMBSC is a cooperative owned by farmers provides for an unusually direct relationship between the point source discharger and some of the nonpoint sources. There are very high penalties for non-compliance.

Obstacles: SMBSC had a sub-par environmental track record, which initially made the environmental community concerned about allowing the plant to participate in a trading program. Negotiations over the environmental improvement component of the trade ratio were difficult.

Web Sites: Minnesota River Basin: http://www.epa.gov/surf2/ahr/30/
http://www.pca.state.mn.us/water/basins/mnriver/index.html
http://www.pca.state.mn.us/news/may99/nr51299.html

Contact: Wayne Anderson, Minnesota Pollution Control Agency (651) 296-7323, wayne.p.anderson@pca.state.mn.us

CHESAPEAKE BAY WATERSHED NUTRIENT TRADING PROGRAM (MULTI-STATE)

Nature of Activity: The Chesapeake Bay Program Office of the U.S. EPA is developing a multi-stakeholder, multi-state, watershed-wide nutrient trading program.

Environmental Problem: Eutrophication of the Bay and tributaries.

Pollutant(s) / Pollution Type(s): Nitrogen and Phosphorus.

Trade Types: All types of trades are up for discussion.

Stage of Implementation: The program is in the early stages of discussion and planning. The Chesapeake Bay Agreement was signed in 1987 and the Tributary Strategies Agreement in 1992. A Chesapeake Bay Program workshop on trading was held in December, 1998. The target completion date for the final program is late 2000.

Relation to TMDL: Many Chesapeake Bay waters are on states' lists of waters not meeting water quality standards and for which TMDLs must be developed (the 303(d) lists) for nutrient related impairments. A Bay-wide TMDL is under development.

Number of Potential Participants: 40 members of the Chesapeake Bay Program's Nutrient Trading Negotiation Team, representing affected stakeholders.

Trading Ratios: All up for discussion.

Estimated Cost Savings: Will be explored.

Available Written Information: Various Chesapeake Bay Program documents, none specifically on trading.

Innovative Aspects: The effort is the most ambitious trading program thus far, in that it is a multi-state effort covering a very large watershed. The program could eventually involve inter-state and intra-basin or inter-basin trades. Developing a trading program by a negotiation process involving all affected stakeholders is itself innovative.

Obstacles: It is difficult to balance the interests of so many stakeholders and to develop a program for such a large water body.

Web Sites: Chester-Sassafras: http://www.epa.gov/surf2/hucs/02060002/
Gunpowder-Patapsco: http://www.epa.gov/surf2/hucs/02060003/
Severn: http://www.epa.gov/surf2/hucs/02060004/
Choptank: http://www.epa.gov/surf2/hucs/02060005/
Pocomoke: http://www.epa.gov/surf2/hucs/02060009/
Lynnhaven-Poquoson: http://www.epa.gov/surf2/hucs/02080108/
Western Lower Delmarva: http://www.epa.gov/surf2/hucs/02080109/
Chesapeake Bay Program: http://www.chesapeakebay.net/

Contact: Allison Wiedeman, U.S. EPA Chesapeake Bay Program Office, (410) 267-5733, wiedeman.allison@epa.gov

NEUSE RIVER NUTRIENT SENSITIVE WATER MANAGEMENT STRATEGY (NC)

Nature of Activity: North Carolina established a nutrient management strategy for the Neuse River Basin to reduce the total nitrogen load to the Neuse estuary from all sources. The strategy sets annual nitrogen allocations for existing point source dischargers over 0.5 MGD, and also provides the option of joining a basin-wide association of point sources. The association's allocation will equal the sum of its members' allocations. If the association or any non-association discharger exceeds its allocation in any year, it must make an offset payment to the State's Wetlands Restoration Fund. The association's members may also trade among themselves. Any new or expanding discharger must either purchase its allocation from an existing discharger at a negotiated price, or make a payment to the Wetlands Restoration Fund. The Fund restores wetlands and riparian areas.

Environmental Problem: Nutrient enrichment-driven eutrophication, fish kills in the Neuse estuary.

Pollutant(s) / Pollution Type(s): Nitrogen and phosphorus (though only N will be traded).

Trade Types: Point/point, point/nonpoint.

Stage of Implementation: The State classified the upper portion of the basin as Nutrient Sensitive Waters in 1983 and declared the entire basin Nutrient Sensitive in 1988. The State began developing basin-wide nutrient rules in 1995, and most rules were effective in August, 1998. Dischargers will have to meet their allocations by 2003 or pay for offsets. The point source association has not yet been established and no trades have occurred.

Relation to TMDL: Several waters in the basin are on the 303(d) list. A TMDL for total nitrogen in the Neuse estuary was approved by EPA in July, 1999. The basis for the TMDL was the study used to implement the trading program.

Number of Potential Participants: Forty point sources submitted letters of interest in joining the association before a March, 1998 deadline, when enrollment was closed for 5 years.

Trading Ratios: There is no ratio established by the rule for trading among the point sources, nor is the offset rate -- the amount per pound to be paid to the Wetland's Restoration Fund by a discharger exceeding its allocation -- formally a trading ratio. However, the amount of the payment -- $11/lb/year -- is based on calculations done by the State for the Tar-Pamlico Basin trading program and represents roughly twice the cost of the least cost-effective nutrient BMPs that the State has been supporting farmers in implementing throughout the State. The State's charge of $11/lb/yr when a point source exceeds its allocation is two or more times higher than the cost at which the State has been obtaining reductions from nonpoint sources. Thus, if we were to assume that a payment into the Wetlands Fund has the effect of increasing the State's spending on nonpoint source BMPs by a similar amount, the offset rate would have a 2:1 trading ratio embedded in it. Moreover, new or expanding point sources that do not purchase allocations from the association must buy offsets from the Wetlands Fund at price 200% of the base offset rate.

Estimated Cost Savings: The offset rate is $11/lb nitrogen for each pound over the association's allocation. For comparison, costs for at-the-plant controls elsewhere in North Carolina (in the Tar-Pamlico Basin) were estimated at roughly $25 - 30/lb.

Available Written Information: Two North Carolina Department of Environment, Health and Natural Resources (now DENR) reports from 1997, several fact sheets.

Innovative Aspects: By instigating nonpoint source controls and collecting payments from point sources that do not meet their allocations, the State assumes much of the transactions burden of trading. Under the strategy's rules for agriculture, farmers can participate in their county plans or implement BMPs individually, however, they will not trade directly with point sources.

Obstacles: Trading between point sources and agriculture was not authorized, in part over concern that farmers would be challenged to meet their own 30% loading reduction goals and thus might have difficulty generating tradeable "excess" reductions.

