The Ohio Conservancy Districts:
A White Paper on Ohio's Conservancy Districts and the Ecosystem Service District Concept

June 30, 2006

Introduction

As one of the case studies of the GLPF Growing Water grant project led by the Environmental Trading Network, the project team compared the concept of an Ecosystem Service District (ESD; Heal, et al. 2001) with the structure and functions of the Ohio Conservancy Districts. The focus of this study is the Miami Conservancy District (MCD or the District), its on-going Great Miami River Watershed Water Quality Credit Trading program as an example of managing some important ecosystem services, and how MCD can build on the water quality trading program to further become a more ecosystem management oriented service district.

The ESD Concept

An ESD is envisioned to be a governmental institution that can provide a coherent and efficient management of ecosystem services (or natural capital) by taking the ecological values of the landscape into account in making economic and social decisions, especially land use decisions. An important feature of ecosystem service management by an ESD is the use of the market to evaluate and guide the distribution of ecosystem services. In order to effectively use the market, an ESD will also need to monitor, quantify, and invest in these services.

As the first step, an ESD will serve two essential functions: coordinating ecosystem related activities across existing jurisdictions and generating information regarding the status and value of ecosystems. To effectively manage the ecosystem, zoning or land use powers and taxation authority may also be necessary.

Ohio Conservancy Districts and the Miami Conservancy District

In the wake of Ohio's Great Flood of 1913, the State of Ohio passed Chapter 6101 of the Ohio Revised Code, known as the Conservancy Act. The primary function of Conservancy Districts is, therefore, flood prevention and control. A Conservancy District is a political subdivision of the State of Ohio. Some key provisions of the Conservancy Act include:

§ 6101.04. Organization and purposes of conservancy districts.

Any area or areas situated in one or more counties may be organized as a conservancy district in the manner and subject to the conditions provided by this chapter for any of the following purposes:

(A) Preventing floods;

(B) Regulating stream channels by changing, widening, and deepening the stream channels;

(C) Reclaiming or filling wet and overflowed lands;

(D) Providing for irrigation where it may be needed;

(E) Regulating the flow of streams and conserving their waters;

(F) Diverting or in whole or in part eliminating watercourses;
(G) Providing a water supply for domestic, industrial, and public use;
(H) Providing for the collection and disposal of sewage and other liquid wastes produced within the district;
(I) Arresting erosion along the Ohio shore line of Lake Erie.
This section does not terminate the existence of any district organized prior to July 19, 1937, entirely within a single county. The purposes of a district may be altered by the same procedure as provided for the establishment of the district.

§ 6101.17. Dominant right of eminent domain.
The board of directors of a conservancy district, when it is necessary for the purposes of this chapter, shall have a dominant right of eminent domain over the right of eminent domain of railroad, telegraph, telephone, gas, water power, and other companies and corporations, and over townships, counties, and municipal corporations.

In the exercise of this right, due care shall be taken to do no unnecessary damage to other public utilities, and, in case of failure to agree upon the mode and terms of interference, not to interfere with their operation or usefulness beyond the actual necessities of the case, due regard being paid to the other public interests involved.

It is clear from the two parts of the Act cited above that the main purpose of a conservancy district is to prevent floods. As a result, its authority regarding land and stream modifications, and its dominant right of eminent domain, are all directed to empower the district to take necessary actions to prevent floods.

Because the necessity of approaching flood prevention from a geographic scale of watersheds/basins, Conservancy Districts naturally cover an area of multiple counties within a major river basin. However, it's unclear what authorities a district has over the land outside its main flood watershed but inside its constituency counties.

It seems that the dominant right of eminent domain was designed to facilitate the district in acquiring/using land and other private or public properties for the purpose of building flood prevention projects or any other related general activities.

The organization of a Conservancy District is shown in the following diagram using the Miami Conservancy District (MCD) as an example.

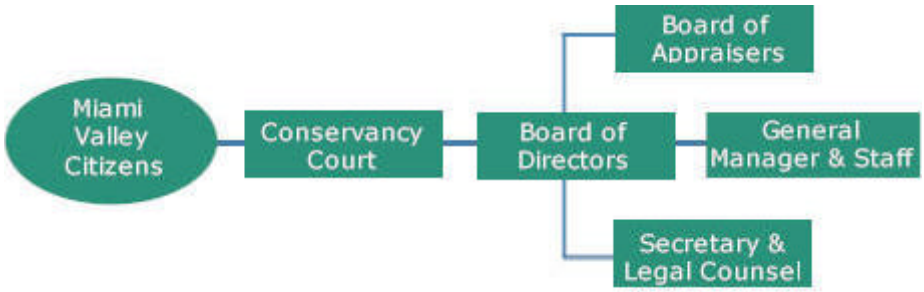

Figure 1. General Organization of a Conservancy District as illustrated by MCD

(Source: www.miamiconservancy.org)

The Conservancy Court is composed of one judge from the Common Pleas Court of each member county in the district. The Conservancy Court appoints the Board of Directors and the Board of Appraisers. The Board of Directors establishes district policy and provides oversight and direction to the Board-appointed General Manager. The Board of Directors makes key decisions with the approval of the Conservancy Court. It is the General Manager's responsibility to implement Board policy and run the day-to-day operations of the district. The Board of Appraisers is responsible of appraising land necessary for work of the district. In MCD, the Board also determines benefits provided by the flood protection system, the groundwater program, and recreational amenities, and approves the methodology used to determine assessments.

