Further Details of the Four Successful Water Quality Trading Projects

North Carolina Tar-Pamlico River Basin program – Nutrient (N&P) Trading

Details

Watershed area: 5450 sq miles

Land cover: 2% urban, 23% agriculture, 55% forest, 20% water

Population density: 80/sq mi; 2 towns > 50,000

Problem: Algal blooms and fish kills in upper Pamlico estuary were linked to excessive nutrient levels in Tar-Pamlico River, and exceedance of chlorophyll-*a* water quality standard.

Pollutants traded: Nitrogen and Total Phosphorus

Accomplishment: 1991-2003: total nutrient loading declined 33% while flow increased 48%. Net cost of program was less than $2 million, compared to estimated cost of command and control approach of 50 to 100 million dollars. The loading reduction has been achieved mostly through the "bubble" approach which set a collective cap for dischargers, allowing informal PS/PS trading; little PS/NPS trading has occurred.

TMDL: There is not a TMDL for the Tar-Pam River. There is a TMDL for nitrogen and phosphorus for Tar-Pamlico Estuary. However this was a very early TMDL and predated the current TMDL process. (Michelle Woolfolk, personal communication, March 1, 2005).

Trading framework: This is not a standard trading program where individual PS and NPS trade directly with each other. The program is similar to an exceedance tax on an association of point sources, the proceeds of which are applied to more cost-effective NPS controls like BMPs.

In phase 1 (1991-1994) PS dischargers formed an association to meet a collective and declining cap for nutrients. In phase 2 (1995-2004) the collective cap changed from a declining to a steady cap. Phase 2 also set NPS reduction requirements. Phase 3 (2005-2014) maintains the steady cap principle and adjusts the numbers to reflect current Association membership.

The Association framework gives PS dischargers flexibility to find cost-effective ways to reduce collective nutrient discharge and meet the cap. Association members can trade freely among themselves to meet the collective cap. If the Association exceeds

collective cap, they must fund NPS controls. In Phase 2, a buyer could choose to fund agricultural or non-agricultural NPS controls. The first 2 years of Phase 3 will target agricultural NPS controls, after which non-agricultural NPS will be reconsidered as an option.

The program reports annually to the state Department of Environmental Management (DEM).

Risk Allocation: The Association bears the risk to meet the collective cap. The State bears the risk to ensure Association payments get translated into NPS load reductions.

Cost of credit: Phase 1 cost of credit was $56/kg of nutrient. Phase 2 cost of credit reduced to $29/kg of nitrogen, its value to be revisited every 2 years. Cost was calculated based on removing 1 kg of nutrient per year via BMP, and includes a safety factor. In Phase 1, the Association made additional minimum payments to the BMP cost share program fund. Currently the credit life is 3-10 years, depending on the type of NPS control funded. Phase 1 credits were carried over to Phase 2. Phase 3 will set separate credit values for nitrogen and phosphorus, and fine tune the formula to calculate credit value.

Permits: The Association does not have a group permit. Instead it has a legally binding agreement with NC DWQ and EPA. Each discharger has a NPDES permit. Association members' permits do not include limits for nitrogen or phosphorus. Individual Association members' nutrient limits were waived since they are subject to a collective cap. PSs not in Association are subject to separate limits.

PS involvement: PS dischargers formed the Tar-Pamlico Basin Association in 1989 to meet goals of state nutrient strategy. This allowed the facilities to operate within a "bubble". 15 dischargers are now in the Association, equaling about 99% of all PS flows to the river. To date, the Association has paid about $1.2M through trading.

NPS involvement: Phase 2 included NPS reduction goals. Based on unsatisfactory results of NPS load monitoring, state established a set of required NPS rules addressing agriculture, urban stormwater, fertilizer management across all land uses, and riparian buffer protection. Farmer implementation of NPS rules is overseen by Basin Oversight Committee and Local Advisory Committee. Farmers were dissatisfied with the Phase 2 changes to trading program. The farmers disliked the required NPS reductions and NPS load accounting uncertainty, while the BMP cost share program received less money

from the Association than in Phase 1 and the credit value decreased almost 50%. Phase 3 addresses the farmers' grievance by targeting the funding of agricultural BMPs and DSWC staffing as the main options available to a credit buyer. Funding of non-agricultural NPS controls will be revisited after 2 years of Phase 3.