Web Sites: Upper Neuse: http://www.epa.gov/surf2/hucs/03020201/
Middle Neuse: http://www.epa.gov/surf2/hucs/03020202/
Lower Neuse: http://www.epa.gov/surf2/hucs/03020204/
http://h2o.enr.state.nc.us/wqhome.html

Contact: Dave Goodrich or Mike Templeton, North Carolina DENR, (919) 733-5083, dave.goodrich@ncmail.net or mike.templeton@ncmail.net

TAR -PAMLICO NUTRIENT REDUCTION TRADING PROGRAM (NC)

Nature of Activity: North Carolina established a basin-wide nutrient trading program to reduce nitrogen and phosphorus loads to the Tar-Pamlico basin. There are two main components: The Tar-Pamlico Basin Association (point sources) and a trading mechanism. The Association works cooperatively to meet nutrient caps set by the State. If the Association does not meet its goals it must purchase offsets by paying a pre-set price per pound to the State's Agriculture Cost-share Program for Nonpoint Source Pollution Control. (This is a State-wide program that pays farmers up to 75 percent of the average cost of implementing approved BMPs.) Monies paid by the Association to the cost-share program are earmarked to finance nutrient offsets from nonpoint sources in the Tar-Pamlico basin. Since the State cost-share program contracts with the farmers, the State rather than the point sources is responsible for finding trading partners and ensuring the validity of the offsets.

Environmental Problem: Eutrophication of Pamlico River Estuary.

Pollutant(s) / Pollution Type(s): Nitrogen and phosphorus.

Trade Types: Point/point cooperation and point/nonpoint trading.

Stage of Implementation: The Basin was designated a Nutrient Sensitive Water in 1989. Program development began in 1990. In 1991 the Association hired an engineering firm to investigate measures and costs for nutrient reduction at the Association's facilities. Trading rules were fully developed in 1992. The point sources have met their collective cap each year since 1990 via the operational measures and minor capital improvements recommended by the engineering analysis, and through the addition of nutrient removal processes at two of the larger facilities. The Association purchased and banked credits for future use, but has not yet needed to use them. The current membership in the Association and price for offsets will continue through 2004.

Relation to TMDL: A TMDL is in place, having been developed during Phase I. An estuarine response model that was developed under Phase I was used to develop the TMDL.

Number of Potential Participants: There are fourteen members of the Association and enrollment will be opened to additional facilities after 1999. The Agricultural Cost Share Program works with multiple nonpoint sources.

Trading Ratios: The current cost of offsets includes a 2:1 ratio. The offset rate of $29/kg/yr is based on the estimated cost of the least cost-effective BMP typically implemented in the Tar-Pamlico Basin – $13/kg/yr, plus an additional $13 for a 2:1 ratio, plus a 10% fee for administrative costs.

Estimated Cost Savings: The offset rate is currently set at $29/kg for each kg over the association's allocation. For comparison, costs for at-the-plant controls were estimated to be $11 - 13 million for 200,000 kg of reduction (approximately $55/kg – $65/kg). Additionally, a Great Lakes Trading Network report cites Malcolm Green (President of the Association) to the effect that the reductions achievable for $1 million from nonpoint sources would cost $7 million from point sources.

Available Written Information: Two North Carolina Department of Environment, Health and Natural Resources (now DENR) reports from 1995, and one each from 1997 and 1998.

Innovative Aspects: The State takes on the burden of arranging for and vouching for the nonpoint source load reductions via the Agriculture Cost-share Program. From the point of view of point sources, this sharply reduces the transaction costs and uncertainties of trading. Members of the Association jointly paid for the engineering study. New dischargers or non-members wishing to expand must buy offsets from agricultural sources.

Obstacles: It was very complex to quantify the impacts of runoff from animal feeding operations. Imprecise language in the trading rule resulted in a controversy over the cost and duration of the credits that have been purchased.

Web Sites: Lower Tar: http://www.epa.gov/surf2/hucs/03020103/
Pamlico: http://www.epa.gov/surf2/hucs/03020104/
http://www4.coastalnet.com/community_orgs/civic_orgs/ptrf/
http://h2o.enr.state.nc.us/nps/tarp.htm

Contact: Rich Gannon, North Carolina DENR, (919) 733-5083, rich_gannon@h2o.enr.state.nc.us

PASSAIC VALLEY SEWERAGE COMMISSION EFFLUENT TRADING PROJECT (NJ)

Nature of Activity: The Passaic Valley Sewerage Commission established an effluent trading program for its industrial users (indirect dischargers). The PVSC established metals limits for its industrial users tighter than technology-based standards in order to improve the quality of the POTW sludge. The PVSC believed that allowing its industrial users the opportunity to trade in achieving the increment of control beyond technology-based standards would reduce compliance burdens. Three companies have entered into two trading agreements (one seller and two buyers).

Environmental Problem: The PVSC needed to lower metals in its sludge so as to meet "exceptional quality" standards. (Exceptional Quality sludge may be used for various purposes without restrictions.)

Pollutant(s) / Pollution Type(s): Heavy metals.

Trade Types: Pre-treatment trade between industrial users of the POTW.

Stage of Implementation: Initial development – the POTW's efforts to allow effluent trading – occurred between 1992 and 1994. Trading rules were finalized and the program began in 1996. One trade occurred between two companies in July, 1997 and was recently reauthorized for a 3rd year. A second trade was completed in September, 1999.

Relation to TMDL: None. The impetus for the pre-treatment trading program was not a TMDL, but was the PVSC's need to meet sludge requirements.

Number of Potential Participants: There are 306 indirect dischargers to the PVSC.

Trading Ratios: 20% of reductions via trading are "retired" for environmental benefit, thus the ratio is 5:4.

Estimated Cost Savings: Confidential business information not disclosed.

Available Written Information: A full report was published in May, 1998 by the U.S. EPA Office of Policy, Planning and Evaluation (EPA-231-R-98-003).

Innovative Aspects: The PVSC program is the only formal pre-treatment trading program in the U.S. (although there may be informal local limit allocations that are effectively trades). The PVSC believes that their relationship with the industrial users was a crucial aspect of the program's implementation -- compliance enforcement must be credible and fair.

Obstacles: Private firms were initially apprehensive about sharing information with each other and uncertain about appropriate pricing. Negotiations with potential trading partners were time consuming. Trading rules were developed after local limits were announced and most dischargers had already made compliance investments. Smaller industrial dischargers were reluctant to spend money to negotiate trades.

Web Sites: Lower Hudson: http://www.epa.gov/surf3/hucs/02030101/
Hackensack-Passaic: http://www.epa.gov/surf2/hucs/02030103/
http://www.epa.gov/oppe/isd/nj/home.htm
http://www.epa.gov/oppe/isd/nj/et.htm
http://www.pvsc.com/

Contacts: Stan Siegel, U.S. EPA Region 2. (212) 637-3701, siegel.stan@epa.gov
Catherine Tunis, U.S. EPA Office of Policy, (202) 260-2698, tunis.catherine@epa.gov

TRUCKEE RIVER WATER RIGHTS AND POLLUTION OFFSET PROGRAM (NV)

Nature of Activity: The Reno-Sparks Joint Wastewater Treatment Facility (Truckee Meadows Water Reclamation Facility) sought to increase its discharge to the Truckee River. The river has been the focus of contentious water rights disputes for decades. The POTW's need to increase its discharge became one of several related issues in the dispute. Parts of the dispute were resolved by a water rights agreement that involves some elements of pollutant trading. The agreement allows the plant to increase its discharge while assuring attainment of water quality standards during the dry (low flow) season. The local communities and the Federal government are sharing the costs of purchasing upstream water rights. The purchases will both: 1) reduce nonpoint nutrient loads by precluding the use of the water for agricultural purposes; and 2) mitigate the impact of increased POTW loading by increasing the river's flow during the dry season.

