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20 E. Market Street • Iowa City, Iowa 52245 • (319) 338-0773
www.IowaPolicyProject.org

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Water Quality Trading and Wetland Banking: Lessons for Iowa

By Subhra Bhattacharjee and Catherine L. Kling

Preserving soil productivity in the United States has been a major policy goal since the Dust Bowl of the 1930s. Water quality improvement later became a component of the policy agenda with the initiation of programs to contain soil erosion and clean up water at the federal, state and local levels. Some of these programs split the costs between the government and landowners for installing practices such as farm ponds or terraces. Others require certain practices, or limit what can be discharged to water bodies; often these mandated changes have not been accompanied by compensation. Examples of the latter form of policies include the banning of DDT at the federal level and limits on the amount of Atrazine that could be applied in some Iowa counties.[1]

Iowa's water quality has suffered in recent years due to intensive agriculture and greater urbanization. The Iowa Department of Natural Resources (DNR) recognizes 2,039 water body segments in Iowa. The DNR designates each segment for a specific use, such as recreation (swimming or fishing); drinking water; or maintaining a healthy population of fish and other aquatic life. Iowa's 2006 list of impaired waters records that of the 823 water body segments for which sufficient information is available, 279 are impaired (34 percent). In these 279 water body segments one or more pollutants has caused water to be unfit for one or more of its designated uses.

A variety of conservation practices[2] are employed on Iowa's agricultural lands to protect or improve water quality and reduce soil erosion. Some examples include terraces, grass waterways, land retirement, sediment control basins, grade stabilization structures, filter strips, wetland restoration, riparian buffers, contour buffer strips, and nutrient management. In some cases these practices have been adopted by landowners without government assistance, in other instances the practices have been adopted under a variety of incentive or regulatory-based federal and state-sponsored programs. In addition, a variety of locally based incentive programs have been implemented at the watershed or county level.

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[1] http://www.epa.gov/history/topics/ddt/01.htm and Iowa Atrazine Management Rules 1990 (http://www.extension.iastate.edu/Publications/PAT1CHP13.pdf)

[2] We use the term "conservation practices" to refer to any land use change that is intended to improve the environment. Another commonly used term is "best management practices". The EPA formally defines Best Management Practices (BMPs) as "effective, practical, structural or nonstructural methods which prevent or reduce the movement of sediment, nutrients, pesticides and other pollutants from the land to surface or ground water, or which otherwise protect water quality from potential adverse effects of human activities." In this report, the terms "conservation practices" and "best management practices" are used interchangeably.

***Subhra Bhattacharjee** is a Ph.D. candidate in Iowa State University's Department of Economics. She works on valuation of environmental amenities.*

***Catherine L. Kling** is a Professor of Economics at Iowa State University and the Head of the Resource and Environmental Policy Division in the Center for Agriculture and Rural Development of Iowa State University.*

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Water quality problems from nutrient leaching and soil erosion are not unique to Iowa. Nutrient runoff and erosion from agricultural land is the largest source of water pollution in Midwest states. While each state is different in terms of its demographic and land use pattern, their similarities in geography, topography, weather and dominance of agriculture outweigh their differences. Hence, programs in neighboring states potentially hold lessons for Iowa.

This paper examines just two voluntary water quality improvement programs: water quality trading and wetland banking. Trading pollution credits is a way to provide an incentive to reduce pollution. Polluters are permitted to buy credits from other polluters in the same watershed who are expected to reduce their pollution by a comparable or increased amount. Wetland mitigation requires the construction of new wetlands to compensate for wetlands lost to agricultural or urban development. We surveyed state- and locally funded examples of these programs in Minnesota, Illinois, Wisconsin, Missouri and Iowa. Our purpose is to provide Iowa decision makers with information about the effectiveness of these programs to improve Iowa's water quality.

WATER QUALITY TRADING

Watershed based pollutant trading is analogous, but not identical to cap and trade schemes being discussed as a solution to limiting carbon dioxide emissions to the atmosphere. Pollutant trading among point sources or between point and nonpoint sources is enabled when there is a limit set on the amount of effluents a point source is allowed to discharge into a water body. The point source is allowed to purchase offsets from nonpoint sources or other point sources rather than meet the reductions themselves. This implies that the sellers of the offsets receive payments from the buyer to reduce their effluent discharge or nutrient runoffs into the water body by specified amounts while the buyer gets to discharge effluents above its limit to the extent of its offsets. Below are examples from Minnesota, Illinois and Wisconsin.

Minnesota

Beginning in 1997, two point-nonpoint source trading projects were undertaken in Minnesota to offset new point source discharges into the Minnesota River. The legal framework for the projects was provided by the National Pollution Discharge Elimination System (NPDES) permits. The primary point sources in these two trading projects were the Rahr Malting Company and the Southern Minnesota Beet Sugar Cooperative. The primary regulator for the projects was the Minnesota Pollution Control Agency (MCPA).