NGO involvement: Discharger association Phase 1 trading proposal was endorsed by Environmental Defense Fund and Pamlico Tar River Foundation. Although these NGOs did not endorse Phase 2, they will endorse Phase 3.

Hot spot avoidance: DWQ reserves right to require nutrient removal of a facility to eliminate a hot spot.

Liability: Once PS have purchased credits, they are no longer liable. State assumes responsibility for monitoring and verification of BMPs.

Monitoring: PS dischargers conduct weekly sampling and annual reporting to DEM. NPS programs are reviewed every 5 years by DSWC. Soil and Water Conservation District inspect at least 5% of contracts annually.

Sources

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Neuse River Basin program – Nitrogen Trading

Details

Watershed area: 6192 sq miles

Land cover: 8% urban, 23% agriculture, 56% forest, 10% water

Population density: 211 persons/sq. mi.

Problem: Excess nutrient loading and eutrophication; Need to reduce TN loading to Neuse River Estuary

Pollutants traded: Nitrogen

Accomplishment: Compliance Association of PS dischargers has met its collective nitrogen cap at lower cost than command and control approach; Larger facilities reduced N loads by approx. 50%.

TMDL: Phase II TMDL for TN in Neuse River estuary approved in 2002. Set allocations for each PS in the watershed, using transport factors based on distance from each PS to endpoint.

Trading framework: Like the Tar-Pamlico program, the main feature of the Neuse program is more like an exceedance tax on a group of dischargers than a direct trading program. Compliance Association members can informally trade point to point with each other to meet the collective TN cap. If the Association exceeds their collective cap for TN, they must make offset payments to the Wetlands Restoration Fund, representing an indirect PS/NPS trade. Association members can also trade directly with non-member PSs.

Risk Allocation: The Association bears the risk to meet the collective cap. The State bears the risk to ensure Association payments get translated into NPS load reductions.

Cost of credit: $11/lb of nitrogen per year, representing a 2:1 trading ratio compared to least cost-effective nutrient BMPs. “New and expanding dischargers that acquire allocation must pay 200% of that rate and purchase 30 years’ allocation prior to applying for an NPDES permit” [Breetz (2004) et al., p.222].

Permits: Compliance Association of PS dischargers was established in 2002. Association has 22 members, as of 2002. Association received a NPDES permit in 2003 which sets a collective cap for TN load to the estuary. If the Association exceeds the cap, it must make offset payments to the Wetlands Restoration Fund. This offsets intensifying land development in the watershed.

Association members have individual TN allocations. A member is in compliance: if the Association does not exceed the cap, or if the Association does exceed the cap but the member has not exceeded its individual allocation. A member is in non-compliance and subject to State enforcement if: the Association exceeds the cap, and that member has exceeded its TN allocation. Regardless of cap exceedance, Association internally charges penalty fees to any member who exceeds its individual TN allocation, on a scale which increases annually.

Members continue to have NPDES permits for other parameters.

PS involvement: PS dischargers formed the Compliance Association to meet a collective TN cap, which is the sum of their individual TN allocations. Individual TN allocations are based on a transport factor, which considers distance of the PS to the estuary. Association members can either trade internally, or trade directly with non-member PSs. New or expanding dischargers can either negotiate allocation purchases from other PSs, or make offset payments to the Wetlands Restoration Fund at 200% the rate.

NPS involvement: Landowners voluntarily participate in the Wetlands Restoration Fund. Agricultural BMPs are not eligible for trading within this program. Trading with farmers was not authorized because of concern they could not meet their own 30% NPS reduction requirement and generate excess credits to sell.

NGO involvement: Involvement of Neuse River Foundation and Neuse Riverkeepers, both environmentalist organizations.

Hot spot avoidance: TMDL is based on improving water quality at the endpoint, the estuary. The TMDL sets transport factors for each PS. This establishes water quality equivalence parameters that only target water quality at endpoint. Hot spots could theoretically occur *between* the PS and endpoint, despite water quality being met at the endpoint.