Environmental Problem: The Truckee River has a variety of water quality problems due to a combination of very low flow and discharges from point and nonpoint sources. There are also endangered species in the River.

Pollutant(s) / Pollution Type(s): Total nitrogen, total phosphorus, total dissolved solids, dissolved oxygen and temperature.

Trade Types: The water rights purchases do not fit easily into the categories of trading types employed in this report, however a point/nonpoint trade may be the most fitting category.

Stage of Implementation: Water rights have been a major issue on the Truckee River for the greater part of this century. Negotiations for this project started in 1994 and an agreement was reached in June, 1996. This agreement resolved several lawsuits that had been ongoing since the early 1980's. As of late 1999, some of the water rights have been bought but completion of the project is not expected for another five years.

Relation to TMDL: A TMDL is in place for total nitrogen, total dissolved solids and dissolved phosphorus in order to control dissolved oxygen. The municipalities had to develop a creative solution in order to both expand the plant and comply with the TMDL.

Number of Potential Participants: The Federal government, the City of Reno, the City of Sparks, Washoe County, the Pyramid Lake Paiute Tribe and various farmers and nonpoint sources are all involved in this program.

Trading Ratios: Explicit trading ratios were not calculated, but the amount of water rights to be purchased is expected to offset the effects of increased loadings from the POTW.

Estimated Cost Savings: Unknown

Available Written Information: A TMDL fact sheet is available from EPA Region 9 and a PBS video "Healing the Water" is available from Water Environment Federation and EPA Region 9. A chronology of events on the Truckee (pre 20th century and 20th century) is available from the Nevada Division of Water Planning.

Innovative Aspects: This is the only trading project to employ purchase of water rights as a tool for improving water quality. Another rare, if not unique, aspect is the use of a mediation consulting firm to assist in dispute resolution.

Obstacles: Water rights and water pollution have been contentious issues in the region for many decades. Negotiations sponsored by Senator Reid of Nevada were facilitated by a mediation consulting firm over a two-year period.

Web Sites: Pyramid - Winnemucca Lakes: http://www.epa.gov/surf2/hucs/16050103/
http://www.state.nv.us/cnr/ndwp/truckee/trchrono.htm

Contact: Cheryl McGovern, Environmental Protection Agency (415) 744-2013, mcgovern.cheryl@epa.gov

NEW YORK CITY WATERSHED PHOSPHORUS OFFSET PILOT PROGRAMS (NY)

Nature of Activity: New York City is implementing a pilot program to allow new or expanding wastewater treatment plants with surface water discharges to obtain offsets so as to allow new phosphorus discharges in phosphorus-restricted basins.

Environmental Problem: Eutrophication and related problems in the municipal drinking water supply reservoirs.

Pollutant(s) / Pollution Type(s): Phosphorus.

Trade Types: Point/nonpoint.

Stage of Implementation: The watershed protection agreement (which allows the offset program) was signed in January, 1997; guidance for the pilot phosphorus offset program was published in March, 1997; the rules and regulations for watershed protection (which established the program) were published in May, 1997. A maximum of three pilot projects in the East of the Hudson River Watershed, with a total volume of 150,000 gallons per day, as well as three pilots in the West of the Hudson Watershed, with a total flow of 100,000 GPD, may be included in the pilot program. Three conceptual offset plans were accepted and two are now in the final, detailed planning stages. Once implemented, these projects will serve as the basis for deciding whether to implement a permanent program.

Relation to TMDL: Phased TMDLs (i.e., with interim targets) are being developed for the East of Hudson and West of Hudson regions. The TMDLs make expansion or new discharge very difficult without an offset.

Number of Potential Participants: The pilot stage is limited to three projects on each side of the Hudson. There were five applicants from the east of the Hudson River region, three of which were accepted. One of the approvals was later revoked when the applicant failed to secure the necessary approval from the town or county to participate in the program. There were no applications from the west of the Hudson region. New York City, New York State, the U.S. EPA, eight counties, nearly 70 localities and several environmental organizations were party to the watershed protection agreement.

Trading Ratios: 3:1

Estimated Cost Savings: Unknown.

Available Written Information: The published watershed regulations, program guidance and participant selection criteria are available from NYC DEP.

Innovative Aspects: Three offsets have been allowed and two are proceeding: two retrofits of storm water controls and one street cleaning program. The NYC DEP requested conceptual rather than detailed offset proposals in the first stage of application review so as to minimize the preparation costs and encourage proposals.

Obstacles: The program was negotiated as part of a very broad agreement between New York City, New York State, U.S. EPA and dozens of localities to protect New York City's 2,000 square mile drinking water supply watershed.

Web Sites: Lower Hudson: http://www.epa.gov/surf2/hucs/02030101/
http://www.ci.nyc.ny.us/html/dep/html/watershed.html
http://www.ci.nyc.ny.us/html/dep/html/tmdl.html

Contact: James Benson, New York City Department of Environmental Protection. (914) 742-2034, Jbenson@valgis.dep.nyc.ny.us.

CLERMONT COUNTY PROJECT (OH)

Nature of Activity: Clermont County is studying and developing county-wide water quality management strategies that may include effluent trading. The County is facing increasing development and forecasts that water quality in the East Fork of the Little Miami River and the Harsha Reservoir may be threatened. Nonpoint sources now account for roughly 70% of the loads into the river (though this varies with wet and dry weather)and they are largely unregulated. The lesser contribution from point sources is thoroughly regulated. The watershed management plan may include effluent trading as a way of encouraging nonpoint source reductions. A U.S. EPA Cooperative Agreement with the Institute for Conservation Leadership, a not-for-profit organization, has distributed funds to an independent contractor to develop a quality assurance plan to enhance water quality data collection efforts, as well as to help define the use of the data in decision making.

Environmental Problem: Increasing development is threatening water quality in the East Fork of the Little Miami River and Harsha Lake Reservoir.

Pollutant(s) / Pollution Type(s): Phosphorus.

Trade Types: Point/nonpoint.

Stage of Implementation: The project has been under discussion and data has been gathered for three years. A study of the potential effect of restoring and/or protecting riparian corridors is currently ongoing, but the effluent trading component is still largely in a conceptual stage. A series of meetings and discussions between various governmental agencies is planned for the end of 1999 and the beginning of 2000 to begin to address effluent trading more substantively. Little Miami, Inc., a local advocacy group, has started working with landowners in the Little Miami Watershed (which includes the East Fork).