In both cases, the purpose of the trades was to allow expanded point source discharge into the Minnesota River by offsetting these discharges with nonpoint source reductions. The pollutants traded were nitrogen and phosphorus. In both projects the point sources identified nonpoint source trading partners and ensured proper working of the nonpoint sources' mitigation measures. Both trading projects had a trading ratio that was equal to or greater than 2:1 i.e. the two facilities were required to reduce nitrogen and phosphorus from nonpoint sources by two tons for every ton above their limit that the plants continued to discharge. (Fang and Easter 2003).

Each permittee set up a trust fund to finance projects that would reduce nutrient runoff. The minimum size of each trust fund was mandated within the permit to ensure the financial viability of the projects. Monitoring and enforcement of both projects involved detailed technical and management reports on each trade by the point sources to MCPA and periodic inspection of project sites by MCPA staff.

Transaction costs for the projects include time spent on permit negotiation, search costs for trading partners, administrative expenditures, reporting requirements for the permittee to the regulator, time spent by MCPA staff on monitoring, inspection and project management. The responsibility for finding nonpoint source trading partners rested with the permittee while regulation and enforcement was undertaken largely by MCPA. Hence most of the transaction costs were borne by the point source dischargers and MCPA.

The Rahr Malting Company Permit (Rahr)

The total maximum daily load (TMDL) for oxygen demand was established for the Minnesota River in 1988. The Rahr Malting Company wanted to build a wastewater treatment plant (WWTP) to expand its production while lowering its wastewater treatment costs, but it could not obtain the necessary emission permits. Instead, Rahr was allowed to offset all of its projected five-day carbonaceous biochemical oxygen demand (CBOD5) load to the river by purchasing CBOD5 reduction credits from nonpoint sources implementing pollution control measures. This was unique in the sense that the credits being traded were for the outcome of nutrient pollution (CBOD5) and not the nutrients themselves. The trading ratios were set at 1:8 for phosphorus and 1:4 (1:1 upstream of the TMDL zone) for nitrogen. Rahr was required to place $250,000 in a trust fund for funding reductions in nonpoint source pollution. Within five years of implementation (1997), Rahr was able to achieve its credit requirements through four trades with nonpoint sources.

Fang and Easter (2003) estimated that the cost of phosphorus reduction was $4.44/lb for the most cost-effective trades in the project. The least cost-effective trades were $5.28/lb. If additional maintenance costs of $79,000 are taken into account, the cost of reducing phosphorus rose to $6.14/lb. Appendix 2 provides a detailed break up of the cost to Rahr and the social cost of the trading project. Fang and Easter find that as compared with other comparable point sources the trading project resulted in substantial savings for Rahr.

Fang and Easter's estimates of the major transactions costs of Rahr are presented in Appendix 3. These estimates show that transaction costs were much higher in the permitting phase than in the implementation phase for both Rahr and MCPA. Further, MCPA's share in total transaction costs was much higher than that of Rahr in both phases. Sixty five percent of the estimated total transaction costs ($105,032) were incurred before any trade took place. Rahr obtained all of its pollution reduction credits through four trades. This limited its transaction costs per credit and was one of the reasons for the success of its trading initiative. When transaction costs are added to the total cost of the project, it raised total costs and the per unit cost of pollutant reduction by about 35 percent. In particular, the cost of reducing phosphorus loads increases to $8.26/lb.

Southern Minnesota Beet Sugar Cooperative (Beet Sugar Coop)

Beet Sugar Coop had been issued an NPDES permit in 1999 for a planned WWTP. The new plant would have discharged 1.75 million gallons of effluent per day into a tributary of the Minnesota River. The permit required Beet Sugar Coop to offset all its projected 4,982 pounds of phosphorus discharged annually by purchasing credits from nonpoint sources. The trading ratio was set at 2.6:1 and the Beet Sugar Coop was required to set $300,000 aside for conservation practices. A large number of trades, particularly in the first three years, were with sugar beet farmers who were members of the cooperative. Between 2000 and 2001, 367 parcels of land involving 164 landowners and 35,839 acres of sugar beet farmland were contracted to plant spring cover crops as a nutrient control measure. The Beet Sugar Coop contracted on average with 100 farmers each year during 2000-01 for 17,920 acres of sugar beet spring cover cropping which generated on average 5,765 credits per year. Farmers were compensated at the rate of $2/acre. From this, Fang and Easter (2003) estimate that the cost of phosphorus reduction for Beet Sugar Coop was $6.22/lb. In contrast, the actual cost to farmers of growing spring cover crops was about $6/acre so that the cost of reducing phosphorus per acre to Beet Sugar Coop by spring cover cropping was $18.65/acre[3] which is high compared with the costs borne by most municipal WWTPs. Farmers were willing to accept a $2/acre payment from SMBSC when their costs were $6/ acre, because growing spring cover crops brought a number of private benefits including the crops which could be sold and the prevention of soil erosion. Thus they did not lose money to adopt this practice. Appendix 4 presents the cost analysis of Beet Sugar Coop's trades. Beet Sugar Coop's trades with farmers to engage in sugar beet spring cover cropping did not result in any cost savings either for the company or socially, due apparently to higher than anticipated *ex post* costs associated with the spring cover cropping.

