

NUTRIENT TRADING RESOURCE DIRECTORY

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What is Nutrient Trading?

Nutrient Trading is a market-based approach to addressing water quality goals. Nutrient Trading allows one source to meet its regulatory obligations by paying another source to reduce its emissions beyond their own requirements. Thus, total nutrient emissions are reduced at lower pollution control costs. It is the transfer of nutrient reduction “credits”, specifically those for nitrogen and phosphorus, between buyers (entities that purchase nutrient reduction credits) and sellers (entities that offer nutrient credits for sale) (Chesapeake Bay Program, 2001). Although our interests in the Mid-Atlantic are primarily focusing on nitrogen and phosphorus, nutrient trading traditionally has been used for sulfur dioxide and other pollutants. Such trading capitalizes on economies of size and the control cost differentials among and between trading sources. This approach potentially can offer better efficiencies in achieving water quality standards in a particular watershed.

Purpose of this Resource Directory

This Nutrient Trading Resource Directory points readers to a core set of information generated by the U.S. Environmental Protection Agency, the states in the Mid-Atlantic Regional Water Quality Program and other state efforts. The federal and state nutrient trading programs in the Mid-Atlantic region are summarized in this directory. The links for each program contain useful information on programs and efforts.

This directory does not attempt to analyze independently the complexity, applicability, or options on nutrient trading. These issues are covered in a separate analysis on the subject. A few notable case studies are provided for the reader along with a summary of what is underway in each of the Mid-Atlantic States.

EPA’s National Role in Nutrient Trading

In 1972, the Clean Water Act was enacted to restore and maintain the integrity of the nation’s waters. The Act established interim goals and a national policy for development and implementation of programs that use point and nonpoint source controls to meet those goals. The States maintain the primary responsibilities and rights to prevent, reduce and eliminate water pollution (US EPA Trading Policy, 2003).

EPA published its *Water Quality Trading Policy* in 2003 to encourage states, interstate agencies and tribes to develop and implement trading programs for nutrients, sediments and other pollutants. Trading programs should be promoted where opportunities exist to reduce pollutants and achieve water quality improvements and reduce costs. EPA trading policy encourages voluntary trading programs that facilitate the implementation of Total Maximum Daily Loads (TMDLs), reduce the cost of Clean Water Act compliance and create incentives for voluntary discharge reductions (US EPA Trading Policy, 2003).

EPA’s Water Quality Trading Policy states that the Agency supports trading when it:

- Achieves early reductions and progress towards water quality standards pending development of TMDLs for impaired waters.
- Reduces the cost of implementing TMDLs through greater efficiency and flexible approaches.

- Establishes economic incentives for voluntary pollutant reductions from point and nonpoint sources within a watershed.
- Reduces the cost of compliance with water quality-based requirements.
- Offsets new or increased discharges resulting from growth in order to maintain levels of water quality that supports designated uses.
- Secures long-term improvements in water quality through the purchase and retirement of credits by any entity.

Resources

US Environmental Protection Agency - Office of Water

National Water Quality Trading Program

- This site provides background information on EPA's Water Quality Trading Program and links to projects and archives. <http://www.epa.gov/owow/watershed/trading.htm>
- This site contains materials and presentations from the July 2003 National Forum on Water Quality Trading. <http://www.epa.gov/owow/watershed/trading/conferences.html>

2003 Water Quality Trading Policy

- This site provides information on EPA's *2003 Water Quality Trading Policy*, fact sheets, press releases and links to other information. <http://www.epa.gov/owow/watershed/trading/tradingpolicy.html>
- This link will take you directly to the 2003 Policy (Adobe PDF format). <http://www.epa.gov/owow/watershed/trading/finalpolicy2003.pdf>

Watershed-Based NPDES Permitting

- This link provides background information on watershed-based NPDES permitting and the relation to trading as well as multiple case studies of its use. <http://cfpub2.epa.gov/npdes/wqbasedpermitting/wspermitting.cfm>

Office of Science and Technology, Engineering and Analysis Division

- Draft *Strategy for National Clean Water Industrial Regulations* (Adobe PDF format). <http://www.epa.gov/guide/strategy/304mstrategy.pdf>



Chesapeake Bay Program

The EPA Chesapeake Bay Program (CBP), created in 1983, is a partnership of Maryland, Virginia, Pennsylvania, the District of Columbia, EPA and the Chesapeake Bay Commission. The Program was created to lead and direct the restoration of the Chesapeake Bay.

In 1995, the CBP first addressed nutrient trading by sponsoring “Market-based Strategies and Nutrient Trading” workshops. In 1999, the CBP organized a multi-stakeholder Nutrient Trading Negotiation Team to explore the possibility of nutrient trading in the Chesapeake Bay watershed (CBP Trading Guidelines 2001). The team developed a set of principals and guidelines for nutrient trading. In 2001, the Chesapeake Executive Council (Governors of Maryland, Virginia and Pennsylvania, the Mayor of the District of Columbia, the EPA Administrator and the Chair of the Chesapeake Bay Commission) endorsed the CBP’s *Nutrient Trading Fundamental Principals and Guidelines*.