Miami Conservancy District (MCD)

The Miami Conservancy District (MCD), established on June 28, 1915, is the oldest and the most active among the 23 existing Districts in the state. The MCD serves 1.5 million people in the Great Miami River Watershed. The District covers 9 counties in the Watershed: Butler, Clark, Greene, Hamilton, Miami, Montgomery, Preble, Shelby, and Warren. However, three counties that have the majority of their jurisdiction located in the Watershed, Logan (upper Mad River and upper Great Miami River), Darke (supper Stillwater River), and Champaign (upper Mad River), are not represented in the District. The District employs 50 full-time, year-round staff and 20 seasonal and temporary staff.

Initial funding to build the flood protection services was entirely paid for by the people of the Miami Valley. No federal or state funds were used for the design or construction of the system (1918-1922). Construction debt was financed through bonds which were retired in 1949. At that time, assessments were reduced to a level required to provide for the ongoing maintenance of the flood protection system. The current system consists of 5 large scale flood control dry dams and levies on the rivers of major towns and cities.

The system of the dry dams (and flood retarding basins) was designed to take care of a flood 40% greater than that of 1913. It was built in an era of large dam constructions intended to "stimulate basinwide economic development by combining flood control, municipal water supply, irrigation, hydroelectric power generation, recreation and water quality improvement functions within single projects (Goldfarb, 1994)". Therefore, it is interesting that the MCD flood control dams were designed only for flood relief. During dam design, the MCD found that "the use of the Miami Conservancy District dams for power development would not be advisable from a financial or practical standpoint (MCD, 1922)", probably referring to the funding source (bond) and the geological conditions of the watershed (flat grades of the main streams in the watershed).

The bulk of all MCD historical and current operation is dedicated to its primary mission of flood protection ensured through maintenance of the 5 dams, their retarding basins, levees, walls, gates, pump stations and related appurtenances. Current activities included a heavy dose of safety upgrades such as installation of relief wells below dams. Roles are expanding as water related needs emerge including water quality monitoring and recreation trails.

MCD maintains real-time monitoring networks to continually update the operation of the flood control system. Updates are posted on the website in the form of press releases indicating status of the dams such as collecting floodwater, holding floodwater, releasing floodwater. It is frequently noted in these releases how often the system has benefited those it was designed to protect (e.g., about 1500 times floodwater stored and released in a controlled rate in the District's 90 years of existence). In addition, it brings this protection claim down the $ level by reminding the public that this protection is achieved at a low cost compared to what would happen people instead relied on pricey insurance and flooding was allowed to occur.

Organization

In addition to the general conservancy district organization structure shown in Figure 1, the MCD has the following specific subdivisions:

Figure 2: Subdivisions and Functions of the Miami Conservancy District
(from www.miamiconservancy.org)

Staff members are housed in these subdivisions. There are also several subdistricts within the MCD. Subdistricts can be set up for a specific geographic area within the District (e.g., the Dicks Creek—Little Muddy Creek Subdistrict and the Miami County

Subdistrict) or a specific function of the District (e.g., the Water Conservation Subdistrict and the Aquifer Preservation Subdistrict). Subdistricts are staffed by the main district and can borrow from the main district for program development. These subdistricts do not have a physical presence, i.e., a subdistrict office or department in the District's main office building in Dayton. Rather, they are a function concept established to accomplish the District's missions in a geographic or task area. The financial statements in the District's 2003 annual report do not illustrate the accounting records of individual subdistricts or subdivisions.

Funding

General funding of the District comes from assessments paid by property owners who receive benefits from services provided by MCD in the following three areas:

- Flood Protection
- Groundwater Preservation Program
- Recreational Amenities

The fee schedule for maintaining the District's flood protection system comes from two sources, unit and individual assessments. Unit assessments are charged to both cities and counties which have property and infrastructure protected by the District's flood protection system. Infrastructure includes public water and sewer systems, roadways and bridges.

Individual assessments are charged against parcels that flooded in the 1913 flood and receive protection from the District's flood protection system. A parcel's assessment is based on two factors including 1913 flood depth and current taxable value. The assessment is computed as a percent of the individual benefits within city or county boundaries. Individual benefits are in turn calculated as a percent of the tax value of a particular property. The percentage ranges from 3% to 30% depending on the depth the 1913 flood reached at the property. Cities pay 40% of the individual assessments within their boundaries. Counties pay a combination of 40% of the individual benefits within the townships, plus 15% of all benefits in the county.