Detailed estimates of transaction costs for Beet Sugar Coop are not available. The permits for Beet Sugar Coop took about six months less to process than the permits for Rahr. That resulted in some savings. Apart from the time involved, the nature of permits issued to the two permittees was similar and it is safe to conclude that the nature of the transaction costs would have been similar, too. The trades were different for the two permittees resulting in differences in transaction costs at the implementation stage.

Beet Sugar Coop is a cooperative with 600 farmer-members. In the first three years it traded exclusively with its members, saving substantially on search and reporting costs. However, the large number of trades (367 for 2000-01) required a large amount of work by MCPA to verify and monitor each trade. Fang and Easter estimate that MCPA staff spent three times as much time on the implementation phase of the Beet Sugar Coop project than the Rahr project. This implies that the total transaction costs for Beet Sugar Coop would have been higher than that for Rahr even though the cost to the permittee would have been lower. This in turn implies that trades in the Beet Sugar Coop project did not lead to any overall cost savings.

Social Benefits from the Projects

In addition to reducing pollution into the Minnesota River for a lower cost, the two trading projects produced additional benefits. The trading projects provided funds for nonpoint sources to implement pollution control measures that benefited other rivers and streams. For instance, landowners involved in the Rush River and Eight Mile Creek (which are tributaries of the Minnesota River and hence part of the watershed where Rahr could trade) were interested in controlling river bank erosion but could not do so on account of financial constraints. Payments by the Rahr enabled them to install measures for preventing soil erosion that also reduced river bank erosion. Trading in pollution credits also enabled the two permittees to expand their production facilities possibly to the benefit of the local economy.

The environmental benefits of trading were not limited to water quality. Prior to the trading project, Beet Sugar Coop stored its wastewater in ponds. The ponds caused an odor problem. This was no longer a problem when Beet Sugar Coop was allowed to discharge its effluents and purchase credits from nonpoint sources. Further, Rahr's floodplain restoration projects created habitat for wildlife. Rahr donated two restored wetlands to the city of New Ulm and a local environmental organization, respectively, for use as a park and an environmental education site.

Finally, the involvement of various stakeholders in trading brought many nonpoint sources and their problems to public attention. It also raised public awareness about pollution control in nonpoint sources.

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[3] Please note the conversion from $/lb to $/acre. The estimates are from Fang and Ester (2003).

Illinois

Illinois Pretreatment Trading Program

The Illinois Environmental Protection Agency (IEPA) introduced its trading program in Illinois in the late 1990s after it determined that a trading program had the potential to cost-effectively address water quality problems. The program was developed with the goal of minimizing compliance costs for meeting pretreatment regulatory requirements at the federal, state and local levels.

IEPA's goal was to establish of a pretreatment trading market in any area serviced by a publicly owned treatment works (POTW) if the POTW met certain requirements, which included (1) operating a local pretreatment program in accordance with state and federal regulations; (2) conforming with NPDES requirements; and (3) receiving indirect discharges from industries subject to federal or local regulation.

The program was not a success in the sense that as of 2004 no trading occurred under the scheme and the program has been dormant since. The failure of the program to generate trades does not mean that if there were trades they would not have been cost-effective. One service area estimated potential cost savings of $6.9 million if it were able to trade federal categorical pretreatment limits. Yet trades didn't take place because the EPA NPDES regulations explicitly disallowed such trades. EPA requires that technology-based standards be met by most point sources by using prescribed technologies. If state or local regulations set emissions requirements above these standards for a point source, then EPA would allow trading. However, in Illinois, the federal technology-based standards are more stringent than any local limits so there is no ability to use trading to reduce the costs of meeting any water quality reductions.

Piasa Creek Watershed Project

This project is a point-nonpoint source trading program aimed at reducing the flow of sediments from nonpoint sources into Piasa Creek, a tributary of the Mississippi River. The Great Rivers Land Trust (GRLT), a local nonprofit, facilitated the project. Under this project a newly constructed water supply treatment facility in Alton, Ill., operated by Illinois-American Water Company (IL-AWC), received permission to discharge its effluent directly into the river and avoid costly treatment in exchange for purchasing emission credits from agricultural nonpoint sources.

Operationally, this was achieved by the IL-AWC being issued additional NPDES permits with the condition that it would provide funding to GRLT to contract with farmers to implement enough conservation practices to offset the increased permits. The project also includes monitoring and educational outreach. The implementation of the 10-year project started in 2001 (Gregory, 2003).