World Resources Institute (WRI) received a grant from EPA’s Chesapeake Bay Program Office in 2002 to develop a pilot software prototype of NutrientNet for the Potomac River watershed. NutrientNet is an online website to facilitate watershed-based nutrient trading. NutrientNet provides users with rules, contacts, privacy agreements, and posts to allow buyers and sellers to meet.

WRI was to develop a Memorandum of Understanding with the State Agency and other stakeholders to support development of NutrientNet in one of the sub-watersheds of the Chesapeake Bay. An MOU was signed in August 2003 with WRI, Metropolitan Council of Governments, Maryland Department of the Environment, Maryland Department of Agriculture and the Maryland Department of Natural Resources.

At this time, no trades have resulted from the Chesapeake Bay Program’s nutrient trading program.

Resources

Chesapeake Bay Program – Nutrient Trading Program

- This site provides background information on the Chesapeake Bay Program’s nutrient trading program as well as links to other sources of information.
<http://www.chesapeakebay.net/trading.htm>
- *Chesapeake Bay Program Nutrient Trading Fundamental Principals and Guidelines* (2001). (Adobe PDF Format)
<http://www.chesapeakebay.net/pubs/subcommittee/nsc/final15guidancedoc.pdf>
- *Nutrient Trading for the Chesapeake Bay* (2001 PowerPoint).
<http://www.chesapeakebay.net/pubs/subcommittee/nsc/tradingpres/index.htm>
- This link provides materials for the June 14, 2001 Nutrient Trading Workshop.
<http://www.chesapeakebay.net/info/nutrienttrading06142001.cfm>
- *Nutrient Trading In the Chesapeake Bay Watershed Public Workshop Proceedings* (Adobe PDF Format).
http://www.chesapeakebay.net/pubs/subcommittee/nsc/Combined_Workshop_Proceedings.PDF

World Resources Institute

- NutrientNet is a project of the World Resources Institute. This site provides information on the nutrient trading process and trading markets including the Potomac River. <http://www.nutrientnet.org>



STATE NUTRIENT TRADING PROGRAMS AND POLICIES

DELAWARE

Nutrient trading is currently not included in Delaware's TMDL program. However, nutrient trading is seen as a possible alternative during the implementation phase of the Inland Bays TMDL (DNREC Factsheet, 2000). DNREC has indicated that trading should be considered as one of several options in reducing phosphorus and/or nitrogen as long as any trading is tightly regulated to ensure true net reductions within the Inland Bays watershed.

Resources

Delaware Department of Natural Resources and Environmental Control

- This fact sheet is available from DNREC and provides a definition for nutrient trading along with some explanation of principles and issues. (Adobe PDF Format)
http://www.dnrec.state.de.us/water2000/Sections/Watershed/ws/fact_nc_nutrient_trading.pdf
- State of Delaware's TMDL Program. Link provides information to the state's TMDL program.
<http://www.dnrec.state.de.us/water2000/sections/watershed/tmdl/tmdlinfo.htm>.
- *An Industry In A Bind*. Fact Sheet discusses some elements of nutrient trading pertaining to Delaware. (Adobe PDF Format) http://www.dnrec.state.de.us/water2000/sections/watershed/ws/8_vlasic.pdf.



MARYLAND

The State of Maryland drafted a nutrient trading concept paper in August 1997. The Maryland Departments of the Environment, Agriculture, and Natural Resources, in conjunction with the Patuxent River Commission are currently exploring the development of a nutrient trading program. Although, the concept of trading is not new, the April 2003 nutrient allocations associated with the Chesapeake Bay 2000 Agreement have created interest in whether a nutrient trading program could assist Maryland in attaining its nutrient reduction commitments (MDE, 2003).

A World Environment Research Foundation (WERF) study in 2002 evaluated whether a trading option could enable Biological Nutrient Reduction (BNR) plants to achieve a 62.5% nitrogen reduction over 1985 loads more cost-effectively than if all plants treated to 5 mg/L or better. The study also looked into the role of nonpoint sources-agricultural, urban, and rural-could selling credits to achieve a 62.5% nitrogen reduction (WERF, 2002). The study found that trading could result in cost savings between \$9 million and \$12 million annually if all plants went from 8 mg/L to 5 mg/L without trading.

The Maryland Department of the Environment held a Nutrient Trading Forum on March 26, 2003 to investigate the concept of nutrient trading. This forum was designed for the Maryland stakeholders to discuss issues of designing a trading program, lessons learned from other programs in the country, relationships with the Chesapeake Bay Program and goal setting.