For example: A $60,000 home is valued for tax purposes at 35%, or $21,000. If exposed to 3 feet of the 1913 floodwater, benefit received is 15% of $21,000 or $3,150. The assessment rate is currently 1.65% of the benefit or $51.98/year.

The Ohio Conservancy Act enables a Conservancy District to levy assessments against property receiving the benefit of groundwater preservation. A unit assessment, levied against each of the nine counties within the program boundaries, funds the District's activities. Each county has the option to pay the assessment out of its general fund or to spread the assessment over all properties within the program area.

Levies were also assessed against property receiving the benefit provided by recreational amenities. The political entities where these amenities are located pay an annual assessment to the District to provide maintenance for bikeways, low head dams and recreational trail bridges in Montgomery and Butler counties. The River Corridor

Improvement Subdistrict's Board of Appraisers set benefits for each type of structure based on its replacement value. An assessment rate is established by the Subdistrict's Board, which is applied to these benefits to establish the annual assessment. The concept is similar to how assessments are established for street lights or curb and sidewalk improvements found on a common property tax bill.

In addition to assessments, the District also pursues outside funds from various funding sources. For example, in 2003, a $700,000 grant was received through EPA's Watershed Initiative (or Targeted Watersheds) Grant Program to implement a suite of watershed improvement projects with local partners throughout the Great Miami River Watershed.

In its 2003 Annual Report, MCD listed five fund categories of its accounting records. Table 1 shows total cash receipts and disbursements for each of the 5 fund categories are as follows:

A. General Fund
Limited to operation, maintenance, and other current expenses of the District.

B. Special Revenue Funds
To account for the proceeds of specific revenue sources that are legally restricted to disbursements for specified purposes.

1. The Aquifer Preservation Subdistrict (APS)
2. The River Corridor Improvement Subdistrict
3. Miscellaneous
    - Watershed Initiatives
    - RiverSmart

C. Debt Service Funds
To account for the accumulation of resources for and the payment of debt principal, interest, and related costs: Dam Safety and Rehabilitation Debt Service

D. Capital Project Funds
To account for financial resources to be used for the acquisition or construction of major capital facilities: Dam Safety and Rehabilitation

E. Internal Service Funds
To account for the financing of goods or services provided by one department or agency to other departments or agencies of MCD.

1. Internal Service Support
2. Internal Service Operations

Table 1. Abbreviated MCD 2003 Financial Statements.

Fund Categories	General	Special Revenue	Debt Service	Capital Projects	Total
Receipts	$ 4,338,252	$ 1,361,881	$ 1,183,936	$ 110,136	$ 6,994,205
Disbursements	4,386,463	1,461,300	1,026,128	6,161,765	13,035,656
Other Receipts/(Disbursements)	(358,165)	(469,000)	0	4,000,000	4,110.835
Balance*	8,236,706	5,875,520	507,232	5,841,087	20,460,545

*Including carry-on's from 2002.

It is clear that the majority (62%) of the case receipts was from the general fund which presumably came from flood protection assessments on private and public properties.

The Great Miami River Watershed Water Quality Trading Program

Water quality credit trading utilizes a watershed framework to improve water quality. For example, a downstream wastewater treatment plant is facing expensive upgrade requirements which will require them to reduce the amount of pollutants they discharge as allowed in their National Pollutant Discharge Elimination System permit. They could invest money upstream that will fund less expensive agricultural management practices and achieve better water quality. Because the improvements are made upstream the quality of the water that flows past the downstream treatment plant will improve and so does all of the water in between. The customers of the wastewater treatment plant benefit from lower costs because expensive upgrades are avoided and everybody benefits from cleaner water.

The Water Conservation Subdistrict of MCD is currently leading is currently leading a water quality trading program in the Great Miami River Watershed. Water quality trading uses marketbased mechanisms to achieve loading reduction of water pollutants. It belongs to a group of environmental policies that assign a dollar value to the "right" of a source discharging/emitting pollutants into the environment and allow the trading of this right (so called emissions trading). The most widely known of these policies is the SO_2 emissions trading scheme that has been in place in the U.S. since early 1990's. In essence, trading of the "right" to discharge uses the market to explicitly value and place dollar values on an important ecosystem function, receiving and assimilating wastes from human activities. By leading the effort in developing, implementing and managing such a market for water pollutants, MCD is in effect managing an important function of the ecosystem in the Great Miami River Watershed.

