3.4 Watershed-Based Trading

Section 2.2.2 describes the mechanism of watershed-based trading, and Section 3.3.3 explains TWI's concept of nitrogen farming and why watershed-based trading is an important element in making nitrogen farming a profitable venture. The primary unanswered question is: will watershed-based trading occur in Illinois? To shed light on this question, the first step is to determine how other watershed-based trading programs came into existence. The second step involves taking the lessons learned from analysis of the case studies, incorporating information about the policy climate in Illinois, and assessing the forces that could prompt a trading market to develop.

3.4.1 Case Studies of Watershed-Based Trading

The purpose of the case studies is to examine watershed-based trading programs currently in the design or implementation phase. The case studies shed light on the questions: what are the driving forces behind the development of trading programs? What methods have proven successful or unsuccessful in establishing programs? And what lessons can be learned to apply to the case of the Illinois River?

Chesapeake Bay

In the 1980's, the U.S. EPA and the states surrounding Chesapeake Bay determined that environmental conditions posed a significant threat to the health of the Bay. The principle problem was identified as low dissolved oxygen content caused by excess nutrients (both phosphorus and nitrogen).[1] Solving this problem would require collective action. In 1987, the EPA, governors of Maryland, Virginia, Pennsylvania, the Mayor of the District of Columbia and the chair of a tri-state legislative body titled the Chesapeake Bay Commission, signed the *Chesapeake Bay Agreement*, calling for a 40% reduction of nutrients entering the Bay. The initial goal was to make the 40% reduction, by the year 2000, "of controllable nutrient loads from point and NPS in the entire 64,000 square mile watershed from levels

being discharged in 1985, and that once achieved, this level would be maintained hereafter." After revisions in 1992 to the *Agreement*, reduction levels, in terms of pound per year, were determined for the Bay as a whole, and then for each major watershed.[2]

In 1999, a Task Force formed to consider actions that could supplement existing tributary strategies in order to meet the nutrient pollution requirements for nitrogen. The Task Force recommended that each jurisdiction implement a cap and goal management strategy by January 1, 2001. Fast approaching deadlines, to meet the new goals, required creative solutions. This prompted an interest in the concept of watershed-based trading.

"In June 1999, the Chesapeake Bay program organized a multi-stakeholder Nutrient Trading Negotiation Team for the purpose of exploring the feasibility of nutrient trading in the Chesapeake Bay watershed and, if appropriate, prepare guidelines for voluntary use by states in the development of their respective nutrient trading programs."[3] This team developed a set of eight fundamental principles along the lines suggested by EPA in the Draft Framework for Watershed-Based Trading. The principles were modified to fit the situation in the Bay. Two of the significant modifications established that sources should try to achieve the 40% reduction goal through their own initiatives before they consider the nutrient trading option and that trading will be allowed only within each major Bay tributary.

The Team designed their guidelines for a trading program around six key elements: identifying nutrient reduction goals, determining eligibility, performing trade administration, ensuring accountability, assessing progress and involving stakeholders. In the provisions of the guidelines much of the responsibility of managing the trading program is designated to the individual states. Some of the state tasks include: program oversight and day-to-day management; monitoring and enforcing trade agreements; developing mechanism to collect and track trading information; and creating or using existing citizen advisory committees. The provisions also establish basic rules for trading that apply to all of the participants.[4]

With guidelines in place, the next step is implementation. The three states, Maryland, Virginia and Pennsylvania, are in the process of developing plans for nutrient trading.[5] Maryland unveiled a state nutrient trading proposal in September of 2000. The proposal sets up trading scenarios between point/point sources, and point/nonpoint sources.[6]

Long Island Sound

The Long Island Sound study, completed in 1990, prompted Connecticut, New York, and the U.S. EPA to agree to take action to control nitrogen loads to Long Island Sound. Research and monitoring indicated a severe problem with low dissolved oxygen during the late summer caused by excessive sources of nitrogen from human activity.[7] To improve the health of the Sound and ensure long term viability of the productive waters, a plan was created:

> The Long Island Sound Comprehensive Conservation and Management Plan (CCMP) adopted by the Governors of Connecticut and New York and the US EPA, *approved in 1994*, calls for the basin wide reduction of nitrogen by 58.5% over the next 15 years to reduce hypoxia in the Sound. This reduction is expected to result in significant progress towards achieving a dissolved oxygen goal of 5.0 mg/l on the surface and 3.5 mg/l on the bottom and no event below 2.0 mg/l at any location throughout the Sound. The CCMP also sets 5-year progress targets of 40%, 75% and 100% of the final goal.
>
> The program is to be implemented by the adoption of a TMDL for nitrogen under the impaired water body requirements of the CWA. The TMDL is then allocated to each source through the adoption of a Waste Load Allocation (WLA) for each point source and a Load Allocation (LA) for NPS. The WLA is subsequently to be included in each municipal wastewater NPDES permit, with an individual compliance schedule.[8]
>
> Nitrogen Credit Trading for Connecticut is offered as an alternative means for municipalities to implement the CCMP and achieve the TMDL and WLAs. The primary concept of trading is that each municipality would only be responsible for its nitrogen to the extent of its impact, and would be allowed to purchase credits (pounds of nitrogen) to meet the requirements for reduction and conversely if it treated beyond its requirements, it could sell the credits produced.
>
> To implement Nitrogen Credit Trading, a "watershed Permit" a general permit issued to all sources is called for which will include all 84 municipal point sources and will establish an annual nitrogen reduction requirement for each source based on its normalized proportion of the total reduction. The permit level will be reduced each year for 15 years based on the amount of nitrogen remaining after completion of construction of wastewater facilities until reaching the TMDL. This single permit, linked to the financing schedule of the Clean Water Fund (the State Grant and Revolving Loan Fund) authorized by statute, will be subject to a single hearing and appeal process, and allowed sources which may choose not to be included to will be immediately be subject to their WLA.

> A Nitrogen Credit Exchange (NCE) will be established to administer the trading program and will be able to arrange for sales or buy and sell credits directly. The NCE will maintain a state account of credits created by the 20% grant portion of the financing and use these credits to meet shortfalls and to establish incentives for nonpoint source program development. The NCE will be funded through the [Clean Water Fund] CWF and fees for service.
>
> Legislation to implement this program was proposed for adoption in the 1999 Connecticut General Assembly by CT DEP [Connecticut Department of Environmental Protection] and has been supported by many organizations testifying at the hearing.

The passage of legislation on the federal level, the finalization of the TMDL for the Sound, and stamp of approval from the EPA advances the implementation of a trading program. In May 2000, Congress passed the Long Island Sound Restoration Act. The Act authorizes $80 million a year, each year through 2003, for cleanup of the Sound. " The bill will provide states with the money to offer additional help to low income, distressed communities that are unable to perform cleanup projects on their own, and it provides the EPA with the authority to work with Connecticut and New York to develop a nitrogen trading program."[9] In December 2000, the final TMDL for nitrogen for the Sound, allocating allowances for sewage treatment plants, nonpoint, and industrial sources, was published. In April of 2001, the DEP announced: "...the US Environmental Protection Agency (EPA) has approved the state's plan to improve the overall quality of Long Island Sound (LIS). This is the first plan in the country approved by the EPA that addresses coastal water quality improvement through watershed-specific permitting."[10]

While the 1999 legislation did not pass, bills continued to be brought forward. State Senate bill 1012, titled "An Act concerning nitrogen reduction in Long Island Sound", was enacted into law in June of this year (2001).[11] According to the Connecticut Office of Legislative Research (OLR), the new law requires the DEP to set up a nitrogen reduction program based on the TMDL limits established for the Long Island Sound. The bill authorizes the DEP to create and oversee a nitrogen credit exchange program.[12] As of July 1, 2001—the effective date of the new law— the path is clear for the implementation of a Connecticut nitrogen credit trading program.

New York has opted not to take part in the creation of a watershed- based trading system at this time. The state Department of Environmental Conservation (DEC) "…believes that the regulatory incentives provided by the New York State Long Island Sound State Pollutant Discharge Elimination System (SPDES) permits should be sufficient to bring about the proposed nitrogen reductions."[13] Although the New York State Long Island Sound State Pollutant Discharge Elimination System (SPDES) permits have language that allows for trading programs the DEC questions whether a trading program would add to the effectiveness of the existing program. [14]

Tar-Pamlico Basin

From its headwaters in the Piedmont region to the Pamlico Sound, the Tar-Pamlico River stretches 180 miles. The watershed is approximately 5,440 square miles, with an estimated population of 365,000 people.[15] Linked with the Albemarle Sound, the two basins form one of the most productive estuaries in the US. The area provides habitat for listed threatened or endangered freshwater mussel species, and includes two national wildlife refuges.[16]