As a solution, DWQ will continue observing the watershed and use adaptive management to compensate for TMDL uncertainty, in order to mitigate potential hot spots. In addition, the Association mechanism to penalize members who do not meet their individual allocations serves to avoid hot spots.

Liability: Association members are not liable for other members' non-compliance. State is responsible for ensuring Association offset payments result in NPS nitrogen reduction.

In addition to offset payments, the Association is subject to penalties and other enforcement action for any exceedance.

Monitoring: Association members submit monthly DMR reports to DWQ. Association submits mid-year, year-end, and five-year reports.

Sources

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Long Island Sound (CT) Nitrogen Trading Program

Details

Watershed area: Entire state of Connecticut; approx. 5000 sq. miles. (The Long Island Sound watershed comprises several states, but only CT is part of this trading program).

Land cover: Highly urban and suburban

Population density: approx. 620/sq mile

Problem: Hypoxia conditions, algal blooms in Long Island Sound due to excess nitrogen discharges from WWTPs.

Pollutants traded: Nitrogen

Accomplishment: Successful use of watershed permitting. EPA considers this a model program. In 2002-2003 the state purchased about $1.75 million in credits. Very few personnel run the program. The state expects to save $200 million, or 20%, over the life of the program by removing nitrogen via trading vs. command and control approach.

TMDL: TMDL to achieve Long Island Sound standard for DO approved in 2001. Nitrogen targeted as limiting nutrient causing algal blooms.

Trading framework: A declining cap for TN over 15 years sets the framework for annual PS allocations of TN in pounds/day. 79 WWTPs have individual TN allocations based on their percentage of the total load, and an equivalency factor which relates the plant distance to the endpoint. The equivalency factor makes nitrogen reductions closer to hypoxic zones more valuable. Thus, WWTPs with more unfavorable discharges are encouraged to remove nitrogen beyond their permit requirements and sell the credits.

The Nitrogen Credit Advisory Board, appointed by the state, oversees the program. WWTPs that discharge less than their allowance sell their credits to the Nitrogen Credit Exchange Program; WWTPs which discharge more than their allowance must purchase credits from the Nitrogen Credit Exchange Program.

Credits are bought and sold on an annual basis. TN allocations are also set annually.

The federal Clean Water Fund (CWF) is a critical resource for a system of state revolving loans and grants, which funds the construction of nitrogen removal upgrades for certain WWTPs. These upgrades are necessary to meeting the declining cap of nitrogen loading. Trading allows more flexible and efficient use of these funds. Reliable

CWF availability, along with trading, are both necessary to achieve the program's nitrogen targets.

Risk Allocation: State bears risk of paying out money. Dischargers bear risk of paying out money.

Cost of credit: CTDEP resets the cost of a credit annually. Price is based on capital and O&M costs of nitrogen removal each year, determined from annual review of plants' performance. Regarding credit life, credits do not carry over to the next year.

Permits: The basis is a watershed permitting approach. The state passed a rule (Public Act 01-180) which created the authority for a general permit. Subsequently, the General Permit took effect in 2002. The General Permit acts as an umbrella for WWTP nitrogen requirements; it replaces the need for separate and far more complex permits for each WWTP. The General Permit sets annual nitrogen limits for each WWTP, below its TMDL waste load allocation to ensure TMDL compliance, over a 5 year period. The General Permit outlines the requirements to buy or sell credits based on the WWTP's equalized nitrogen loading.

PS involvement: 79 WWTPs

NPS involvement: No current NPS involvement in trading. NPS nitrogen removal is currently considered more expensive than from PSs. TMDL does specify a goal of 10% NPS nitrogen reduction. As program continues, the price of PS credits is expected to rise. At that point trading with NPS may become favorable.

NGO involvement:

Hot spot avoidance: TMDL is based on improving water quality at the endpoint, the estuary. The TMDL sets transport factors for each PS. This establishes water quality equivalence parameters that only target water quality at endpoint. Hot spots could theoretically occur *between* the PS and endpoint, despite water quality being met at the endpoint.