A 2:1 trading ratio was required by the end of the project (meaning that for each ton of emissions discharged at the Alton facility, it must purchase two tons of reduction from upstream sources). This was a conservative trading ratio as EPA's TMDL guidance requires only a 1.5:1 ratio. Since Alton's projected annual direct discharge was 3,300 tons there needs to be an annual reduction 6,600 tons of sediments into Piasa Creek by nonpoint sources by the end of the project (2010).

The conservation practices for sediment reduction include land acquisition, conservation easements, streambank stabilization, and development of silt basins, dry dams, terraces, grassed waterways, filter strips and grade control structures. To compute the amount of credit an agricultural producer can earn (and trade) for adopting a conservation practice, the GRLT used the Universal Soil Loss Equation in conjunction with other information.

The Illinois Pollution Control Board and IEPA approved the contract between GRLT and IL-AWC for this project. The approval process took nearly two years. GRLT chose which projects to fund by ranking on the basis of a sliding scale of cost per ton of soil saved.

The burden of regulation and monitoring are shared by IEPA and GRLT. Monitoring and reporting requirements incorporated into the NPDES permit enable IEPA to monitor sediment offsets. GRLT monitors the measures installed by the nonpoint sources and provides quarterly and annual reports to IEPA and IL-AWC.

Landowners are responsible for maintenance of sediment control structures on their land. The landowner's contract can be terminated at the halfway review point if the IEPA finds the program is not effective in achieving sediment reductions.

While the project will not be complete until 2010, several successes already stand out. While only one point source has contracted to purchase nonpoint source credits (IL-AWC), this trade appears to have succeeded in reducing the treatment plant's costs of meeting water quality requirements. In the absence of trading, the lagoon and landfill required to build the new wastewater treatment facility in Alton would have cost $7.4 million in capital investment and $0.42 million annually in operation and maintenance costs. Compared with this, the trading project will have saved $4.15 million over 10 years.

As of the project's fourth year (2004), the required reduction in sediments from the nonpoint sources had already crossed the halfway mark.

The project's administrative costs account for 15 percent of total costs (Breetz et al 2004). These include costs of monitoring and verification as well as approvals. However, the fact that GRLT bears the major burden for monitoring ensures that IEPA and IPCB staff do not have to bear the majority of transactions costs for monitoring once the approval process is over.

The project's outreach and education have been a major success. Initially, landowners were not very keen on trades with IL-AWC. But the outreach efforts have been effective because landowners began approaching IL-AWC to contract for trades rather than the other way around. This is bound to reduce the search costs for trading partners and thus lower the transaction costs for the project.

Wisconsin

In the early 1990s, the state of Wisconsin established a 1 mg/L limit on phosphorus discharge into water bodies, it created interest in water quality trading programs among wastewater treatment plants.[4] The phosphorus discharge limit was expected to affect between 35 percent and 40 percent of all Wisconsin POTWs. Three pilot programs in water quality trading were authorized by the Wisconsin Legislature in 1997. The pilot programs authorized were in the Fox Wolf Basin, the Red Cedar River Basin and the Rock River. Of these, the Red Cedar River Basin was the only one to generate actual trades.

Fox Wolf Watershed Project

Covering an area of 6,400 square miles, the Fox Wolf River Basin is the largest drainage basin into Lake Michigan. Green Bay, where the Fox Wolf River drains into Lake Michigan, has faced excessive nutrient loading since the 1980s. Technology-based effluent limits and pretreatment standards (1 mg/l L limit on discharge of phosphorus) were successful in cutting discharges from point sources into the basin

[4] http://www.legis.state.wi.us/rsb/code/nr/nr217.pdf

but not enough to improve Green Bay's continually declining water quality. The water trading pilot was authorized in the Fox Wolf Basin with the aim that point sources would channel funds to nonpoint sources through this program, enabling them to undertake pollution control measures.

The stakeholders in the project included the Wisconsin DNR, which authorized the pilots; the Water Environment Research Foundation, which provided funding for monitoring and analysis; the Fox Wolf Watershed Alliance, a nonprofit organization that took the initiative to conduct extensive water quality monitoring, modeling and analysis to inform policy regarding water quality trading; and the United States Geological Survey, which assisted with monitoring.

As noted before, the project did not generate any trades, so trading ratios and mechanisms for verification and auditing were not established. The Fox Wolf Watershed Alliance tried to promote the use of an online nutrient registry to facilitate trading, but it was not tested as there were no trades.

Anticipated transactions costs for point sources were high because in absence of clear guidelines from the regulator, the point sources were responsible for the mechanism and details of their trading programs. Trading that is not supported by state guidelines is vulnerable to criticism from the environmental community. As a result, point sources would have preferred to trade with other point sources, as allowed by Wisconsin law, rather than with many nonpoint sources.