> Agriculture and forest are the dominant land uses in the Tar-Pamlico Basin. While forest in the upper half of the basin is largely undisturbed, a large portion in the lower coastal plain is managed for logging. Thirty-seven percent of the basin is devoted to agriculture, which is predominantly row crop cultivation and intensive livestock operations… As of 1989, there were approximately 875 hog, chicken, dairy, and turkey operations. Many of these have expanded beyond their original capacities or are using outdated waste management facilities. Increased fertilizer use, expanding livestock operations, and a growing human population have been affecting the waters of the Tar-Pamlico Basin for three decades.[17]
>
> In recent years, low dissolved oxygen levels, sporadic fish kills, loss of submerged vegetation, and other water quality problems have plagued North Carolina's Tar- Pamlico basin. Studies have linked many of these problems to increased nitrogen and phosphorus loading to the system. In 1989, the North Carolina Environmental Management Commission (EMC) designated the Tar-Pamlico basin as Nutrient Sensitive Water. The classification, based on years of detailed nutrient loading studies, required the development and implementation of a strategy to manage both point and nonpoint nutrient sources to meet water quality goals.
>
> The North Carolina Division of Environmental Management (NCDEM) responded by developing stricter nitrogen and phosphorus effluent standards

> for dischargers in the basin. However, dischargers were concerned about the high capital costs that might be required to achieve the nutrient reduction goals. Consequently, a coalition of dischargers [the Association], working in cooperation with the Environmental Defense Fund, the Pamlico-Tar River Foundation, and NCDEM, proposed a nutrient trading framework through which dischargers can pay for the development and implementation of agricultural best management practices (BMPs) to achieve all or part of the total nutrient reduction goals. The EMC approved the program in December 1989. As a condition of the EMC's approval, the discharger coalition agreed to fund the development of an estuarine model. The model will be used as a tool to evaluate specific nutrient reduction strategies for the basin. This information will then be used to revise effluent nutrient standards for Phase 2 of the project.
>
> Under the Tar-Pamlico Nutrient Trading Program, dischargers are free to trade reduction debits and credits among themselves, as long as the loading standards for the basin are met. This allows Association members to maximize the cost-effectiveness of their operations. However, the state will continue to use individual permitting and enforcement to control any localized impacts that may occur.[18]

Phase I covered the period of 1990-1994. Phase II covers the period of 1995-2004 and is currently underway. The results of Phase I are as follows:

- Every year, the Association kept nutrient loading beneath an annually decreasing cap, reducing overall nitrogen and phosphorus loads by about 20% despite growth as reflected in a flow increase of about 7%. They did so largely by improving treatment facilities' efficiencies following the optimization study.
- The estuary model was completed, setting the stage for establishment in Phase II of an overall reduction goal for the estuary based on water quality standards. Such a reduction goal could be applied to NPS in addition to point sources.
- The Association provided up-front funding of almost $1 million worth of agricultural BMPs, in large part through a federal EPA grant. They banked credit from this for future cap exceedences.
- Fourteen dischargers equaling about 90% of all point source flows to the river joined the Association.[19]

As of yet, no official trades have taken place. The Association continues to keep nutrient loading beneath the cap without utilizing banked credits. When and if trading begins, the price for a credit is set at $29/Kg.[20]

As Phase II progresses, the emphasis have shifted from point source to NPS pollution reductions. In the view of the EMC, voluntary NPS pollution reduction programs

have not provided adequate results. The state Division of Water Quality (DWQ) and the DEC are currently going through a state level rulemaking process for nonpoint source reduction goals.[21] The impact of formal NPS rulemaking on the prospect of nutrient trading remains to be seen. At the start of Phase III, in 2004, the terms of the Tar-Pamlico nonpoint source strategy and watershed-based trading program will be renegotiated.[22]

Lessons Learned from the Case Studies

In the three case studies, a substantial threat to the health of an economically and recreationally important waterway spurred support for substantial nutrient load reduction. Groups turned toward the idea of watershed-based trading, as a supplement to regulation, for its potential to be a cost-effective and efficient method of improving water quality. Finding a solution to the problem of nutrient reduction and establishing a trading system involved working with multiple stakeholders. Each group took a different approach. The Chesapeake Bay Program used negotiation to create a consensus among the different stakeholders. The Long Island Sound group, under direction from the Region III EPA office, designated a TMDL for the Sound and the state of Connecticut enacted legislation to allow for trading. In the Tar-Pamlico Basin case, a coalition of dischargers, environmental groups and regulators formed to respond to stricter nitrogen and phosphorus effluent levels.