Resources

Maryland Department of the Environment

- This site provides links to many documents related to the Maryland Nutrient Trading Program.
<http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/home/Nutrient%20Trading%20Exploration.asp>.

Maryland Department of Natural Resources

- Maryland Tributary Strategies call for the state to look into the benefits of nutrient trading.
<http://www.dnr.state.md.us/bay/tribstrat/index.html>.

World Environment Research Foundation

- This link provides information on the WERF study of *Nitrogen Credit Trading in Maryland: A Market Analysis for Establishing a Statewide Framework*.
https://www.werf.org/acb/showdetl.cfm?&DID=7&User_ID=71201&st=1203&st2=88954066&st3=-38914255&CATID=1&Product_ID=214&count=8&Pcount=21&DETAIL=1



PENNSYLVANIA

In 1999, PA began its participation on a negotiation team sponsored by the Chesapeake Bay Program to develop a nutrient trading program for the Chesapeake Bay watershed. The team efforts led to the adoption of the *Chesapeake Bay Program Nutrient Trading Fundamental Principles and Guidelines* document in 2001 (PA Strategy 2002).

In August of 2000, Pennsylvania's Joint Legislative Air and Water Pollution Control and Conservation Committee held a public hearing on trading in response to House Resolution 361 of 2000, which directed the Joint Legislative Air and Water Pollution Control and Conservation Committee to evaluate the feasibility and advisability of establishing a voluntary water quality credits and trading program as an incentive for achieving point and nonpoint source pollution reductions beyond those required by Federal and State clean water laws and to promote cooperative community-driven watershed management planning. The Committee recommended that PA Department of Environmental Protection (DEP) establish a watershed-based nutrient trading pilot program to help identify trading program elements. The plan was to be developed by the DEP and a stakeholder group consisting of persons representing point sources, nonpoint sources, environmental organizations and watershed associations.

This trading initiative involved a trading pilot in the Conestoga River watershed with the intent to develop a framework to guide trading in any Pennsylvania watershed (PA Nutrient Credit Discussion Paper, 2003). DEP is responsible for oversight and management of the Pennsylvania trading program, including decisions on issues such as eligibility, credit certification, verification, compliance monitoring and enforcement. Individual trading projects must be approved by DEP. In order to help facilitate alignment with the CWA, DEP will consult with EPA throughout development and implementation of Pennsylvania's trading program. DEP will align provisions for water quality trading with the State's water quality and watershed programs (PA Nutrient Credit Discussion Paper, 2003).

The Conestoga River Nutrient Trading Pilot is the primary effort currently underway in Pennsylvania, with a major focus on developing market-based approaches that can help address not only TMDLs, but also Chesapeake Bay challenges. The project's goal is to improve environmental quality by establishing a voluntary pollution credit-trading program within the Conestoga River watershed.

The project is a partnership involving Enterprising Environmental Solutions (EESI), The Conservation Fund, the Pennsylvania Environmental Council, Environmental Defense, the Chesapeake Bay Foundation and the Pennsylvania Department of Environmental Protection (EESI, 2004).

Resources

Enterprising Environmental Solutions, Inc

- This link provides information on the Conestoga River Nutrient Trading Pilot.
<http://www.eesi21.org/market.htm#chesapeake>.

Pennsylvania Department of Environmental Protection

- *Pennsylvania's Chesapeake Bay Nutrient Reduction Strategy*. This document was released by PA DEP in June 2002 and highlights the state's strategy.
http://www.dep.state.pa.us/hosting/pawatersheds/chesapeakebay/resources/ref/nutrient/pa_nutrient_strategy/Nutrient%20Reduction%20Strategy%20FINAL%20-%202005-20-02.pdf
- Draft Discussion Paper: *Nutrient Credit Trading for Watershed Improvement*. This link provides detailed information about the Pennsylvania nutrient trading initiative.
http://www.dep.state.pa.us/dep/subject/advoun/liason/2003/pa_trading_framework_april_2003_draft.pdf



VIRGINIA

Reference to nutrient trading was first included in the statutory language for contents of a tributary strategy plan. As per Part D of [§2.2-219](#) of the Code of Virginia, cost-effectiveness (including nutrient trading) should be a consideration in the content. The 1996 Commonwealth of Virginia Shenandoah and Potomac River Basins Tributary Nutrient Reduction Strategy acknowledged that nutrient trading could allow for greater innovation in areas that seek more cost-effective reductions to achieve their share of the basin-wide reduction goal (Virginia, 1996).

In practice, water quality trading in Virginia began in the city of Williamsburg, which is currently utilizing an urban nonpoint-source trading program. Williamsburg allows developers the option of meeting their phosphorus requirements through the purchase of credits from a regional stormwater management facility. The city has constructed regional stormwater management facilities that generate the credits by reducing loads beyond existing conditions. The generated credits are sold and used to cover both the cost of construction and operation and maintenance associated with the regional control structure (Stormwater, 2003).