Development of the Great Miami River Watershed Water Quality Credit Trading Program

The main driver behind the Great Miami River (GMR) Watershed Water Quality Credit Trading (WQCT) program is the more stringent effluent requirements for municipal, industrial and other permitted point sources under the pending nutrient standards proposed by the Ohio Environmental Protection Agency. Estimated millions of dollars would be required (Kieser & Associates, 2004) if the permitted point sources in the watershed (mostly municipal wastewater treatment plants) are to invest in new technology and equipment to achieve the new effluent requirements. In addition, with nonpoint sources make up the majority of the nutrient loadings (Reutter, 2003) in the watershed, it is doubtful that meeting the effluent requirements by point sources alone can achieve the nutrient standards for receiving waters. Nonpoint sources, mostly agricultural operations in the GMR Watershed, will also need to make significant load reductions. Besides nutrient load reductions, agricultural management practices that reduce agricultural nutrient loadings, such as conservation tillage, have many ancillary benefits that can improve water quality and habitat conditions in receiving waters.

Examples are sediment load reduction, peak runoff flow attenuation, groundwater recharge enhancement, and riparian ecosystem improvement. However, funding for agricultural management practices is inadequate in the watershed with the main source being the USDA-NRCS administrated Farm Bill conservation programs.

The Conservancy District, under the leadership of "Dusty" Douglas Hall, Manager of Program Development, saw the opportunity to establish a water quality trading program in the watershed under these circumstances. Such a trading program has the potential to offer a cost-effective approach to achieve the point source nutrient load reductions required by the pending new standards while providing the agricultural sector in the watershed a new source of nongovernmental funding for environmentally friendly management practices. The District is well suited to lead such a program because:

- The District has worked with both rural and urban communities in the watershed in flood protection, urban stormwater management planning, groundwater monitoring and protection, water quality improvement outreach activities in cooperation with local watershed organizations, and recreational amenities development.
- The District is not a regulatory agency. As a service district, it is trusted by the agricultural community.
- The District and its staff members have acted as a liaison between state regulatory agencies, particularly OEPA, and local regulated communities (municipalities) in areas such as stormwater management planning and wellhead protection programs. Such an intermediary role enables the District to effectively communicate with both OEPA and main credit buyers in a point-nonpoint source water quality trading program, a key to the active participation of buyers in and support of OEPA for a trading program.

The idea of developing a water quality trading (WQT) program was followed by two years of meeting and negotiating with all potential players in such a program. In meetings with county Soil and Water Conservation Districts (SWCDs), it was clearly heard that farmers, particularly smaller ones would never want to be regulated. Environmental groups don't like trading because of the uncertainties involved. This is where the monitoring aspect of the trading program came about (a percentage of projects and subwatershed monitoring, the latter has been done technically by MCD with its flow monitoring program).

The program design uses place-specific management and a 3rd party (MCD) to bring together the agricultural sector and municipalities (representing municipal wastewater treatment plants, the main point sources in the watershed). This would not have happened if it were a regulatory program. The wastewater treatment plants (WWTPs) were attracted to the program because:

1. The State of Ohio is moving toward establishing water quality standards and TMDLs in the watershed that will require substantial nutrient load reductions from WWTP discharges.
2. A market analysis conducted by Kieser & Associates indicated that water quality trading can save point sources in the watershed up to $370 million dollars compared to treatment facility upgrades in achieving the required nutrient load reductions.

3. MCD help the WWTPs negotiated with the OEPA terms of the trading program that provided lower trading ratios to reward early participation in the program and more importantly long term stability, i.e., modification of their permit language to a 10-year pilot program that allows the permittees to use nonpoint source credits to meet load reduction requirements.

Within the District, the trading program is supported by the Conservancy Court, the Board of Directors, and the District General Manager. It is important to create an idea that is sellable and the trading program leaders made it clear that a win-win environment existed with trading. The Water Conservation Subdistrict used main district funds (~$150K to 200K) to develop the trading program and these funds will be repaid with program funds contributed by WWTPs and/or funds generated from credit transactions.

Main Features of the GMR WQCT Program (MCD, 2005)

In this program, water quality credits are generated from pounds of phosphorus (TP) and pounds of nitrogen (TN) that are prevented from discharging into the Great Miami River Watershed's rivers and streams. Water quality credits only originate from an activity undertaken voluntarily, i.e. not otherwise required by local, state, or federal law. Water quality credits may be purchased by permitted dischargers, who become eligible buyers, for the purpose of complying with regulations related to the particular nutrient for which the credit is generated.

Eligible buyers are public and private entities that (1) hold a state-issued National Pollutant Discharge Elimination System (NPDES) permit, (2) have their NPDES permit modified to reflect their participation in the Trading Program, and (3) participate in funding the District's administrative and analytical costs for the trading program.

A trade occurs when water quality credits are transferred to an eligible buyer for their use to comply with an NPDES permit. The cost of a water quality credit is determined by the market. In general, the cost of a water quality credit is likely to be the sum of expenditures for the project (including applicable capital, operating, administrative and ongoing maintenance costs) divided by the number of credits.