Ex ante estimates placed the average cost of reducing phosphorus load at $76/lb for point sources and $26/lb for BMPs in agricultural land. This provided the rationale for the trading program. Later it was found that costs for point sources were lower than those for nonpoint sources in the Upper Fox and Wolf Rivers. Only the Lower Fox River had a cost differential that was favorable to trading.

Red Cedar River Basin Project

In west central Wisconsin's Red Cedar Watershed, nonpoint sources account for 93 percent of the phosphorus load. Algae blooms and eutrophication in Tainter Lake had been a cause for concern and activities to monitor and manage water quality had been undertaken since 1984 by the Red Cedar Steering Committee, a nongovernmental organization, which coordinated water quality monitoring at several lakes and developed a model to determine the phosphorus loading rates of different land uses. The committee's initiative led to authorization in 1997-98 of the Red Cedar River Basin Project,funded by a USEPA grant. Other stakeholders in the project included the Wisconsin DNR, the City of Cumberland and the Barron County Land Conservation Department.

The trades in this pilot project were generated by Cumberland, which, faced with a 1mg/L limit on discharge of phosphorus, sought to purchase 4,400 pounds of annual phosphorus offsets instead of making expensive upgrades for its POTW. The Barron County Land Conservation Department served as the contact between Cumberland and farmers, signing up the latter for trading and verifying their BMPs.

The trading ratio was set at 2:1. Farmers could be paid for a BMP for three years. The trades conducted involved nutrient management planning or no-tillage. To ensure compliance, farmers were paid for a BMP only after the Wisconsin DNR verified implementation. Landowners applying for the trading program were evaluated according to the trading area criteria and the soil was tested in each field to calculate the phosphorus delivery to the stream from the field where the BMP was used.

Cumberland contracted with 22 farmers for 5,000 pounds of phosphorus credits in 2001 and a similar number in 2002 and 2003. In 2001 Cumberland paid 22 farmers a total of $14,526. The direct cost of the program would have been roughly the same in 2002 and 2003.

MITIGATION BANKING

"A mitigation bank is a wetland, stream or other aquatic resource area that has been restored, established, enhanced or preserved for the purpose of providing compensation for unavoidable impacts to aquatic resources permitted under Section 404 [of the U.S. Clean Water Act] or a similar state or local wetland regulation. A mitigation bank may be created when a government agency, corporation, nonprofit organization, or other entity undertakes these activities under a formal agreement with a regulatory agency."[5]

Wetland banking is being increasingly used in the Midwest to address the loss of wetlands due to urban or agricultural development. There are a variety of specific rules that regulate mitigation responsibilities when a wetland is lost. Section 404 requires that a permit be obtained before a wetland can be filled or destroyed. To obtain a permit from the responsible agency (the Army Corps of Engineers) the applicant must demonstrate that they have restored an equivalent amount of wetland at the site or have purchased an offset from a third-party. The purchase of an offset from a third-party provides the basis for wetland "banking," which is also referred to as "mitigation banking."

In a mitigation bank, an agency or firm acquires a large tract of land and restores wetlands. Based on the extent and type of wetlands restored, "credits" are earned which can then be sold to those who need them to satisfy their mitigation requirements. In March 2008, the U.S. EPA in conjunction with the Corps and other federal agencies has issued guidelines governing the development and transfer of credits from wetland mitigation banks which is likely to spur their increased use.

There has been legitimate concern expressed over whether the wetlands provided at mitigation banks are equivalent in function to destroyed wetlands. Existing, scattered wetlands also provide habitat benefits. However wetlands mitigated in banks may be superior to mitigation efforts that are made on site as the latter are likely to be piecemeal, not maintained, and may perform poorly. (A larger, contiguous area of restored wetlands may be superior to a series of scattered, non-integrated wetland sites.) Several states in the Midwest have used mitigation banks over the past two decades to maintain and enhance their wetlands resources in the face of development activity. Below are descriptions of banks in Missouri and Minnesota and a comparison in Iowa.

Missouri

Missouri has several agricultural and developmental wetland mitigation banks. The Missouri Agricultural Wetland Mitigation Bank (MAWMB) in Stoddard County was the first wetland mitigation bank in the United States. It services nine counties in the Bootheel Region of Missouri. It was founded by private initiative and now has several stakeholders involved as partners.

The Agricultural Conservation Innovation Center (ACIC), a private non-profit organization affiliated with the American Farmland Trust, sponsored and manages the bank. It provided the funds to acquire a permanent conservation easement on the mitigation parcel, implement the restoration activities and manage the mitigation site over the long term. An interagency committee called the Mitigation Bank Review Team (MBRT) was set up to examine and approve all potential wetland impacts to be mitigated to MAWMB and determine replacement ratios. The MBRT was chaired by the Missouri NRCS and included representatives from the US Army Corps of Engineers, USEPA, U.S. Fish and Wildlife Service, Missouri DNR and the Missouri Department of Conservation. NRCS holds the permanent

[5] (http://www.epa.gov/owow/wetlands/facts/fact16.html)

conservation easement and ensures that the property is protected in perpetuity. The mitigation site landowner is responsible for the restoration and long-term management, maintenance activities, and taxes on the property. This is an example of a successful private-government partnership in a project that started out as a private initiative.