The Virginia Water Quality Improvement Act of 1997 was enacted by the Virginia General Assembly in response to the need to finance the nutrient reduction strategies being developed for the Chesapeake Bay and its tributaries (VA DEQ, January 2004). The Virginia Water Quality Improvement Act of 1997 allows for grants funding water quality improvements including nutrient credits. Conceptually, if a point source were to implement controls so as to discharge less than its goal under the tributary strategy, a credit could be created and banked for one year, sold to WQIF grantees, or transferred to the State for a bonus payment. If a point source fails to meet the annual performance requirements, under the act, it would be expected to repay the State a portion of the grant with interest (based on the amount of the 'overage').

Included in the initial grant guidelines for the Water Quality Improvement Fund was language promoting nutrient trading and incentives. In March 2000, members of the DEQ Director's Water Advisory Committee were briefed on the WQIF status and asked to provide names of interested members to participate in a work group to draft these guidelines. In the 2001 *Annual Report on the Virginia Water Quality Improvement Fund*, the Department of Environmental Quality agreed to publish guidelines governing the use of incentives such as nutrient credits, nutrient trading, and/or other concepts designed to encourage the Grantee to operate the Project to achieve numerical concentrations below those specified in the grant agreement. Subsequently, agency staff postponed further development of the incentive guidelines called for by the grant agreements in order to assess the influence that a Chesapeake Bay Program initiative, involving adoption of nutrient trading guidelines, may have on the market based incentives program (VA DEQ 2001 Update).

Initially, the Virginia program only included point-to-point trades, however, point to nonpoint trades could be considered under the Chesapeake Bay Program (EPA Office of Water, 1999).

Some of Virginia's Draft Tributary Strategies (Eastern Shore, James Rive and York River Basins) released in 2004 suggest that nutrient trading within sub-basins will likely be employed to achieve prescribed goals (VA DEQ, 2004)

At its meeting on August 31, the State Water Control Board (SWCB) approved for public comment regulation 9VAC25-720 (Water Quality Management Planning Regulation) and 9VAC25-40 (regulation for Nutrient Enriched Waters). As per section 9VAC25-720-40, the provisions of the Chapter and Regulation For Nutrient Enriched Waters And Discharges Within The Chesapeake Bay Watershed (9VAC25-40) constitute the nutrient reduction requirements for point source discharges in the Bay watershed to protect the Bay and its tidal rivers while section 9VAC25-720-40 provides the specific language for promoting trading and offsets. The [Draft Regulations](#) are available online from the VA DEQ website.



Example

In 1998, the Henry County Public Service Authority and the City of Martinsville entered into a cooperative agreement whereby one agreed to a reduction in its permit limit for discharging total dissolved solids so the other could have an increased permit limit. Each of the POTWs were assigned allocations for several parameters in order to protect the water quality at a downstream drinking water intake (US EPA, 1999).

The Henry County Public Service Authority requested the City of Martinsville's Sewage Treatment Plant to reduce its allocation of total dissolved solids by 20,000 kilograms per day. This allowed a "transfer" to Henry County's permit allocation thus increasing its allowable discharge by the same amount per day (US EPA, 1999).

Although this trade was approved it was never undertaken due to unrelated issues (EPA, 1999).

Resources

Stormwater: The Journal for Surface Water Quality Professionals

- *Nutrient Trading: A Bridge Over Troubled Water?* January/February 2003. This link provides information on Virginia's nutrient trading efforts in Williamsburg. http://www.forester.net/sw_0301_nutrient.html

US Environmental Protection Agency

- Link to the US EPA's watershed trading web page. From here you can locate projects and links to other information. You can also find information on conferences and specific information on the 2003 EPA Trading Policy. <http://www.epa.gov/owow/watershed/trading.htm>.

Virginia Department of Environmental Quality

- Link to the homepage for the Virginia Department of Environmental Quality Water Quality Program. <http://www.deq.virginia.gov/water/>.
- From this site you can access the Draft Tributary Strategies other elements of Virginia's Water Quality Program found on the Secretary's website: <http://www.naturalresources.virginia.gov/Initiatives/TributaryStrategies/index.cfm>
- Draft *Water Quality Management Planning Regulation* (regulation 9VAC25-720). This link will take you to the Draft version of the regulation that will be released for public comment. <http://www.deq.state.va.us/bay/9vac25720.pdf>



WEST VIRGINIA

In response to the TMDL Stakeholder Group recommendations on July 24, 2002, West Virginia Department of Environmental Protection convened a Water Quality Trading Stakeholders Committee at the University of Charleston. The main focus of this committee was to evaluate whether a water quality trading program was appropriate for the state (WV DEP 2002). The mission of the committee was to “Develop a consensus-based recommendation on whether or not a trading program is appropriate for West Virginia, and if so, to develop consensus-based recommendations on a conceptual framework for that program.” (Water Quality Trading Stakeholder Committee, 2004).