Water quality credits will mainly be generated by implementing management practices that reduce the discharge of nutrients from agricultural land uses. Other opportunities to generate credits may include urban storm water management or home sewage treatment system upgrades - that go beyond what is required by law. The specific agricultural management practices that generate credits will be proposed by local soil and water conservation professionals. They will work directly with agricultural producers to identify and propose management practices that work best to accomplish the desired nutrient reduction. Reductions will be verified through inspections and by conducting water quality monitoring at a portion of the project sites. Water quality will also be measured with a continuous monitoring program on a subwatershed scale.

An advisory group, with broad-based stakeholder representation, will develop project criteria and then use it to review proposals and make recommendations for funding

specific projects. The criteria will include consideration of the existence of an approved watershed action plan and/or an approved TMDL for the area of the proposed project.

The Miami Conservancy District and its Water Conservation Subdistrict are responsible for the program management, including general program administration, water quality monitoring, and credit aggregation and distribution. Figure 3 below (adapted from MCD, 2005) shows the flow of trades. Note that in the diagram, there is not direct interaction between farmers and the regulatory agency, the Ohio EPA. This insulates those farmers from having to work with the Ohio EPA, removing a significant barrier to the participation of farmers in the trading program.

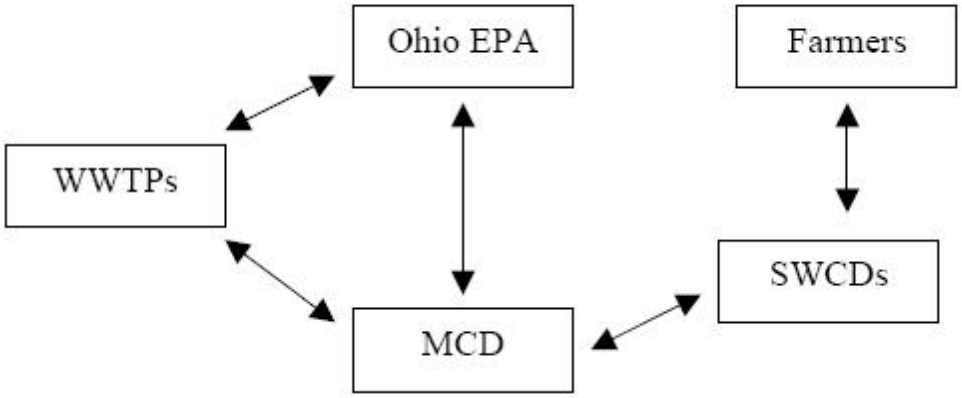

Figure 3. Flow of Trades in the Great Miami River Water Quality Trading Program

Specific Features of the Program

Several specific features of the trading program are worth noticing here. First, to be eligible to become a credit buyer in the program, a WWTP must first participate in funding the District's administrative and analytical costs for the trading program. Eligible buyers that participate in the program before NPDES compliance requirements for nutrients are called "Investors." Eligible buyers that choose to participate in the program but not in advance of their regulatory requirements are called "Contributors" (MCD, 2005). "Investors" are rewarded with a lower trading ratio (hence lower price for credits) for their early participation in financially supporting the program and contributing to early nonpoint source load reductions. Eligible buyers are currently funding the program at a rate that is proportional to their permitted discharge flow rate.

Second, the District also manages an Insurance Pool of credits to be used as a "guarantee" for credits being generated for eligible buyers. The Insurance Pool is one of two strategies used to insure that an eligible buyer is not at enforcement risk due to a possible failure of a management practice (the other one being the Management Practice Contingency Plan). Credits may be withdrawn from the pool, if necessary, to replace credits that are lost due to a failed management practice. The SWCD staff responsible for oversight of the management practice will make the determination that a management practice has failed. Credits deposited to the Insurance Pool will have a life of five years

from their date of deposit. If a pooled credit is not used within five years from its date of deposit, that credit will be retired.

A portion of the pooled credits will originate from projects that are funded by "Contributor" status eligible buyers. For Contributors with discharges to attaining water, one of every two required credits is directed to the Insurance Pool. For Contributors discharging to non-attaining water, one of every three required credits is directed to the Insurance Pool. In addition, water quality improvement projects subsidized by other sources of funds such as the Section 319 Nonpoint Source grant program may generate credits for deposit in the Insurance Pool. The District is actively pursuing credits to insure the Insurance Pool maintains adequate credits.

Third, a field and subwatershed scale monitoring plan is in place to analytically analyze the performance of the trading program. The program targets to collect project-specific data on a minimum of 5% of the total number of credit-generating projects. Nutrient data are also being collected at a larger scale to assess the overall effectiveness of the program within the Great Miami River Watershed. The District implemented a subwatershed water quality monitoring program that collects samples on a continuous basis at four different locations throughout the Watershed. In addition to providing an indication of the effectiveness of the trading program these data will fill a large gap in information necessary to more fully understand the role of nutrients within the Great Miami River Watershed and its contribution to downstream nutrient loading.