The Chesapeake Bay watershed, by far the largest watershed in the case studies, encompasses three states and the District of Columbia. In order for the stakeholders to come to any form of agreement the process needed to involve consensus and be voluntary. Regulating across such a span of state governments without the willing participation of the states would pose a substantial challenge. The guidelines derived by the Nutrient Trading Team allow each state the flexibility to build their own program in a way that will best fit the needs of the state while addressing the needs of the larger watershed as a whole. The success of this collaborative approach will be demonstrated by the creation of trading programs by all of the states within the Chesapeake Bay watershed.

The Long Island Sound watershed approach is not as inclusive, in terms of developing a trading program, as the Chesapeake Bay negotiation. Although governors of both New York and Connecticut signed the CCMP, only Connecticut is working on establishing a program. The CCMP limits trading market development to a closed system,[23] which is dependent on established regulations like TMDLs. The closed system also limits

the ability for program implementation if the current state NPDES permitting language does not allow nutrient reductions through watershed-based trading. Connecticut succeeded in changing its regulations after three years of introducing legislation, but may have been aided by a political shift caused by designation of the Long Island Sound TMDL. Without the impetus of designating a TMDL, the slow political process of changing or creating new legislation could have stymied implementation of a trading program. In addition, this state-by-state approach, without negotiation, decreases the chances that a system will be developed that both states can utilize despite the fact that the TMDL functions as if they are one large watershed.

The coalition in the Tar-Pamlico case formed through the initiatives of the stakeholders. Coalition formation is not something that can be mandated. It requires leadership on the part of the dischargers and open-mindedness on the part of the regulators. The Tar-Pamlico approach offers an interesting look at the potential relationship of point source dischargers to nonpoint sources. Rather than trying to regulate nonpoint dischargers directly, the Tar-Pamlico program experimented with using point source funds to address the nonpoint source problem. The interesting result of the program was a substantial nutrient loading reduction by point sources and a realization that formal state rules are required to create the necessary reductions in NPS loading.

The process of establishing a watershed-based trading system is far from simple. While all of the three cases have some form of program in place, none are actively trading. The World Resources Institute comments:

> While effluent trading programs have been very successful for lead, air emissions, and sulfur dioxide trading, the results in the water quality area are not impressive… Several factors are thought to have contributed to the limited activity, including the severe restrictions imposed by the state on the ability of sources to trade, the vulnerability of the program to legal challenge, and the fact that the dischargers developed a variety of compliance alternatives that had not been foreseen when the regulations were drafted.[24]

This does not necessarily indicate that establishing a trading system is not worthwhile. It demonstrates that, while dischargers have great concerns about their ability to meet new water quality standards, when they are faced with the possibility of having to make substantial cutbacks they are able to find new methods of reduction at relatively low cost.

As reduction levels continue to ratchet down, the cost of reduction will increase. With a credit market in place, dischargers will turn to trading when the costs of new equipment outstrip the alternative of paying others to reduce.

The lack of fully operating watershed-based trading programs can also be explained by the novelty of the concept. The idea of trading effluent credits became part of the pollution reduction vocabulary only with the passage of the 1990 Clean Air Act Amendments. Trading is largely discussed only in terms of air pollution. Water pollution has different levels of complexity caused by variations in pollution transport across the land and different political jurisdictions. Watershed-based trading has a higher level of uncertainty, partially due to labor-intensive monitoring requirements, and a lack of understanding of the long-term impacts of problems like the Gulf of Mexico Hypoxia (Section 2.2.2).

Regardless of whether trading occurs, several significant benefits accrue from trying to establish a trading system. In all three of the cases, substantial water quality improvements were made through raising stakeholder awareness of the impacts of nutrients in the watershed. Information about the threat of economic loss from hypoxia, and the ratcheting down of regulations created a new dynamic between regulators and regulatees. The option of trading introduced the potential for finding creative solutions for dischargers. An increase in the number of possible outcomes diffuses the potential argument that having to reduce the nutrient load will economically cripple corporations and communities. Options allowed stakeholders to come to the table to negotiate with more open minds and led to cooperative solutions.