The committee agreed that load reductions to generate credits might be created by any of the following:

- Restoring or creating and maintaining a wetland;
- The installation of equipment or implementation of management practices at orphan sites of environmental contamination or legacy mining activity to control discharges to the waters of the state by a person or party that is not responsible for the contamination or liable for response activities under state and federal regulations;
- The installation, operation and maintenance of projects designated to control pollutants associated with stormwater;
- Implementation of in stream restoration or stream bank erosion control;
- Installation or enhancement of riparian buffers; or
- Other pollution controls or management practices approved by DEP.

The committee also agreed that nonpoint source reduction projects could be considered as eligible for trades, in accordance with EPA policy. When trades involved interstate waters, the committee agreed that the state’s participation in the Ohio River Valley Water Sanitation Commission (ORSANCO), the Interstate Commission on the Potomac River Basin (ICPRB) and the Chesapeake Bay Program should be used as the basis for such trading programs as long as DEP determined that those programs are comparable to those of West Virginia. Recommendations also called for trading to be allowed among public entities and within a single NPDES permit

In order to ensure compliance with water quality standards, the committee agreed that trades in 303(d) listed streams prior to TMDL development must show significant progress toward meeting water quality standards. In cases where the trade would occur after development of a TMDL, the trade must lead to compliance with all water quality standards and be consistent with the TMDL and other Clean Water Act permitting requirements. Finally, trades in unimpaired streams would need to meet all water quality standards in addition to complying with NPDES permitting regulations (Final Report WQ Trading Team, 2004).

While the group was able to reach consensus on a number of issues, it was ultimately unable to reach consensus on the question of whether water quality trading was appropriate for West Virginia (Final Report WQ Trading Team, 2004).

Cheat River

From 1999 to 2001, a stakeholder group in West Virginia participated in the development of TMDLs for the Cheat River and its tributaries. EPA Region 3 released TMDL plans for 55 segments of the Cheat River and its tributaries in 2001. The primary source of water quality impairments was the result of acid mine drainage (AMD) from the West Virginia coal mines (Downstream Strategies, 2004).

The Cheat River Watershed trading project, sponsored by EPA in 2002, is a water quality trading program encompassing multiple pollutants. Much of the nutrient pollution in the Cheat River watershed comes from nonpoint sources. The Cheat River TMDL resulted mainly from AMD.



The framework for the Cheat River trading project evolved from two years of Cheat Trading Stakeholder group meetings from 2002 to 2004. Under the framework, the main focus is to reduce acid mine drainage pollutants including iron, aluminum, manganese, zinc and acid loads. Successful trades will require the pollutant or activity meet the approval of the Cheat Watershed Restoration Authority. The trading framework calls for the creation of the Cheat Watershed Restoration Authority to develop and manage trades and other investments in water quality. The Authority would ensure that all trades reduce pollution and lead to the attainment of ecological and water quality goals (Downstream Strategies, 2004). Trades are allowed on both a “same-pollutant” and “cross-pollutant” basis. A common unit of exchange must exist when trades are made. The unit of exchange must be approved by the Cheat Watershed Restoration Authority and WV DEP. A net reduction in pollutant loads must result from all “same-pollutant” trades while net ecological benefits must result from “cross-pollutant” trades (Downstream Strategies, 2004).

Any point or nonpoint source may participate in a trade provided they meet the Cheat trading framework criteria. The framework also calls for all trades to be incorporated into NPDES permits. The overseeing agencies will be responsible for approving all trades and for ensuring that monitoring and enforcement take place (Downstream Strategies, 2004).

No trades have taken place in the Cheat watershed.

Resources

Downstream Strategies

- Link to the Cheat River Watershed trading initiative. This site provides links to all background materials, meeting minutes and agendas and reports by Downstream Technologies.
<http://www.downstreamstrategies.com/cheat.html>
- *The Potential for Water Quality Trading to Help Implement the Cheat Watershed Acid Mine Drainage Total Maximum Daily Load in West Virginia.* This link will take you directly to the report submitted to EPA Region 3 in April 2004. <http://www.downstreamstrategies.com/CheatReport.zip>
- *A Trading Framework for the Cheat River Watershed, West Virginia.* This document provides a detailed description of the trading framework for the Cheat River as developed by Downstream Strategies. <http://www.downstreamstrategies.com/CheatTradingFrameworkFINAL2-18-04.doc>

Water Environment Foundation

- *Cheat River Acid Mine Drainage TMDL Case Study: Increasing stakeholder confidence in computer models.* This document discusses nutrient trading in relation to computer TMDL models.
<http://www.wef.org/pdffiles/TMDL/Hansen.pdf>