The Midland Wetland Restoration is another privately run mitigation bank that operates commercially. The company has about 100 credits available for sale to landowners and provides services to landowners all over the state of Missouri.

Minnesota

The Minnesota Department of Transportation is responsible for establishing a number of wetland mitigation banks in the state. One of its largest projects was the Rice Lake Mitigation Bank, which restored 670 acres of wetlands in the Staples Drainage Area. The land for this wetland is owned and managed by the Minnesota Department of Natural Resources.

Wetlands in the state of Minnesota are protected by the Wetland Conservation Act of 1991 (WCA). The act is administered by the Minnesota Board of Water and Soil Resources (BWSR), implemented by local government units, and enforced by the Department of Natural Resources. WCA seeks to ensure that development projects do not result in any net loss of wetland quantity, quality and biological diversity. The act requires that development projects avoid disturbing a wetland to the extent possible, then minimize any impacts where the wetland cannot be left undisturbed and finally replace any lost wetland acres, functions, and values. Overall the WCA establishes a comprehensive, statewide approach to wetland conservation.

One aspect of this comprehensive approach has been to distinguish between different types and qualities of wetland. This is put in practice by pooling all the wetland credits available within Minnesota and then separating them into credit by wetland types.

The Federal Highway Administration reviewed successful wetland mitigation programs and described the sites managed by the Minnesota Department of Transportation as successful. This success was attributed to research-backed choice of plant species to seed the wetlands and the availability of historical data generated by the University of Minnesota's Center for Urban and Regional Affairs on the location and description of the State's pre-settlement wetlands. The availability of this information allowed Minnesota Department of Transportation to focus its dollars on restoration efforts, which have higher success rates than creating new wetlands.

An important issue in this respect is the fate of a privately owned mitigation bank site after the initial years when the site restoration and monitoring are complete, and all credits have been exhausted. At this point the site may be sold or transferred to the new owner and there is a need for mechanisms to ensure that the integrity and diversity of the site is maintained.

The Federal Highway Authority study identified the following best practices and innovations in the state of Minnesota:

- “Minnesota is seeking to establish mitigation sites not only to serve all geographic areas but also of specific wetland types within those the geographic areas. Minnesota pools all the wetland credits available within the State and then separates them into credit by wetland types.

• Minnesota is attempting to focus mitigation efforts where needed, particularly in the areas with the highest historical loss of wetlands rather than just within the designated service area or within the watershed.

• Minnesota uses one umbrella agreement that covers all mitigation sites.

• All future sites will be created and managed as a statewide system.

• Preservation as mitigation can be used in extreme circumstances; however, the mitigation must include a restoration component."[6]

Iowa

Iowa's first agricultural mitigation bank is a wetland located in Colter Marsh in Franklin County. It was sponsored by the Iowa Farm Bureau Federation in partnership with the Iowa DNR. The USDA's Natural Resources Conservation Service provided the technical assistance for the project. The bank is intended to provide offsets for farmers in north-central Iowa, a region typified by prairie potholes, and the bank serves farmers with cropped farmed wetlands (upland depressional wetlands) on their land.

The restoration of wetlands at this site generated about 60 wetland "functional units." These units are determined by the NRCS and are intended to be sure that the replacement of wetland acreage adequately compensates for the lost functional features of the wetland that will now be farmed. Since an average of about 0.5 credits are typically required to compensate for draining an acre of wetlands, this bank can provide the needed offsets for about 100 acres of wetlands converted to farming.

The cost of credits to mitigate an acre of farmed wetland is $8,140. Based on a replacement ratio of 0.55, this amounts to $14,800 per credit. This estimate covers the cost of restoring the wetland and the cost of the land. Iowa DNR owns the land and will be responsible for the maintenance of the wetland. As of the second week of September 2008, the bank had sold all but nine of its available mitigated wetland credits. In this sense, the project appears to have been a success.

LESSONS LEARNED

If the state of Iowa, watershed groups, nonprofits, or other entities are interested in developing and implementing new voluntary programs to address environmental problems, this report has identified examples of permit trading and wetland banking in neighboring states from which lessons can be learned. It is important to recognize however, that there are still relatively few cases of highly successful, or even highly active, incentive-based programs in the Midwest so that significant care must be taken in drawing conclusions from these attempts. In most cases, the programs have been small and covered small watersheds or areas. Nevertheless, we identify a number of "lessons" associated with the design and implementation of permit trading and wetland banking.