Relation to TMDL: None.

Number of Potential Participants: There are four major point sources and several minor point sources in the area. U.S. EPA, Ohio EPA, and Clermont County are the major governmental stakeholders.

Trading Ratios: Not yet discussed.

Estimated Cost Savings: Not yet determined.

Available Written Information: A preliminary report on the riparian corridor restoration study is available in the Little Miami Journal. Other materials are available on the Project XL web site and Clermont County's Office of Environmental Quality web site.

Innovative Aspects: The County is developing a computer model to predict changes in water quality due to changes in land use. The model will help the County in its planning and zoning decisions. Based on the model, the County may also revise or develop ordinances regarding subdivisions, sediment and erosion control, and sewer and water systems.

Obstacles: Unknown.

Web Sites: Little Miami: http://www.epa.gov/surf2/hucs/05090202/
Clermont County: http://www.co.clermont.oh.us
Project XL: http://yosemite.epa.gov/xl/xl_home.nsf/all/clermont.html
Little Miami, Inc.: http://www.littlemiami.com/

Contact: Wayne Gorski, EPA Region 5. (312) 886-0140, gorski.wayne@epamail.epa.gov
Lisa Reiter, EPA Office of Reinvention. (202) 260-9041, reiter.lisa@epa.gov
Paul Braasch , Clermont County Office of Environmental Quality. (513) 732-7745, pbraasch@clermont.co.oh.us

DELAWARE RIVER BASIN TRADING SIMULATION

Nature of Activity: U.S. EPA, with the aid of the Pennsylvania Department of Environmental Protection, sponsored a project that simulated the creation of four trading programs in Pennsylvania. The project aimed to gain experience in developing trading programs and to help agencies that might consider initiating or participating in trading programs. Of the simulations that were performed, the one with the most potential to become a real trade involves a POTW expansion in Westfalls Township, PA. Westfalls is planning a significant expansion of its POTW that discharges to the Delaware River. The Delaware River Basin Commission has designated this area of the river as Special Protection Waters, in which any new or significantly expanding discharger may not effect a "measurable change" in existing water quality. Moreover, new or significantly expanding POTWs are prohibited from discharging until they have exhausted "load reduction" options. The DRBC requires expanding plants to offset both direct and indirect loads generated by their expansion. The Westfalls POTW may seek offsets by financing improvements at a POTW in Port Jervis, NY and/or by financing BMPs and installation of sewer connections to replace failing septic systems.

Environmental Problem: The area has been classified by the DRBC as having "exceptionally high scenic, recreational, and ecological values." The Special Protection Waters Designation is aimed at protecting the area's water quality and places very stringent restrictions on new discharges.

Pollutant(s) / Pollution Type(s): CBOD, total suspended solids, ammonia, phosphorus and nitrogen

Trade Types: The trade could potentially involve point/point and point/nonpoint reductions.

Stage of Implementation: The DRBC created the Special Protection Waters classification in 1992 and amended the regulations in 1994. The simulation group met several times during the Spring and Summer of 1999, however actual investigation into potential trades has not begun in earnest.

Relation to TMDL: These waters meet all applicable standards and no TMDL is planned. The intent of the offset requirement is to protect these high quality waters.

Number of Potential Participants: POTWs of West Fall and Port Jervis, NY DEP and PA DEP, U.S. EPA, DRBC, various landowners.

Trading Ratios: Ratios would be decided case-by-case and pollutant-by-pollutant. The simulation group concluded that a minimum ratio of 1.1:1 would be desirable to achieve environmental benefits.

Estimated Cost Savings: Unknown.

Available Written Information: The DRBC Water Quality Regulations are available from the DRBC. A final report on the simulation project was submitted to EPA in late 1999.

Innovative Aspects: The trade would be designed to offset both the POTW's direct discharge and any new, indirect discharge (such as storm water) from the growth that the expanded POTW would serve. Moreover, the trade would be designed to offset a broad set of pollutants, rather than just one pollutant or class of pollutants. This is one of very few potential trades involving requirements intended to protect high quality waters rather than requirements intended to improve degraded waters. Finally, if Port Jervis, NY is involved, the trade would be an interstate trade.

Obstacles: Coordinating between the State, Federal, and Basin regulatory agencies over many pollutants may prove difficult.

Web Sites: http://www.epa.gov/surf2/hucs/02040104/
http://www.epa.gov/surf2/ahr/10/
http://www.state.nj.us/drbc/drbc.htm

Contacts: Charles Marshall, Philip Services Corporation, (215) 643-5466, cmarshall@philipinc.com
Paul Scally, Delaware River Basin Commission. (609) 883-9500, pscally@drbc.state.nj.us

HENRY COUNTY PUBLIC SERVICE AUTHORITY AND CITY OF MARTINSVILLE AGREEMENT (VA)

Nature of Activity: Two POTWs from neighboring municipal jurisdictions in Virginia have entered into a cooperative agreement whereby one POTW has agreed to a reduction in its permit limit for discharging total dissolved solids so the other can have an increased limit. Henry County's Lower Smith River wastewater treatment plant and the Martinsville sewage treatment plant are assigned allocations for several parameters, including total dissolved solids, in order to protect water quality at a downstream drinking water intake in Eden, North Carolina. The Henry County Public Service Authority requested of the City of Martinsville that Martinsville's STP lower its allocation of total dissolved solids by 20,000 kg/day and "transfer" the allocation to Henry County's WWTP. Henry County needs the allocation in order to accommodate expanded production by its most significant industrial user. The permitting division of the Virginia Department of Environmental Quality determined that the trade would not violate the Clean Water Act's anti-backsliding provision because the provision allows relaxation of water quality-based limitations if they are consistent with the Act's anti-degradation policy. Since the two plants discharge into the same stream segment and since there will be no decrease in water quality, the increased allocation is allowable.

Environmental Problem: Total dissolved solids in the Smith River and in-stream water quality at a drinking water intake in Eden, North Carolina.

Pollutant(s) / Pollution Type(s): Total dissolved solids.

Trade Types: Point/point.

Stage of Implementation: Discussions regarding the trade have been ongoing since 1998. The trade has been approved in concept but, because of unrelated issues, has not yet occurred.

Relation to TMDL: The wasteload allocations are not part of a TMDL, but the situation is analogous.

Number of Potential Participants: 2

Trading Ratios: 1:1

Estimated Cost Savings: The cost savings for the POTWs is unclear, but the trade will facilitate industrial expansion in the area by increasing the permitted discharge of one POTW.

Available Written Information: The draft permit and fact sheet are available through Virginia DEQ.

Innovative Aspects: Since a significant industrial user could not have increased production without an increase in the Lower Smith Plant's allowable loadings, the trade can be seen as facilitating economic growth in the area.

Obstacles: The Virginia Department of Environmental Quality initially expressed apprehension about the potential for increased toxics discharge, but decided that TDS was the only parameter affected by the trade.