West Virginia Department of Environmental Protection

- Link to the Water Quality Trading Stakeholder Committee’s site. The Committee is located under the West Virginia Department of Environmental Protection’s Office of Innovation. This link provides information on the progress and activities of the committee up to its final recommendation to the Cabinet Secretary in April 2004. You can also access the final report sent to WV DEP Secretary Stephanie R. Timmermeyer on April 16, 2004. <http://www.dep.state.wv.us/Item.cfm?ssid=21&SSIID=429>
- Link to the executive summary of the *Final Report of the Water Quality Trading Team*:
http://www.dep.state.wv.us/Docs/5328_Executive_Summary.pdf



CASE STUDIES

Nutrient trading initiatives in the Mid-Atlantic region are relatively new and still in the development stage. The following case studies look at some initiatives outside the region that have been successful or show promise to be in the near future. These case studies detail what a completed trading program could look like in the region.

Tar Pamlico Sound

The Tar-Pamlico River basin begins in the Piedmont of North Carolina and extends approximately 180 miles through the Coastal Plain to the Pamlico Sound. The Tar River collects flows from approximately 2,300 miles of freshwater streams before entering the estuarine Pamlico River at Washington, NC. The 5,400 square mile basin encompasses portions of 17 counties, including the cities of Rocky Mount, Tarboro, and Greenville, as well as much agricultural and forest land. In the late 1980's, increases in algal blooms and fish kills in the upper Pamlico estuary were linked to excessive nutrient levels in the River. These conditions led the state Environmental Management Commission (EMC) to designate the entire Tar-Pamlico River basin as "Nutrient Sensitive Waters" (NSW) in 1989. This designation required the state to develop a nutrient management strategy for the basin (NCDENR, February 2002).

The strategy's first phase, which ran from 1990 through 1994, produced an innovative point/nonpoint source "trading" program that allows point sources, such as wastewater treatment plants and industry, to achieve reductions in nutrient loading in more cost-effective ways. Phase I resulted in the following accomplishments:

- Nutrient loads were held beneath an annually decreasing cap, reducing overall nitrogen and phosphorus loads by about 20% despite growth by improving treatment facilities' efficiencies.

The second phase increased nutrient goals to 30% reduction in nitrogen loading from 1991 levels and holding phosphorus loading to 1991 levels. Phase II calls on nonpoint sources to contribute to these goals, and establishes a set of nonpoint source rules addressing agriculture, urban stormwater, fertilizer management across all land uses, and riparian buffer protection (NCDENR, February 2002). DWQ staff have found statistically significant reductions in both total nitrogen and total phosphorus over this time period.

The Tar-Pamlico program is not a traditional trading program. In the point-nonpoint 'trading', the dischargers pay an offset fee for each mass unit of pollutant by which they, as a group, exceed a cap each year. These offset funds go to a voluntary agricultural cost share program, and are used to pay willing farmers 75% of the cost of installing nutrient-reducing Best Management Practices (BMPs) on farms within the Basin. Thus, the Tar-Pamlico program establishes responsibility at the group level. One advantage is that individual transaction and tracking costs are reduced by using an existing program (cost share) combined with minor administrative costs of tracking the point source loads annually (NCDENR, August 2001).

Flat rate trading credits were established per kilogram of nitrogen reduced by DWQ. The rate will be reviewed every two years. All credits for structural BMPs will be for 10 years; credits for non-structural BMPs will be for 3 years. Currently, no trades have taken place.

Resources

North Carolina Department of the Environment and Natural Resources

- The following link provides information on the evolution of the Tar-Pamlico nutrient strategy to date. This website also contains links to more detailed descriptions of the program's elements.
<http://h2o.enr.state.nc.us/nps/tarpam.htm>
- Division of Soil and Water Conservation: Tar-Pamlico River Basin Nutrient Reduction Trading Program.
<http://www.enr.state.nc.us/DSWC/pages/tar-pamlico.html>.

U.S. Environmental Protection Agency

- Link to the TMDL Program and Nutrient Trading Program on the Tar-Pamlico sound.
<http://www.epa.gov/OWOW/tmdl/cs10/cs10.htm>.



Long Island Sound

In 1985, Congress appropriated funds for US EPA to research, monitor and assess the water quality of Long Island Sound through the Connecticut Department of Environmental Protection (CT DEP) and the New York State Department of Environmental Conservation (NYSDEC). Later, the Clean Water Act Amendments of 1987 allowed Long Island Sound to be classified as an “Estuary of National Significance”. Much of the efforts addressed low dissolved oxygen (hypoxia) with discharges from sewage treatment plants, atmospheric deposition and runoff being the primary sources of the nutrient enrichment in the Sound (Long Island Sound TMDL). In 1998, Connecticut, New York and the US EPA adopted a plan that called for nitrogen reduction targets of 58.5% from point and nonpoint sources with a 15-year schedule (Long Island Sound TMDL).