Water Quality Trading Lessons

• Initiatives to address water quality problems need to be backed by enforceable and sufficiently strong requirements that limit pollution. In the absence of stringent standards, even well-designed programs cannot work. For example, Wisconsin has one of the most robust enabling legal structures for water quality trading. Wisconsin law allows trading of effluent credits between point-point, point-nonpoint and

[6] http://www.fhwa.dot.gov/environment/wetland/scanrpt/mn.htm

nonpoint-nonpoint sources. Yet, of its three pilot projects, only one generated any trades because the standards imposed on point sources in Wisconsin were not strict enough to make trading cost-effective.

• Policies that dictate the technology a polluter must use to lower emissions can significantly hinder trades. If policymakers aim to ensure that targets for nutrient and sediment control are achieved with the lowest possible cost, then the law should allow polluters to consider proven methods of effective mitigation and choose the one with the lowest cost. The Illinois Pretreatment Trading Project was hindered because trading between point source and nonpoint sources was not allowed to substitute for its technology-based limits.

• Cost-benefit analyses that occur before water quality projects begin usually do not take into account the associated environmental effects which may translate into costs or benefits. For instance, the Rahr trading project in Minnesota resulted in several benefits that were external to the initial goals of the project. Associated environmental externalities, if taken into account in the planning stages, would provide a more accurate evaluation of the potential costs and benefits of a proposed project.

• If the majority of the burden of transaction costs of small trades is borne by the regulator, it does not create incentives for the permittee to achieve its targets using as few trades as possible. Thus, the permittee may engage in a large number of small trades, increasing the transaction costs for the project as a whole and per credit (e.g. Beet Sugar Coop), resulting in a more costly program than necessary.

Water Quality Trading Summary

There have been instances in Midwestern states of successful trading programs. However, because there have not been many programs and some of those programs have been unsuccessful, it is difficult to provide conclusive recommendations. Without more information on both the costs and benefits that water quality trading might bring to Iowa, we can not recommend statewide adoption. There is enough evidence to recommend that Iowa to establish a few test water quality trading programs in individual watersheds to gather more information on the costs and benefits.

Wetland Banking Lessons

• The Board of the Missouri Levee and Drainage District Association notes two advantages of wetland banks, (1) farmers get to move wetlands off their farms so more acres can be graded, drained and farmed to provide increased net returns; and, (2) a levee/drainage district, when economically advantageous, can move wetland places away from levees, drainage ditches and facilities thereby realizing an initial savings for construction and avoiding future low return maintenance costs.

• Wetland mitigation banking can be carried out almost completely on private initiative. It is beneficial for both the landowner who gets to purchase credits and the company building the bank because it can make a profit selling credits. The government or regulator’s role here is to ensure that the wetland bank stays a wetland in perpetuity and that credits are estimated correctly and exchanged fairly.

• Wetland banks are meant to compensate for wetlands lost to farming or development activity, not primarily to improve water quality. Water quality benefits could come if a wetland mitigation bank were located between a stream or a lake and agricultural land. In such cases, the wetland might act as a buffer between the farmland and the water body and reduce the amount of nutrient runoffs into the water body. The gains in water quality from a wetland located between a water body and farmland must be weighted against the loss in water quality that could occur from the destruction of the original wetland.

• A comprehensive approach to wetland banking must take into account not just the size, but the quality of the wetland, to ensure that credits are not used to compensate for the destruction of a beneficial wetland with the construction of a poor or mediocre functioning wetland. In general, distinguishing between different qualities of wetlands, as was done in Minnesota, could ensure that the overall quality of wetlands within a state does not go down on account of development.

• A system needs to be put in place that requires the maintenance wetland banks after the initial years of building and monitoring are over. After the first 10 to 15 years, there is a possibility that the bank may be sold or transferred to a new owner. It is necessary to ensure that responsibilities to maintain the wetland are transferred with the ownership when this happens.

Wetland Banking Summary

Wetland banking is generally not a device for improving water quality, although under some circumstances it might do so. These circumstances will depend on the particular wetland trade, location and hydrology. With Iowa's current system, it is not clear that either wetland quality or maintenance can be assured or that any water quality improvements will occur.

CONCLUSION

Water quality trading and wetland banking programs may one day prove to be substantive and cost-effective approaches to achieve environmental improvements, but at the moment the efforts in the Midwest are nascent. While there is evidence that incentive-based programs have potential, they have been implemented at small scales and relatively small participation. Thus, it cannot be expected to have achieved significant success in terms of environmental improvement. Nonetheless, some of the failings of these programs can benefit those who seek to design and implement better versions. Likewise, the successes can be built upon for improvements as well.