Web Sites: Upper Dan: http://www.epa.gov/surf2/hucs/03010103/

Contact: Dick Sedgley, McGuire, Woods, Battle & Boothe. (804) 775-1112, rhsedgle@mwbb.com
VA DEQ West Central Regional Office – (540) 562-6700.

VIRGINIA WATER QUALITY IMPROVEMENT ACT AND TRIBUTARY STRATEGY

Nature of Activity: The State of Virginia is developing a guidance for trading and other market-based incentives for use in conjunction with Water Quality Improvement Fund grants. (The WQIF is one of the main components of the Water Quality Improvement Act of 1997. The Act is one of the State's mechanisms for implementing its tributary strategies. Tributary strategies are the operational documents of the interstate Chesapeake Bay Agreement to limit nutrient loads to the Bay by 40%.) The WQIF, which currently targets only the Potomac-Shenandoah basin but will soon target other Bay basins, aims to provide incentives for point sources to decrease their total nitrogen and total phosphorus discharges beyond levels established by the tributary strategy. The WQIF grants provide cost-share funds to POTWs and some private WWTPs for biological nutrient control and other nutrient control systems. Under the proposed trading provision, if a point source were to implement controls so as to discharge less than its tributary strategy goal, a credit would be created that the point source could bank for one year, sell to other WQIF grantees, or transfer to the State for a bonus payment. If a point source were to fall short of its expected reduction, it would be expected to repay to the State the annualized cost share amount (plus interest as a "monetary assessment"). No trading has been implemented yet; the program is under discussion by a water issues advisory group.

Environmental Problem: Eutrophication of the Chesapeake Bay and its tributaries.

Pollutant(s) / Pollution Type(s): Nitrogen and phosphorus.

Trade Types: The program would initially include only point/point trades under the WQIF, but might possibly be expanded to include point/nonpoint trades under the Chesapeake Bay Program.

Stage of Implementation: The Water Quality Improvement Act was passed in 1997, while the Tributary Strategies plan was developed between 1996 - 1998. Environmental groups objected to the trading provision, and the program is currently being discussed by a water issues advisory group. The final guidance on market-based mechanisms is expected by spring of 2000.

Relation to TMDL: The Tributary Strategies plan for nutrient reduction is part of the voluntary, federal-interstate Chesapeake Bay Program. EPA added the Virginia main Bay and its tidal tributaries to the 303(d) list, thus requiring development of TMDLs for nutrients.

Number of Potential Participants: Unknown.

Trading Ratios: 1:1

Estimated Cost Savings: Unknown.

Available Written Information: Virginia Water Quality Improvement Act of 1997, Annual Reports of the WQIF, Annual Reports of Nutrient Reduction Strategies for Virginia's Tributaries to the Chesapeake Bay. The draft guidance on market-based mechanisms is available; final guidance is expected by spring of 2000.

Innovative Aspects: The credits would be generated by improvements paid for in part by State funds. The credits could be sold back to the State.

Obstacles: Thus far, point sources have expressed only limited interest in the program. Environmental groups have objected to the creation of a trading program as guidance relating to a grant program rather than through a more formal regulation. A provision for fair inclusion of nonpoint sources has been difficult to craft for both political and technical reasons.

Web Sites: Virginia: http://www.epa.gov/surf2/states/VA/
http://www.deq.state.va.us

Contact: John Kennedy, Virginia DEQ . (804) 698-4312, jmkennedy@deq.state.va.us

WISCONSIN EFFLUENT TRADING RULE DEVELOPMENT

Nature of Activity: The Wisconsin Department of Natural Resources is developing rules for a State-wide trading program. The State legislature authorized local pilot trading programs in order to study and evaluate the prospect of a broad State-wide program. There are currently three pilot programs at various stages of development. The three pilot programs are reviewed in this report: Fox-Wolf Basin, Red Cedar River and Rock River Basin.

Environmental Problem: If established, a trading program could address various water quality problems across the State.

Pollutant(s) / Pollution Type(s): The program could potentially include multiple pollutants, but the pilot programs are focusing on phosphorus.

Trade Types: Point/point, point/nonpoint and nonpoint/nonpoint are all being considered.

Stage of Implementation: The Wisconsin legislature passed Act 27 authorizing the pilots in 1997. Three pilots are now under way. Modeling and design and implementation of the trades are at different stages of completion. The goal is to have a State-wide trading program in place by the end of 2000.

Relation to TMDL: The trading pilots are taking place in advance of planned TMDLs for each of the three pilot water bodies. Modeling and monitoring efforts completed during the pilots will be used in the development of the eventual TMDLs.

Number of Potential Participants: The program would be a State-wide program. Each of the three pilot programs has established a local advisory committee consisting of a variety of stakeholders.

Trading Ratios: The trading ratios are under consideration. One of the pilots will employ a 2:1 ratio.

Estimated Cost Savings: One of the aims of the pilot programs is to determine the range of economic benefits of a trading program.

Available Written Information: Three brief pilot program reports are available from the WI DNR as part of the annual report to the Governor. A report on the Fox-Wolf Basin has recently been published by the Water Environment Research Foundation. The Wisconsin DNR's second annual report to the Governor on the Wisconsin pilot programs was published in September, 1999.

Innovative Aspects: The State legislature passed an act authorizing pilots and provided a budget of $100,000 for supporting the pilots. The legislation specifies that there must be a local advisory committee for each pilot.

Obstacles: Unknown.

Web Sites: Wisconsin: http://www.epa.gov/surf2/states/WI/
http://www.dnr.state.wi.us/org/water/wm/nps/poltrade.html

Contact: Mary Anne Lowndes, WI DNR (608) 261-6420, lowndm@dnr.state.wi.us

FOX-WOLF BASIN WATERSHED PILOT TRADING PROGRAM (WI)

Nature of Activity: A watershed-wide pilot trading project is being developed in the Fox and Wolf Basins as part of the State of Wisconsin's program to investigate trading. Trading in the Fox-Wolf Basin would aim to reduce phosphorus loadings to Green Bay. As a result of a 1988 Remedial Action Plan for the Basin, point source dischargers were required to meet a 1 mg/L phosphorus limit. Further, a level of 0.3 mg/L was set as a goal for the future. A study of the potential economic advantages of trading in the Fox-Wolf was recently released. The study's conclusions are: 1) the lower Fox Basin appears to be ripe for trading because further nonpoint source reductions may be less expensive to achieve than further point source reductions; 2) the Upper Fox Basin may not be an appropriate locus for trading since further point source reductions may be more cost-effective than further nonpoint source reductions; and 3) trading on the Wolf may be contingent on future discharge limits faced by WWTPs.

Environmental Problem: Dissolved oxygen and eutrophication in Green Bay.

Pollutant(s) / Pollution Type(s): Phosphorus.

Trade Types: Both point/point and point/nonpoint trades are being discussed.