Looking at the case studies, several hopeful signs emerge for an increased use in watershed-based trading: the states in the Chesapeake Bay Program are voluntarily working to design their own programs; Long Island Sound has a TMDL that encompasses a multi-state sized watershed; Connecticut passed state legislation that will open the way for trading; the Tar-Pamlico Basin is tackling rulemaking for nonpoint sources; and the federal government has offered assistance through the efforts of the EPA and passage of major legislation providing funds for processes that will help to clean-up the nation's estuaries.[25]

3.4.2 Application to Illinois

The discussion of the components of watershed-based trading (Section 2.2.2.) and the analysis of case studies provide the framework to build an answer to the question—will a watershed-based trading system be developed for the Illinois River watershed? From the case studies, three main components for developing a trading system can be summarized as: a recognition of a substantial threat to an important waterway (particularly a major estuary); the development of a coalition of stakeholders; and the political will — on a local, state and/or regional level— to build or legislate the administrative capacity to facilitate a trading program. As a part of the upper Mississippi River basin, and a substantial contributor of nitrogen pollution, the state of Illinois recognizes a role in the Gulf of Mexico hypoxia problem. Illinois government and agency representatives are part of a coalition of states examining the hypoxia issue, as well as other coalitions tackling water quality issues within the state. The main question, examined in the following discussion, regards the presence or absence of political will to act.

Potential for Regulatory Action

Considering that Illinois has the highest number of nutrient impaired waterways in the nation; TMDLs have yet to be designated for any watershed segment; and all NPS pollution control measures are voluntary, the state has not demonstrated much effort towards addressing nutrient reduction using regulatory measures.[26] In addition, Illinois has requirements within its NPDES permits that restrict the ability to use trading to meet water quality standards. Illinois permitting language does not allow in-stream (basically off-site) treatment credit for any discharger's limits.[27] To allow trading on a statewide basis, Illinois would have to make changes in the law. So far discussion of watershed-based trading on a statewide level has been merely hypothetical.[28]

Innovations

The political will to establish a closed trading system based on some form of "cap" is very low in Illinois. However, Illinois has a history of promoting creative voluntary programs and circumventing the command and control route of pollution control. For NPS pollution there is the CREP program (Section 2.2.2.). For air pollution there is the Emissions Reduction Market System (ERMS). The ERMS is, "the nation's first trading program to significantly reduce ground level ozone (smog) formation… The ERMS is a market-driven program that allows participating sources that emit volatile organic materials (VOM) to trade unused emissions during an "ozone season" which lasts from May through September."[29] While the ERMS is limited to reductions of air pollutions in the metropolitan Chicago nonattainment area, it is a working model of a trading program in Illinois.

For watershed-based trading, a project in the southern portion of the state has recently set a new precedent. The Piasa Creek Project is the first case of sediment trading in Illinois.

> Great Rivers Land Trust [GRLT] and Illinois-American Water Company [IAWC] have signed an agreement to begin implementation of the Piasa Creek Watershed Project. The 10-year project will reduce sedimentation in the Piasa Creek Watershed approximately 6,600 tons per year by the end of the contractual agreement. The process of achieving the sediment reduction rates will include a variety of soil conservation practices such as silt basins, dry dams, streambank stabilization and land acquisition in key areas of the watershed.
>
> The Piasa Creek Watershed covers over 78,000 acres in portions of Jersey, Madison and Macoupin Counties. The original watershed management plan was developed in 1995 at a time when watershed management was a relatively new concept. Although a number of watershed management projects have been implemented since the development of the plan, most of those projects have been small in scale, because no program existed to fully fund a total watershed treatment of this magnitude.
>
> [IAWC] has been operating a water treatment facility along the Mississippi River at the west edge of Alton, Illinois for over 100 years. During that time the company drew water from the river, filtered the water, sold the clean water to the people in surrounding communities, and deposited the filtered sediment back into the river. In 1999 the water company began construction of a new water treatment plant. New environmental regulations require that new facilities construct sediment lagoons instead of discharging the materials back into the river. The new lagoons are costly to construct and maintain. As an alternative, Illinois-American Water Company proposed funding the

> Piasa Creek Watershed Project to reduce sediment entering the Mississippi River 2:1 compared to what the water plant would discharge into the river (3,300 tons per year). In return for approximately $4 million in funding for the life of the 10-year project, Illinois-American would be granted a discharge permit by the Illinois Environmental Protection Agency. The agreement was approved by the Illinois Pollution Control Board[IPCB], and that allowed work on the Piasa Creek Watershed Project to begin.[30]

To obtain the discharge permit the IAWC petitioned for a variance for the NPDES permit for the new facility. The variance was granted in February of this year (2001).[31] The IAWC and the GRLT view this project as a win-win scenario. Installing the cheapest alternative to treat the sediment on-site would have cost the IAWC $7 million.[32] By paying the GRLT to restore the watershed, the company saved $3 million. The GRLT is thrilled by the arrangement. Not only do they have private funds to start a large-scale watershed restoration project, including conducting a fluvial geomorphology study, they can also apply for federal matching grants and take advantage of programs like CRP to maximize the scope of the restoration.[33]

The existence of the two trading programs, even though they are on a small scale compared to the Illinois River watershed, means that state government and agency representatives are familiar with the idea of trading. If the ERMS and the Piasa Creek Project continue to be successful, they will strengthen the likelihood that other trading programs will be considered in the future.