In 2001, the Connecticut General Assembly passed legislation that established the Nitrogen Credit Exchange Program for the Long Island Sound. This was the first of its kind in the nation (Newsletter, November 2003). An NPDES General Permit for Nitrogen Discharges was passed and issued in January 2002. The permit regulates nitrogen discharges from the 79 Publicly Owned Treatment Works (POTWs) identified in Appendix 1 of the permit (General Permit, 2002).

The framework for trades indicates that each of the POTWs covered under the General Permit is allowed an annual nitrogen discharge limit. Monitoring is used to determine if a POTW meets or exceeds its annual limit. Facilities are required to monitor total nitrogen at least weekly (General Permit, 2002). When limits are exceeded that particular facility must purchase credits to bring it into compliance with the permit. Likewise, plants that discharge less than their allocation can sell the credits their particular facility has generated. The value of credits are determined by the aggregate nitrogen removal costs (per pound) for that particular year. In 2002 this amount was \$1.62 per credit or pound of nitrogen (Newsletter, November 2003). POTWs may also purchase credits directly from CT DEP, as the agency is required under PA 01-180 to sell sufficient credits to meet compliance (General Permit Factsheet).

The Report of the Nitrogen Credit Advisory Board to the Joint Standing Environmental Committee of the General Assembly (September 2003) highlights the following achievements:

- Each of the 79 POTWs listed under the General Permit cooperated in implementing the Nitrogen Credit Exchange program.
- During 2002, Connecticut POTWs discharged an average of 15,840 pounds of nitrogen per day, which is 13% less than was projected.
- Three facilities completed nitrogen removal upgrades during 2002. Five more are scheduled to be completed in 2003.
- The Clean Water Fund financed nitrogen removal projects. The facilities with completed projects removed 2,861,852 pound of nitrogen in 2002. The combined capital, operation and maintenance costs were \$4,709,445.
- 38 POTWs purchased nitrogen credits at a cost of \$1,317,223. 39 sold credits they generated for a value of \$2,757,323. All remaining credits generated in 2002 were purchased by the State for \$1,440,100.



Resources

Connecticut Department of Environmental Protection

- Link to Connecticut's Clean Water Fund. <http://dep.state.ct.us/wtr/cwa/cwfund.htm>
- *Managing Environmental Compliance in Connecticut* – Newsletter. The November 2003 issue of this newsletter provides some background information on the Long Island Sound Nitrogen Credit Exchange. <http://dep.state.ct.us/enf/newsletter/nov03.pdf>
- *General Permit for Nitrogen Discharges*. This link will take you to the 2002 General Permit. (Adobe PDF Format). http://www.dep.state.ct.us/pao/download/watrdown/nitrogen_gp.pdf
- *General Permit for Nitrogen Discharges* – Factsheet. This factsheet summarizes the information found in the General Permit. (Adobe PDF Format). <http://www.dep.state.ct.us/wtr/lis/nitrogengp/ngpfs.pdf>
- *Report of the Nitrogen Credit Advisory Board to the Joint Standing Environmental Committee of the General Assembly*. This report, submitted in September 2003, addresses issues associated with implementation of the Nitrogen Credit Exchange Program. (Adobe PDF Format) <http://dep.state.ct.us/wtr/lis/nitrocnr/annrpt.pdf>

Nitrogen Control Program for Long Island Sound

- This link will take you to the homepage for the Nitrogen Control Program for Long Island Sound. This site provides links to many elements of the Long Island Sound TMDL, including public comments, FAQ's and fact sheets. <http://www.dep.state.ct.us/wtr/lis/nitrocnr/nitoindex.htm>
- This link will take you directly to the complete text of the Long Island Sound TMDL. <http://www.dep.state.ct.us/wtr/lis/nitrocnr/tmdl.pdf>
- *Nitrogen Credit Exchange* - Factsheet. <http://dep.state.ct.us/wtr/lis/nitrocnr/nitrcrdt.pdf>

Connecticut General Assembly

- *Public Act No. 01-180I. An Act Concerning Nitrogen Reduction In Long Island Sound*. This Act explains the establishment of the Nitrogen Credit Advisory Board. <http://www.cga.state.ct.us/2001/act/Pa/2001PA-00180-R00SB-01012-PA.htm>

Environmental Trading Network

- This site provides many useful links to access information on Long Island Sound. <http://www.envtn.org/resources.htm#programs>

US Environmental Protection Agency

- *A Summary of U.S. Effluent Trading and Offset Projects*. This report provides general information on the Long Island Sound Nitrogen Credit Exchange Program. <http://www.epa.gov/owow/watershed/trading/traenvrn.pdf>
- *Watershed-Based Permitting Case Study: Final Permit* – Fact Sheet. This fact sheet by US EPA provides a progress update on the Long Island Sound Nitrogen Credit Exchange Program. http://www.epa.gov/npdes/pubs/wq_casestudy_factsht1.pdf