Stage of Implementation: The project was chosen as a pilot in a State-wide study in 1997/1998. One potential trade has been identified. The project will have a pilot project status for two years. If trades occur, the contract period can be no longer than five years.

Relation to TMDL: TMDLs will be developed for segments of the basin. It is expected that TMDL development will encourage investigation of trading opportunities for pollutants other than phosphorus. Modeling and monitoring efforts are already complete.

Number of Potential Participants: There are potentially hundreds of participants in a very large area. A team of partners examining trading includes Fox-Wolf Basin 2000, Inc. (a not-for-profit organization that acts as the lead agency for the trading program), and many stakeholders from governmental, academic, environmental and corporate entities.

Trading Ratios: Trading ratios are among the topics being discussed.

Estimated Cost Savings: The study found that BMPs can reduce phosphorus from nonpoint sources at an average cost of $26/lb., while further reductions from point sources would cost an average of $73/lb. The expected average cost savings would therefore be $47/lb (though the range of control costs for both point and nonpoint reductions is quite large).

Available Written Information: The first and second annual reports to the Governor from the Wisconsin DNR are available. A brief description is available from the Great Lakes Trading Network. Fox-Wolf 2000 publishes a quarterly newsletter and has several reports available on their web site. A full report by Resource Strategies, Inc. was recently published by Fox-Wolf 2000 and the Water Environment Research Foundation.

Innovative Aspects: The program is part of a State-wide project to evaluate trading (discussed in this report).

Obstacles: Many municipal dischargers have already installed phosphorus controls to meet an international agreement to reduce loadings to the Great Lakes and may not need further reductions, thus the pool of potential buyers may be limited.

Web Sites: Fox River: http://www.epa.gov/surf2/ahr/14/
Wolf: http://www.epa.gov/surf2/hucs/04030202/
http://www.fwb2k.org/main.html
http://www.dnr.state.wi.us/org/gmu/sidebar/iem/lowerfox/index.htm#poll
http://clean-water.uwex.edu/foxwolf/

Contacts: Mary Anne Lowndes, WI DNR, (608) 261-6420, lowndm@dnr.state.wi.us
Jim Pinkham, Bruce Johnson, Fox-Wolf Basin 2000, (920) 738-7025, jpinkham@athenet.net , foxwolf@athenet.net

RED CEDAR RIVER PILOT TRADING PROGRAM (WI)

Nature of Activity: A watershed-wide pilot trading project is being developed in the Red Cedar River watershed as part of the State of Wisconsin's program to investigate trading. Prior to the State legislation, local groups had already performed significant modeling and monitoring. Of the eighteen municipalities in the watershed, the City of Cumberland has gone the farthest toward implementing a trade. The City's POTW is faced with a phosphorus discharge limit of 1 mg/L, but the City would prefer to obtain an equivalent reduction at lower cost by funding offsets from nonpoint sources. A reduction of 4,400 pounds of phosphorus per year would need to be obtained from lands that drain to the Hay River. Other municipalities in the watershed, including the Village of Colfax, are beginning to pursue similar strategies in order to meet the same 1 mg/L effluent limit.

Environmental Problem: Algal blooms, macrophytes, and low dissolved oxygen concentrations in Tainter Lake.

Pollutant(s) / Pollution Type(s): Phosphorus.

Trade Types: If implemented, both the Cumberland and Colfax efforts would be point/nonpoint trades. Approximately 80% of the phosphorus loadings to the watershed are from nonpoint sources, thus the POTWs are seeking to contract with landowners to implement BMPs.

Stage of Implementation: The Red Cedar project started in 1994. A basin water quality model that assigns approximate loading rates to different land uses was developed. The watershed was chosen as a pilot for the Wisconsin program in 1997/1998. Cumberland is surveying nonpoint sources, evaluating BMPs, and pursuing trades with landowners. The city has submitted a report on its proposed trading project to the Wisconsin Department of Natural Resources but has not yet contracted with any landowners. Colfax is investigating trading and will submit a proposal to the Wisconsin DNR similar to the Cumberland proposal.

Relation to TMDL: TMDL development will begin within two years based on past and ongoing modeling.

Number of Potential Participants: The City of Cumberland and the Village of Colfax, their respective county Land Conservation Departments, and multiple nonpoint sources.

Trading Ratios: 2:1. Cumberland must reduce watershed phosphorus loads by an amount equal to twice what they would need to abate in the absence of trading.

Estimated Cost Savings: The economics of the trading program are being investigated and administrative costs are being tracked separately.

Available Written Information: The first and second annual reports to the Governor from the Wisconsin DNR are available. A brief description is available from the Great Lakes Trading Network.

Innovative Aspects: The project is part of a State-wide project to evaluate trading (discussed in this report). The City of Cumberland's permit requires that the City either commit to trading or implement controls at the plant to achieve the 1 mg/L standard. A detailed agreement between the WI DNR and the City pursuant to the permit subsequently established many specifications for the trading program, including dates by which the City must obtain commitments for the trades (October 1, 2000) and must implement the trades (October 1, 2001). The City may discontinue this trading agreement at any time, but if so, it must construct phosphorus removal facilities at the treatment plant during the following construction year.

Obstacles: Lack of substantial interest on the part of farmers, many of whom are wary of entering into long term agreements.

Web Sites: Red Cedar: http://www.epa.gov/surf2/hucs/07050007/
Lowe Chippewa: http://www.epa.gov/surf3/hucs/07050005/
http://clean-water.uwex.edu/lowerchip/redceder.htm

Contact: Mary Anne Lowndes, WI DNR (608) 261-6420, lowndm@dnr.state.wi.us

ROCK RIVER BASIN PILOT TRADING PROGRAM (WI)

Nature of Activity: A watershed-wide pilot trading project is being developed in the Rock River Basin as part of the State of Wisconsin's program to investigate trading. The Rock River Watershed Partnership, a stakeholder group in the Basin, is spearheading the program. The Partnership is not a legal entity, thus the POTWs in the basin that may need to achieve nutrient load reductions formed a separate group to raise funds to conduct studies. The Partnership includes the POTWs but represents a broader group. A Partnership committee has examined nearly fifty separate issues concerning trading. In 1997 the Partnership entered into a Memorandum of Understanding (MOU) with the Wisconsin DNR that stated, among other things, that the DNR will not pursue point sources for additional reductions in loadings of phosphorus or other pollutants if the reductions can be achieved more cost-effectively through control strategies for non-point sources. The MOU also called for investigating effluent trading as a possible approach for achieving reduced nutrient loads.

Environmental Problem: General water quality in the basin.

Pollutant(s) / Pollution Type(s): Currently phosphorus is the pollutant being studied, however, a successful program may encourage development of trading for other pollutants.

Trade Types: Both point/point and point/nonpoint trades are being investigated, though the latter seem most promising.