Forces for Change in Illinois

If a watershed-based trading program for nitrogen is going to develop in Illinois, the impetus will come from two directions: local efforts to respond to high levels of nitrogen, or a statewide effort to address hypoxia in the Gulf of Mexico. Local concerns about nitrogen will center around drinking water issues (Section 2.2.1). The precedent set by the Piasa creek project opens the door for very localized trades between dischargers and nonpoint sources, or even point sources like a nitrogen farm.[34] On the larger scale, by fall of 2002 the Gulf of Mexico Action plan calls for development of strategies for nutrient reductions on the sub-basin level.[35] Specific targeting of point and nonpoint sources is not scheduled until the spring of 2003, but development of strategies may function as a catalyst for the large sub-basins (i.e. the state of Illinois) to actively set goals for reduction levels. While the goals may

be voluntary, the existence of the larger coalition could provide an incentive for Illinois to consider developing a trading program.

If the coalition of Upper Mississippi Basin States follows Chesapeake Bay's model of creating a trading program and negotiates guidelines, Illinois still faces Connecticut's original problem of inflexible regulation. Illinois also shares the Tar-Pamlico scenario of a high percentage of nutrient loading caused by nonpoint sources. If the Gulf of Mexico hypoxia problem gains enough political momentum to spur states to act, Illinois will face a tough set of choices. The state can start to aggressively implement regulatory measure like TMDLs, change legislation to allow for more flexible applications of NPDES permits, and/or begin the rulemaking process for NPS pollution. Faced with politically controversial measure like TMDL enforcement and creating rules for NPS pollution, developing a mechanism for trading could become a very attractive option.

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[1] See section 2.2 for discussion on effects of hypoxia.
[2] Adapted from Nutrient Trading for the Chesapeake Bay, conference paper.
[3] Draft Chesapeake Bay Program Nutrient Trading Guidance Document, 9/8/00.
[4] EPA Draft Framework.
[5] Wiedeman, A. 8/14/2000.
[6] Brown, R. 9/22/2000.
[7] CDEP website, Nitrogen Removal Program
[8] Nitrogen Credit Trading for Long Island Sound Watershed, conference paper.
[9] Shays, C. 2001. Congressional press release.
[10] CDEP website, press release.
[11] Connecticut Business and Industry Association website.
[12] State of Connecticut website, general assembly files.
[13] Long Island Sound Study Summer/Fall 1998 Update, p 7.
[14] Ibid.
[15] North Carolina Soil and Water Conservation website.
[16] Ibid.
[17] EPA Office of Water website, original source North Carolina Department of Environment (NCDEM).
[18] EPA Office of Water website.
[19] NCDEM website
[20] According to Steve Coffey, the $29/Kg is based on the cost of installing aerobic lagoons in swine farms. This type of BMP is considered to be the most expensive method of nutrient reduction.
[21] NCDEM website
[22] Coffey, S. 7/2001. Personal communication.
[23] See Section 2.2.3 for a full description of closed trading systems.
[24] Faeth, P.2000. p14-15.
[25] See appendix 1 for more info on the Estuary Restoration Act.
[26] See Section 2.2.1 for more details and sources of information.
[27] Mc Swiggen, T. 7/2001. Personal communication.
[28] Ibid.

[29] Illinois Environmental Compliance website

[30] Great Rivers Land Trust website

[31] Tomkins, S. 7/2001. Personal communication.

[32] Jonson, M. 7/2001 Personal communication.

[33] Ringhausen, A. 7/2001. Personal communication.

[34] There is also the potential for a profitable relationship to form between a nitrogen farm and a water processing facility even if trading does not occur. Currently the Illinois American Water Company has two off-site treatment ponds that help to reduce nitrogen loads in the river water, making cleanup of the water for residential use less expensive. One facility is located in Pontiac, Illinois on the Vermillion River, while the other facility is located in Streator, Illinois. Source: personal communication with Marc Jonson.

[35] Action Plan, p8.