Colorado River Salinity Study

The Colorado River basin covers 242,000 square miles within the United States plus an additional 2,000 in Mexico. The Colorado River supplies water to millions of people both within and outside the basin. Salinity concerns began in the 1960s. Roughly 30 million people depend on the Colorado River for water. Damages from dissolved salts exceed \$300 million per year (NRCS, 2004). In 1967, the seven states of the Colorado River basin adopted the *Guidelines for Formulating Water Quality Standards for the Interstate Waters of the Colorado System*. These guidelines addressed issues such as total dissolved solids, chlorides, sulfates and sodium. In 1971, the EPA released the results of the study of Colorado River salinity. The EPA recommended the adoption and enforcement of salinity criteria to hold the maximum mean monthly concentration of total dissolved solids at Imperial Dam at 1000 mg/l. In 1973, the basin states formed the Colorado River Basin Salinity Control Forum.

The *Colorado River Salinity Control Act* was approved on June 24, 1974. Amendments to the act were made in 1984, 1995, 1996, and 2000. Title I of this act address commitments of the United States to Mexico relating to the quality of water delivered to Mexico. Title II formed the Colorado River Basin Salinity Control Program. The Act directed the UD Departments of Agriculture and the Interior manage the river's salinity that was contributed by public lands. The Colorado River Basin Salinity Control Program reduces salinity preventing salts from dissolving and mixing with the river's flow. Improvements in irrigation and vegetation management have reduced water available to transport salts. The program also controls point source, such as saline springs. An interstate and interagency public/private partnership that includes the basin states, federal agencies and water users, works to reduce salts in the river (NRCS, 2004).

The basin states provide up to 30 percent of the up-front cost share for the federal programs. The Department of Agriculture provides much of the up-front cost share to agriculture producers that implement land management and irrigation practices that reduce salt loadings. Within the Department of the Interior, the Bureau of Reclamation was responsible for multiple salinity control projects. Through 1995 amendments of the 1974 Act, the Bureau was able to promote competition through a Basinwide Salinity Control Program. This resulted in large cost savings. Congress authorized \$75 million to the program in 1995 and an additional \$100 million in 2000. The Department of the Interiors Bureau of Land Management is charged with implementing a comprehensive program to reduce salt loading to the Colorado River. Efforts are made to minimize the impacts of grazing, reduce the impacts of off-road vehicle use, protect riparian areas, and management of vegetative cover.

As of 2000, it was estimated that the combined efforts resulted in a salt loading reduction of 772,627 tons per year. This reduction corresponds with annual damage costs being reduced approximately \$88 million per year. As of 2000, nearly 50 percent of the targeted salinity control had been achieved. Reductions in salinity have reduced corrosion of plumbing fixtures, improved wastewater discharge quality (allowing plants to meet permits), resulted in improvements in agricultural productivity and water efficiency, and allowed for the longer life of utility treatments facilities and pipelines (NRCS Brochure, 2000).

In order to meet the salinity control goals in 2020 at the Hoover Station, the Colorado River Basin Salinity Control Forum established a new level of salinity control. The new target will require 1,800,000 tons of salinity control. This will require 1,000,000 tons of new controls to be added to those already in place (Progress Report #21).

Resources

Environmental Protection Agency

- *Regulation No. 39: Colorado River Salinity Standards*. This regulation establishes the water quality standards for salinity in the Colorado River basin.

http://www.epa.gov/wqsdatabase/demo/docs/co_8_no39.pdf



Natural Resources Conservation Service

- This site provides information on the Colorado River Basin Salinity Control Program.
<http://www.nrcs.usda.gov/programs/salinity/>
- *Colorado River Basin Salinity Control Program Brochure*. This brochure provides information on the history and program of salinity control in the basin.
<http://www.nrcs.usda.gov/programs/salinity/CRBSCP%20Brochure.pdf>

Bureau of Reclamation

- This site contains information on the program as well as the latest annual reports showing progress in the six USDA Colorado River Basin Salinity Control Projects administered by NRCS. Numerous documents and data are available for download from this site.
<http://www.usbr.gov/uc/progact/salinity/index.html>
- *Dataweb for the Colorado River Basin Salinity Control Program*. This site provides a great deal of information and details some of the projects. <http://www.usbr.gov/dataweb/html/crwq.html>
- *Quality of Water – Colorado River Basin Progress Report No. 21*. This document is the most recent progress report from the US Department of the Interior, published in January 2003.
<http://www.usbr.gov/uc/progact/salinity/pdfs/PR21Final08042004.pdf>

Colorado River Board of California

- This site provides information on the activities of the Colorado River Board in California.
<http://www.crb.ca.gov/>