As a solution, the State reserves the right to revoke or modify a PS's authorization under the General Permit for reasons necessary to protect human health or the environment, or to implement the TMDL. There is also a priority to use federal funds for nitrogen removal in distressed communities. Finally, the use of the NCAB instead of a free market is meant to protect poorer communities.

Liability: Any plant that exceeds its allocation and does not purchase credits is subject to enforcement.

Monitoring: WWTPs monitor and report flow and effluent on a regular basis. CTDEP inspects each of the General Permit plants at least once per year.

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Kalamazoo River Phosphorus Trading Demonstration Program (1997-2000)

Details

Watershed area: 2000 sq miles

Land cover: 57% cropland and pasture, 21% forest, 3% wetland, 8% urban, and 11% other.

Population density:

Problem: Local paper mill was seeking to expand while controlling treatment costs and discharge. State was concerned that increased phosphorus discharge would further impact a hypereutrophic lake downstream.

Pollutants traded: Phosphorus

Accomplishment: No actual trades occurred primarily because the main PS discharger, the paper company, went out of business. However the project did establish a trading framework, and implement voluntary NPS reductions.

TMDL: The trading program preceded the TMDL, which was completed in 2002.

Trading framework: This was a demonstration trading project which ran from 1997-2000. A Steering Committee directed the project. The Committee was composed of representatives from government, industry, agriculture, and environmental NGOs. The committee acted as a clearinghouse and banked all NPS credits. PS/NPS trades were essentially indirect because all trades were routed through the Committee.

Point-nonpoint trading: PSs purchased credits from the Committee by funding BMPs at a 2:1 trading ratio. A farmer had to meet minimum agricultural management standards to be eligible for the program, otherwise improvements to meet those standards were traded at a 4:1 ratio. Point-point trades had a 1.1:1 ratio.

An NPS landowner needed approval from the Steering Committee to receive funds for BMP implementation. The approval process was lengthy and took between 1-6 months.

Risk Allocation: The use of Service Agreements (see 'Liability' below) fairly allocates risk between the NPS and Steering Committee.

Cost of credit: Credit value was calculated based on trading ratio, cost per pound of phosphorus removal, and amortizing for the BMP life span.

Permits: PSs could purchase credits to accommodate growth but not to exceed their NPDES discharge limits. Point source use of the credits is at their discretion and must be accommodated through an NPDES permit modification prior to use.
PS involvement: Paper company, municipal discharger, and other small PSs.
NPS involvement: Farmers implementing agricultural BMPs and landowners installing streambank restoration controls. Farmers were generally reluctant to participate because they did not trust regulators, feared being targeted as polluters, and resisted making voluntary changes that might later become required. Steps which partially overcame this included informal meeting with farmers on the Steering Committee, providing anonymity through identifying sites by location rather than farmer's name, and using recognized and trusted agriculture contacts to work with the farmers.

> Approaches that stress what is in the best interest of the farm, the farmer and the landowner are likely to be well received. Anything else will be typically viewed as inappropriate and thus not likely successful. Agricultural improvements, potentially funded through outside sources, can provide financial benefits to on-farm operations as well as credits that become a marketable commodity. Commodities are well understood by agriculture. Publicity (good or bad) for the farming community, however, tends to make producers shy away from programs that are regulatory in nature, especially as they may pertain to their operations and defined environmental impacts. Private contracts with trading credit users, rather than the inclusion of the farmer in a point source permit, are a much preferred approach for agriculture to participate in trading (http://www.envtn.org/programs/kazoo.htm).

NGO involvement: Local environmental groups, and agriculture advocacy group
Hot spot avoidance: By not allowing PSs to exceed permitted discharge limits, there was no risk of hot spots. Additionally, trading was restricted to selected reaches of the Kalamazoo River whereby point source use of credits would not result in hot spots.
Liability: Payment for point-nonpoint trades were made in 3 stages per a Service Agreement, in order to verify actual implementation of the BMP. If the NPS partner failed to comply with the Service Agreement, they would have to refund the money to the Steering Committee. The Service Agreement was written simply but clearly to establish accountability between each participating NPS partner and the Steering Committee.

Monitoring: Agricultual BMP monitoring performed by the Natural Resource Conservation Service (NRCS); water quality monitoring performed by an environmental consulting company.

Sources:

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