Finally, the program established an adaptive implementation approach to estimating nutrient load reductions. Currently, a spreadsheet model developed by the US EPA Region V office and based on the Michigan load quantification methods for CWA Section 319 projects is being used to quantify load reductions resulting from agricultural BMPs. As field monitoring of credit generating projects gets implemented, the Ohio EPA and Ohio DNR will establish a Load Reduction Workgroup. The Workgroup will be responsible for the periodic evaluation and enhancement of the Load Reduction Spreadsheet. The Workgroup will receive project specific information on management practices, load reduction estimates, and associated analytical data. Based on these data, the Workgroup will direct and oversee the biannual evaluation of the accuracy of estimates made for the trading program. This adaptive approach will ensure the trading program will produce optimized return-on-investment for nutrient management practices and maximized attainment of state water quality standards.

Trading Program Progress

For the first year of program operation (2006), five municipal WWTPs joined the program with contributions to the program fund totaling more than $352K. In addition, the District successfully applied for a three-year grant ($938K) from USDA's Conservation Innovation Grant program to support the program's administrative and monitoring costs. The first round of credit-generating project application and selection was conducted in March 2006. There were 71 bids submitted to the District, representing farmers and landowners from seven counties in the District and three of the four major subwatersheds of the Great Miami. The Project Advisory Group selected 13 projects to

be funded based on a BMP load reduction efficiency criteria of $2/lb of total nutrient (phosphorus and nitrogen) loads reduced. Fifty bids were deemed ineligible because the BMPs used did not have a standard load reduction quantification method available in the spreadsheet model used in the program. Other bids were ineligible because they intended to use the trading program as matching funds for other federal/state conservation programs. These bids, however, can be reconsidered for the next round of project funding when the ineligible elements of the projects are removed.

MCD in Comparison with ESD

Ecosystem services districts (ESDs) are conceptual government authorities dedicated to management of ecosystem services. The Growing Water RFP defines an ESD as "a specialized government entity to direct public investment into activities that enhance those ecological services that improve the condition of the district's water and water dependent natural resources." By taking the value of ecosystem services into account in making economic and social decisions, ESDs have the potential to promote sustainable development and fundamentally change the way our economic activities interact with the ecosystem.

The paper pioneering the ESD concept (Heal et al., 1997) considered the powers an ESD should have to manage ecosystem services, which include, from least to most controversial:

- coordination across existing different service districts (Coordination);
- generation of information on ecosystem services (Information Generation);
- zoning authority or other land use powers (Land Use), and;
- taxation authority (Taxation).

This section measures MCD's functions against these four categories. The impact of the new water quality credit trading program on MCD's potential evolution to becoming an ecosystem service agency is also discussed. The process of building and operating a water quality trading market has involved MCD in all the four functions that the ESC concept envisions for such a district.

Coordination

Although the organization of MCD is county based, the flood control origin of the district has its main activities naturally fall into the Great Miami River watershed boundary. MCD works regularly with local organizations such as SWCD to obtain external funds and work together on watershed improvement projects. However, it seems that MCD does not have a defined role of coordinating officially established service districts. On the other hand, interestingly, some of MCD's subdistricts clearly have different service focuses than the main district's flood protection (e.g., the Water Conservation Subdistrict and the Aquifer Preservation Subdistrict).

In addition, the recently re-activated Water Conservation Subdistrict covers a broad range of watershed activities, including assisting community-based watershed organizations, Phase II Stormwater permitting assistance, public education, and land conservation. The water quality trading program is also operated by this subdistrict. Other envisioned

activities by the Subdistrict include expanded water quality monitoring, restoration of natural floodplains and wetlands, streamside recreational development, and public education.

For the Great Miami River Watershed Water Quality Credit Trading program, substantial efforts were made to obtain support from state and federal regulatory agencies (i.e., the Ohio Environmental Protection Agency and the U.S. Environmental Protection Agency) and local public and private organizations. During 2003, numerous meetings and discussions were held with various potential partners including staff of various public and private wastewater dischargers, county Soil and Water Conservation Districts, the Ohio Farm Bureau Federation, Ohio EPA, Ohio DNR, and the U.S. EPA. Cooperation and regulatory flexibility offered by Ohio EPA and U.S. EPA leadership staff, throughout the discussions, bodes well for the potential to implement an innovative and cost-effective program. For example, Ohio EPA has agreed to coordinate data collection with MCD, to participate in efforts to strengthen community-based watershed groups, and to cooperatively pursue a water-quality trading effort in the Great Miami River Watershed. Ohio DNR also has agreed to provide technical support and oversight for the trading program.