Stage of Implementation: Development of the program began in 1996 when the Partnership was formed by several municipalities that were evaluating phosphorus control measures in the basin. In January, 1996, the WI DNR concluded a MOU with the World Resources Institute to study the basin. In January, 1997, the Partnership entered into an MOU with the WI DNR to find solutions to water quality issues. Modeling and monitoring have been underway for approximately a year. Each of the POTWs must decide before May, 2000, whether it will participate in a trade. Those that participate must complete a trade before 2002; those that decide not to participate must upgrade their facilities by October, 2002.

Relation to TMDL: TMDL development for some segments of the basin will commence within two years. There is no explicit relationship now between the trading program that is being explored and the plans for TMDLs. The Rock River Partnership's meeting notes reflect some concern about how trading contracts and obligations may be affected if they predate TMDL obligations.

Number of Potential Participants: Over sixty participants had committed to the program as of late 1999; of these, 24 are POTWs and the remainder are counties, industries and environmental groups.

Trading Ratios: A range of ratios from 1.6:1.0 to 3.7:1.0 will be employed depending on a variety of factors such as location and impact on the receiving waters.

Estimated Cost Savings: Potential cost savings are being analyzed. WRI found that effluent trading had the potential to be very cost-effective, but studies of savings to specific POTWs or from specific BMPs have not yet been conducted.

Available Written Information: The first and second annual reports to the Governor from the Wisconsin DNR are available. Several updates on the Rock River program are available from the Partnership.

Innovative Aspects: The Partnership has explicit goals, including identifying the least-cost-mix of solutions. Participants are being asked to help pay for modeling and monitoring to "buy in" to the trading program. Active participation in the program allows permitted facilities to defer upgrades.

Obstacles: The costs for the studies were more substantial than originally anticipated and securing funding has been difficult. Establishing the trading ratios was difficult as well.

Web Sites: Crawfish: http://www.epa.gov/surf2/hucs/07090002/
http://clean-water.uwex.edu/rrp/
http://clean-water.uwex.edu/rockriver/

Contacts: Mary Anne Lowndes, WI DNR, (608) 261-6420, lowndm@dnr.state.wi.us
Suzanne Wade, Rock River Partnership (920) 674-8972, sswade@facstaff.wisc.edu

APPENDIX 1: PROJECTS LISTED BY STAGE OF IMPLEMENTATION

Project	Other	Program Under Development			Program Approved	Program Being Implemented			Page
		studies undertaken	under discussion	finalplanning		specific trade mechanism approved	trade implementation under way	trade(s) completed	
Boulder Creek Trading Program						T	T	T	4
Cargill and Ajinomoto Plants Permit Flexibility						T	T	T	12
Cherry Creek Basin Trading Program						T	T	T	6
Grassland Area Tradable Loads Program						T	T	T	1
Lake Dillon Trading Program						T	T	T	8
Passaic Valley Sewerage Commission Effluent Trading Program						T	T	T	27
Rahr Malting Permit						T	T	T	22
Tampa Bay Cooperative Nitrogen Management						T	T	T	11
Tar-Pamlico Nutrient Reduction Trading Program						T	T	T	26
Truckee River Water Rights and Offset Program						T	T	T	28
Kalamazoo River Water Quality Trading Demonstration						T	T		19
Henry County Public Service Authority and City of Martinsville Agreement						T			32
New York City Watershed Phosphorus Offset Pilot Programs						T			29
Southern Minnesota Beet Sugar Cooperative Plant Permit						T			23
Specialty Minerals, Inc. in Town of Adams						T			15
Wayland Business Center Treatment Plant Permit						T			17
Bear Creek Trading Program					T				3
Chatfield Reservoir Study and Trading Program					T				5
Fox-Wolf Basin Watershed Pilot Trading Program					T				35
Neuse River Nutrient Sensitive Water Management Strategy					T				25
Red Cedar River Pilot Trading Program					T				36
Virginia Water Quality Improvement Act and Tributary Strategy					T				33
Long Island Sound Trading Program		T	T	T					9
Rock River Basin Pilot Trading Program		T	T	T					37
Blue Plains WWTP Credit Creation		T	T	T					10
Michigan Water Quality Trading Rule Development	policy development	T	T	T					20
Clermont County Project		T	T						30
Lower Boise River Effluent Trading Demonstration Project		T	T						13

Project	Other	Program Under Development			Program Approved	Program Being Implemented			Page
		studies undertaken	under discussion	final planning		specific trade mechanism approved	trade implementation under way	trade(s) completed	
San Francisco Bay Mercury Offset Program		**T**	**T**						2
Town of Acton POTW		**T**	**T**						16
Maryland Nutrient Trading Policy	policy development	**T**	**T**						18
Wisconsin Effluent Trading Rule Development	pilots active	**T**	**T**						34
Minnesota River Nutrient Trading Study	study	**T**							21
Chesapeake Bay Nutrient Trading Program	early discussion								24
Delaware River Basin Trading Simulation	early discussion								31
Illinois Pretreatment Trading Program	inactive								14
Clear Creek Trading Program	discontinued								7

APPENDIX 2. PROJECTS SORTED BY POLLUTANTS

Project	Unspecified	Nutrients		TSS / TDS	NH_3	Temp.	pH	BOD / DO	Metals			Page
		N	P						multiple	Hg	Se	
Michigan Water Quality Trading Rule Development	other unspecified	T	T									20
Illinois Pretreatment Trading Program	Multiple											14
Delaware River Basin Trading Simulation		T	T	T	T							31
Truckee River Water Rights and Offset Program		T	T	T		T		T				28
Chesapeake Bay Nutrient Trading Program		T	T									24
Maryland Nutrient Trading Policy		T	T									18
Tar-Pamlico Nutrient Reduction Trading Program		T	T									26
Virginia Water Quality Improvement Act and Tributary Strategy		T	T									33
Blue Plains WWTP Credit Creation		T										10
Long Island Sound Trading Program		T										9
Neuse River Nutrient Sensitive Water Management Strategy		T										25
Tampa Bay Cooperative Nitrogen Management		T										11
Rahr Malting Permit			T					T				22
Town of Acton POTW			T									16
Bear Creek Trading Program			T									3
Chatfield Reservoir Study and Trading Program			T									5
Cherry Creek Basin Trading Program			T									6
Clermont County Project			T									30
Fox-Wolf Basin Watershed Pilot Trading Program			T									35
Kalamazoo River Water Quality Trading Demonstration			T									19
Lake Dillon Trading Program			T									8
Lower Boise River Effluent Trading Demonstration Project			T									13
Minnesota River Nutrient Trading Study			T									21
New York City Watershed Phosphorus Offset Pilot Programs			T									29
Red Cedar River Pilot Trading Program			T									36
Rock River Basin Pilot Trading Program			T									37
Southern Minnesota Beet Sugar Cooperative Plant Permit			T									23
Wayland Business Center Treatment Plant Permit			T									17
Wisconsin Effluent Trading Rule Development			T									34
Henry County PSA and City of Martinsville Agreement				T								32
Boulder Creek Trading Program					T	T	T					4
Cargill and Ajinomoto Plants Permit Flexibility					T			T				12
Specialty Minerals, Inc. in Town of Adams						T						15
Passaic Valley Sewerage Commission Effluent Trading Program									T			27
Clear Creek Trading Program									T			7
San Francisco Bay Mercury Offset Program										T		2
Grassland Area Tradable Loads Program											T	1