PROGRAM INFORMATION AND REFERENCES

Websites:

Environment Trading Network "Water Quality Trading" http://www.envtn.org/wqt/stateprograms_page.html

Federal Highway Administration http://www.fhwa.dot.gov/environment/wetland/scanrpt/index.htm#toc

Iowa Department of Agriculture and Land Stewardship http://www.iowaagriculture.gov/

Missouri Department of Natural Resources: Wetlands http://www.dnr.mo.gov/env/wrc/wetlands.htm
Missouri Levee and Drainage District Association: Agricultural Wetland Mitigation Banks http://www.mldda.org/wetlandbank.htm

Missouri Watershed Information Network http://www.mowin.org/

Natural Resource Conservation Service: A Guide to Conservation Programs in Iowa http://www.ia.nrcs.usda.gov/Programs/Guide.html

United States Environmental Protection Agency: "Section 404 and Swampbuster: Wetlands on Agricultural Lands" http://www.epa.gov/owow/wetlands/facts/fact19.html

Wisconsin Department of Natural Resources "Watershed Based Pollutant Quality Trading" http://www.dnr.state.wi.us/runoff/pt/

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APPENDIX 1

Trade Cost Analysis of the Rahr Trading Project (1997-2002)					
Cost to Rahr	**Cottonwood & Minnesota****	**Eight Mile Creek**	**Rush River**	**Total**	**Average (per trade)**
Credit generated (per day)*	100.7	14.8	98.7	214.2	53.6
CBOD[5] removed(lb in 5 years)	367,555	54,020	360,255	781,830	195,458
P[@] removed (lb in 5 years)	45,944	6,753	45,032	97,729	24,432
Cost ($)*	102,000	17,810	101,122	300,044[&]	75,011
Cost per credit ($)	1,013	1,203	1,025	--	1,401
Cost per lb $CBOD_5$ removed ($/lb)	0.56	0.66	0.56	--	0.77
Cost per lb P removed ($/lb)	2.22	2.64	2.25	--	3.07
Social costs (10-year)*					
Cost ($, annualized)	15,201	2,654	15,070	44,715[&]	11,179
Cost per lb $CBOD_5$ removed ($/lb)	0.21	0.25	0.21	--	0.29
Cost per lb P removed ($/lb)	1.65	1.97	1.67	--	2.29
Social costs (20-year)*					
Cost ($, annualized)	10,389	1,814	10,299	30,560[&]	7,640
Cost per lb $CBOD_5$ removed ($/lb)	0.14	0.17	0.14	--	0.20
Cost per lb P removed ($/lb)	1.13	1.34	1.14	--	1.56

Source: Fang and Easter (2003)

** Two trades are combined here, the Cottonwood and the Minnesota River sites, both of which are located near New Ulm and are flood scoured area set-asides and the vegetation restoration, Separate cost numbers were not sought after in this study.

@ Phosphorus

[&] Also includes additional expenditures totaled at about $79,112, resulting mostly from a failed trade and miscellaneous post-construction site maintenance ($29,112), and structural repaining due to flood damages (estimated at about $50,000).

*Assuming an 8% discount rate

APPENDIX 2

Transactions Cost Analysis of Rahr's Trading

		Time (hr)	Rate ($/hr)*	No. of personnel	Total ($)
Permitting Phase					
Rahr	Consultants	30	200	2	12,000
	Company Staff	30	75	2	4,500
	Sub Total	120	--	4	16,500
MCPA**	Staff (engineer)	1,387	24	1	33,301
	Staff (permit writer)	347	24	1	8,325
	Staff (supervisory)	347	29	1	10,168
	Sub Total	2,080	--	3	51,794
	Phase Total	2,200	--	7	68,294
Implementation Phase					
Rahr	Company Staff	35	63	1	2,188
	Sub Total	35	--	1	2,188
MCPA	Staff (engineer)	1,387	24	1	33,301
	Sub Total	1,387	--	1	33,301
Outside help	Citizen Group	45	17	1	750
	Sub Total	45	--	1	750
Nonpoint	Landowner	--	--	--	500@
Sources	**Sub Total**	--	--	--	500
	Phase Total	427	--	3	36,738
	Grand Total ($)	3,667	--	10	105,032

Source: Fang and Easter (2003)

*Median values

** (1) MCPA staff salary rate based on median levels for different staff categories; (2) fringe benefits not counted; (3) full time MCPA staff member is assumed to work 2,080 hours per year.

@ Legal fee for contract proof-reading

APPENDIX 3

Cost Analysis of SMBSC's sugar beet spring cover cropping trades

	2000	2001	Average
Acreage (acre)	18,188	17,651	17,920
Payment made by SMBSC ($/acre)	2.00	2.00	2.00
Total payment by SMBSC ($)	36,376	35,302	35,839
Credits generated (lb P)	5,298	6,232	5,765
Credits per acre	0.29	0.35	0.32
Cost per lb P ($/lb)	6.87	5.66	6.22
Cost to growers ($/acre)*	6.00	6.00	6.00
Total cost to growers ($)	109,128	105,906	107,517
Actual cost per lb P ($/lb)	20.60	16.99	18.65

Source: Fang and Easter (2003)

*Expert estimate, not inflation adjusted