Staff prepared a draft amendment to the Official Plan of The Water Conservation Subdistrict of MCD, which would reactivate the dormant Subdistrict to carry out the proposed program. In June 2004, the Board of Directors approved the final Official Plan amendment. By the end of 2004, a draft Operations Manual had been completed for the program. Currently, additional funding for initiating and partially implementing the program is being pursued.

The WQT program in the Great Miami River watershed, led by MCD, is a project involving a variety of stakeholders including regulatory agencies, local governments, conservation districts, citizens' groups, and private landowners (farmers). MCD's role as the program administrator and credit broker makes a coordinating function necessary. The quantification of load reduction credits, an essential step of the trading process, provides the district information regarding the benefits of ecosystem restoration efforts, which can in turn be translated into economic value. Although only a small part of a comprehensive ecosystem analysis, such evaluation certainly moves MCD a step closer to the information generating function of an ESD.

In summary, the development and implementation of the Water Quality Credit Trading program required a tremendous amount of coordination among various local, state, and federal agencies. The program is a shining example of the ability of MCD and its staff in working with all levels and all branches governmental organizations.

Information Generation

MCD maintains an extensive and continually expanding monitoring network throughout the Great Miami River watershed. These stations monitor groundwater levels, groundwater quality and surface water quality at wells and streams. Miami Conservancy District's monitoring network currently consists of 189 groundwater level wells, 77 water quality wells. In addition to data collection, MCD staff interprets and analyzes the data to

provide important information to decision-makers to help guide their use of the region's water resources. These results are published in user-friendly, non-technical reports that are widely distributed to MCD's constituents. MCD maintains 37 rain gauge stations and a subsequent database of rain records. MCD maintains or partners with other interests in the operation and maintenance of several 45 stream gauges and 2 lake gauges mostly provided by USGS.

For the Great Miami River Watershed Water Quality Credit Trading program, four automatic monitoring stations have been setup at major subwatershed outlets to provide baseline information on watershed nutrient loading conditions. In addition, 5% of the credit-generating projects will be monitored at the field or local small watershed scale to physically measure the improvement of water quality by these projects. Furthermore, monitoring for biological indices, the direct measure of the health of the river ecosystem, will be conducted to assess the overall effectiveness of the trading program.

Although these data collection activities have well equipped MCD to quantify water related ecosystem services, MCD has not taken conscious steps towards such quantification. Apparently, these data collection activities can be well justified with flood control/protection and groundwater quality protection. However, to take the MCD closer to an ESD, these data need to be analyzed in a way that goes beyond hydrology, chemistry, or biology. Economic and social factors and goals will also have to be considered.

Interestingly, MCD has actually started to move in this direction. Personal communications with MCD staff members indicated that MCD has initiated a study with the Ohio State University to study the economic impacts of watershed improvement projects such as trails, buffer strips, and river access points. In the water quality credit trading program, water quality monitoring data and the analysis results will have a direct impact on an important economic activity in the watershed, the operation of wastewater treatment facilities. This is because these results will eventually determine how many credits a point source can purchase from nonpoint sources, how much in-plant treatment needs to be done, and whether it should increase its sewage treatment fees to purchase more credits or upgrade its facilities. Such considerations in effect connect water quality quantification with economic goals of municipalities through the water quality trading market.

Land Use

It appears that outside of flood control and possibly groundwater protection, MCD has very limited land use power. Except the initial land and property acquisitions for the construction of the flood control dam system, we have not been able to find cases where MCD exercised its dominant right of eminent domain. Although this is far from what an ESD is envisioned to be able to do in terms of managing land use for optimum ecosystem services, flood control, being a key service provided by any ecosystem, is an excellent starting point for land use management by any service district aspiring to become an ESD.

The District also acquires land, apparently using its general fund and grant or other extra funding sources, for preventing development on the floodplain and other watershed improvement projects. In addition, it appears that the District tries to influence local authorities' zoning decisions with technical advice and education. With its reputation and ability to work with all sides of a given issue and the consensus building approach (evident in the water quality trading program), MCD does influence local decisions directly or indirectly.

Through the water quality trading program, the District is actually influencing the land use decisions of individual landowners through the water quality credit market. Between continuing the traditional farming practices that can cause soil, nutrient, and water storage capacity loss from the land, and switching to new farmland management practices such as conservation tillage or even retiring the land from crop production that can improve soil and water quality and quantity of the land and provide other ecosystem services (e.g., flood reduction and wildlife habitat), farmers make the choice by considering the economic incentives offered through the water quality credit market created by the District's trading program. Using the market to change land use patterns voluntarily towards those that can produce more ecosystem services, although not a direct land use authority envisioned by the ESD concept, is in fact preferable in most cases and fits better with the concept's central theme of using market forces to manage ecosystems.