APPENDIX 3. PROJECTS LISTED BY NATURE OF ACTIVITY AND PROJECT NAME

Project	Activity Description	Page
Clear Creek Trading Program	Discussions on watershed trading program	7
Chesapeake Bay Nutrient Trading Program	Large watershed trading program	24
Long Island Sound Trading Program	Large watershed trading program	9
Cargill and Ajinomoto Plants Permit Flexibility	NPDES permit flexibility	12
New York City Watershed Phosphorus Offset Pilot Programs	Offset pilot programs	29
Rahr Malting Permit	Offset for 1 discharger	22
Southern Minnesota Beet Sugar Cooperative Plant Permit	Offset for 1 discharger	23
Specialty Minerals, Inc. in Town of Adams	Offset for 1 discharger	15
Town of Acton POTW	Offset for 1 discharger	16
Truckee River Water Rights and Offset Program	Offset for 1 discharger	28
Wayland Business Center Treatment Plant Permit	Offset for 1 discharger	17
Clermont County Project	Potential regional trading project	30
Illinois Pretreatment Trading Program	Pretreatment program	14
Passaic Valley Sewerage Commission Effluent Trading Program	Pretreatment program	27
San Francisco Bay Mercury Offset Program	Regional offset program	2
Tampa Bay Cooperative Nitrogen Management	Regional cooperation	11
Blue Plains WWTP Credit Creation	Single trade	10
Henry County PSA and City of Martinsville Agreement	Single trade	32
Maryland Nutrient Trading Policy	State-wide trading program	18
Michigan Water Quality Trading Rule Development	State-wide trading program	20
Virginia Water Quality Improvement Act and Tributary Strategy	State-wide trading program	33
Wisconsin Effluent Trading Rule Development	State-wide trading program	34
Bear Creek Trading Program	Watershed trading program	3
Boulder Creek Trading Program	Watershed trading program	4
Chatfield Reservoir Trading Program	Watershed trading program	5
Cherry Creek Basin Trading Program	Watershed trading program	6
Delaware River Basin Trading Simulation	Watershed pilot program	31
Fox-Wolf Basin Watershed Pilot Trading Program	Watershed pilot program	35
Grassland Area Tradable Loads Program	Watershed trading program	1
Kalamazoo River Water Quality Trading Demonstration	Watershed pilot program	19
Lake Dillon Trading Program	Watershed trading program	8
Lower Boise River Effluent Trading Demonstration Project	Watershed trading program	13
Minnesota River Nutrient Trading Study	Watershed trading study	21
Neuse River Nutrient Sensitive Water Management Strategy	Watershed trading program	25
Red Cedar River Pilot Trading Program	Watershed pilot program	36
Rock River Basin Pilot Trading Program	Watershed pilot program	37
Tar-Pamlico Nutrient Reduction Trading Program	Watershed trading program	26

APPENDIX 4. PROJECTS LISTED BY CONTACT NAME

Contacts	Project	Page
Abu-Saba, Khalil	San Francisco Bay Mercury Offset Program	2
Anderson, Wayne	Rahr Malting Permit	22
Anderson, Wayne	Southern Minnesota Beet Sugar Cooperative Plant Permit	23
Austin, Susan	Grassland Area Tradable Loads Program	1
Bailey, Walter	Blue Plains WWTP Credit Creation	10
Batchelor, David	Kalamazoo River Water Quality Trading Demonstration	19
Batchelor, David	Michigan Water Quality Trading Rule Development	20
Benson, James	New York City Watershed Phosphorus Offset Pilot Programs	29
Braasch, Paul	Clermont County Project	30
Downing, Jane	Specialty Minerals, Inc. in Town of Adams	15
Downing, Jane	Town of Acton POTW	16
Downing, Jane	Wayland Business Center Treatment Plant Permit	17
Eckenrod, Richard	Tampa Bay Cooperative Nitrogen Management	11
Faeth, Paul	Minnesota River Nutrient Trading Study	21
Gannon, Rich	Tar-Pamlico Nutrient Reduction Trading Program	26
Goodrich, Dave	Neuse River Nutrient Sensitive Water Management Strategy	25
Gorski, Wayne	Clermont County Project	30
Halley, Doug	Town of Acton POTW	16
Johnson, Bruce	Fox-Wolf Basin Watershed Pilot Trading Program	35
Karkoski, Joe	Grassland Area Tradable Loads Program	1
Kearney, Virginia	Maryland Nutrient Trading Policy	18
Kennedy, John	Blue Plains WWTP Credit Creation	10
Kennedy, John	Virginia Water Quality Improvement Act and Tributary Strategy	33
Lowndes, Mary Anne	Fox-Wolf Basin Watershed Pilot Trading Program	35
Lowndes, Mary Anne	Red Cedar River Pilot Trading Program	36
Lowndes, Mary Anne	Rock River Basin Pilot Trading Program	37
Lowndes, Mary Anne	Wisconsin Effluent Trading Rule Development	34
Marshall, Chuck	Delaware River Basin Trading Simulation	31
McGovern, Cheryl	Truckee River Water Rights and Offset Program	28
McKee, Bill	Lake Dillon Trading Program	8
Norbeck, Carl	Clear Creek Trading Program	7
Parachini, Dick	Bear Creek Trading Program	3
Parachini, Dick	Chatfield Reservoir Study and Trading Program	5
Parachini, Dick	Cherry Creek Basin Trading Program	6
Park, Jim	Illinois Pretreatment Trading Program	14
Parsons, Greg	Boulder Creek Trading Program	4
Peterson, Larry	Lower Boise River Effluent Trading Demonstration Project	13
Pinkham, Jim	Fox-Wolf Basin Watershed Pilot Trading Program	35
Reiter, Lisa	Clermont County Project	30
Scally, Paul	Delaware River Basin Trading Simulation	31
Schary, Claire	Lower Boise River Effluent Trading Demonstration Project	13
Sedgley, Dick	Henry County Public Service Authority and City of Martinsville Agreement	32
Siegel, Stan	Passaic Valley Sewerage Commission Effluent Trading Program	27
Tedesco, Mark	Long Island Sound Trading Program	9
Templeton, Mike	Neuse River Nutrient Sensitive Water Management Strategy	25
Tunis, Catherine	Passaic Valley Sewerage Commission Effluent Trading Program	27
Turkle, Ralph	Cargill and Ajinomoto Plants Permit Flexibility	12
Wade, Suzanne	Rock River Basin Pilot Trading Program	37
Wiedeman, Allison	Chesapeake Bay Nutrient Trading Program	24
Wyatt, Lane	Lake Dillon Trading Program	8

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