Taxation

Similar to its land use power, taxation by MCD is also largely based on flood control and groundwater protection, two pillar functions of the District. Funding analysis (see Table 1) shows that basic service assessments (taxation) provides the majority of MCD's operation expenses, likely reaching beyond these two key functions. The way that the assessments are levied is similar to a service value based scheme, although it is far from the evaluation process proposed by Heal et al. (2001) that is based on the production possibility frontier of the natural resources in an ecosystem and the maximum possible value for society from these natural resources.

Again, using existing regulations to create markets, such as the Great Miami River Watershed water quality credit market, to make ecosystem service users to pay for these services will work better than directly taxation. Equally important is the political resistance to taxation that has to be considered. Among the four functions of an ESD as envisioned by the concept, taxation is potentially most controversial. Unless absolutely necessary, finding a market mechanism or other innovative way to achieve similar results without taxation may well be the key to the success of any future experiment of implementing the ESD concept.

From Conservancy Districts to ESD

It can be concluded from this analysis that the Miami Conservancy District has the following characteristics that enabled it to be successful in developing the water quality trading program. It is a governmental organization with 1) the mandate to preserve and manage natural lands or resources (water quantity and quality in MCD's case), 2) the capability of conducting research to quantify the ecosystem services generated from the

lands or resources, 3) the resources and authority to obtain additional public or private funding to implement conservation measures (e.g., assessments and grants), 4) the ability to manage the funds (i.e., repay the loan if required, and reinvest in further conservation measures if profit is generated), and 5) the leadership to create new conservation programs based on local conditions using regulatory or market forces to finance the programs.

Heal et al. (2001) suggested for steps to foster the implementation of ESDs. First, assess the ecological, economic and social conditions to justify the needs for safeguarding comparatively well-known ecosystem services (e.g., flood protection and water quality). Second, monitor the outcome of similar efforts elsewhere. Third, experiment and innovate. And fourth, promote model of success. From the analysis above, it can be shown that the Miami Conservancy District has in effect gone through the first three steps, particularly with the development and implementation of the water quality trading program.

MCD has always played an important and active role in managing the ecosystem in the Great Miami River watershed through its flood management, groundwater protection, and services for recreational amenities in the watershed. Although the District is not consciously moving towards a more ESD look-like organization, with the inauguration of the water quality trading program, the district is involved in ecosystem service management in a more apparent and direct way than ever before. More significantly, the use of the market to manage water quality has put the District more closely aligned with one of the central themes of the ESD concept, i.e., using the market to evaluate and manage ecosystem services. In addition, the successful development and implementation of the water quality trading program exemplifies an important aspect of the nature of the District—the conservancy district model works precisely because the districts are not regulatory agencies but service districts.

The biggest differences between MCD and a proposed ESD lie in the taxation and land use authorities that an ESD is envisioned to possess. Increasing or adding new taxes (assessments) is always difficult and it will take tremendous amount of public education and scientific research to justify the increases or new taxes on the ground of ecosystem protection beyond flood control and water quality improvement. Taking land use decision control from local governments and putting them under MCD is more difficult. Some fundamental changes in the political and administrative powers of all levels of local government in Ohio (or even in the Unites Sates as the entire nation) will have to happen for such a power shift to be realized. Based on these difficulties, it seems unlikely that MCD will ever become an ESD in the way that Heal et al. (2001) envisioned.

However, exactly how closely MCD resembles an ESD is not what makes the comparison between the two institutions valuable. The more important question is how MCD can, building on its experiences and successes, particularly the water quality trading program, manage the ecosystem services provided by the natural resources in the Great Miami River watershed using the principles outlined in the ESD concept. Towards that end, some strategic considerations may be contemplated.

First, more programs like the water quality trading program need to be developed to manage ecosystem services beyond the reduction of pounds of nutrients lost to runoff from farmland. Within its statuary limitations, the District may play a role in areas such as aquatic habitat restoration, urban stormwater treatment and reduction, and even the more systematic program of urban sprawl. In addition, the leadership of the District need to consider a strategic shift of the District's future directions if ecosystem service management is to become a major part or even the focus of the District's mission. The District is limited by its statuary authorization and geographic size to deal with only water related issues in the Great Miami River watershed and surrounding counties. It can not directly making land use decisions, the key issue of ecosystem management. How to get involved more directly into this area in cooperation with local government is a challenge to the District. In addition, ecosystem issues such as nutrient loadings from the entire Mississippi River basin and carbon sequestration needs to be addressed in the regional, national or even global level. Cooperation with service districts and government agencies from other states will be necessary. Finally, as Heal et al. (2001) pointed out as the last one of their four-step approach to implement ESDs, the success of the MCD model can be promoted to other conservancy districts in Ohio and beyond. The authors of this white paper are in fact working on the establishment of a conservancy district in northeast Ohio where rapid development needs to be balanced with natural resources preservation.

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