CONSERVATION INNOVATION GRANT NRCS 68-3A75-5-199
Biannual Progress Report #6

Grantee Name: The Miami Conservancy District, Water Conservation Subdistrict (WCS)	
Project Title: Great Miami River Watershed Water Quality Credit Trading Program	
Project Director: Douglas "Dusty" Hall	
Contact Information:	**Phone Number: (937) 223-1278 ext. 3210** **E-Mail: dhall@miamiconservancy.org**
Period Covered by Report: April 1, 2008 through September 30, 2008	
Project End Date: September 30, 2008	

Summarize the work performed during the project period covered by this report:

The Great Miami River Watershed Water Quality Credit Trading Program (Trading Program) finished its third year of implementation and final year of this Conservation Innovation Grant. It is important to note that although the Conservation Innovation Grant is completed, the Trading Program will continue. The Water Conservation Subdistrict (WCS) of The Miami Conservancy District has continued to work with participating wastewater treatment plants, soil and water conservation districts, and the Project Advisory Group (PAG) to establish additional projects to generate credits and reduce nutrient discharges into the Watershed. In total, projects approved through the Trading Program during the three years of this Grant are projected to reduce nutrient discharges by more than 647,000 pounds. Water quality monitoring associated with the Trading Program continues to increase the understanding of nutrient discharges and loading within the watershed.

Describe significant results, accomplishments, and lessons learned. Compare actual accomplishments to the project goals in your proposal:

Results and Accomplishments

1. Completed the fourth round of project reviews. The Project Advisory Group endorsed funding for 14, fourth-round projects which are expected to reduce nutrient discharges by 215,975.5 pounds over the life of the projects. See Appendix 1, Water Quality Credit Generating Project Information Spreadsheet.
2. Implemented site inspection protocol.
3. Issued a fifth-round request-for-proposals (RFP) for projects to generate credits and accepted project proposals for review.
4. Created credit tracking software.
5. Completed nutrient reduction cost comparison study. See Appendix 2, Nutrient Reduction Cost Comparison.
6. Completed additional subwatershed monitoring. Determined annual nutrient loading during the Grant period and extrapolated loading for three calendar years. Generated an updated draft Operations Manual including a new data collection strategy. See Appendix 3, Draft Operations Manual.
7. Revision of Total Maximum Daily Load (TMDL) study of the Stillwater subwatershed commenced by Ohio EPA based on Trading Program data. See Appendix 4, Dayton Daily News Article.
8. Began project to evaluate field-scale drainage management strategies and to expand spreadsheet model with the drainage practices. See Appendix 5, Agreement with ODNR.
9. Extended marketing efforts resulting in magazine articles. See Appendix 6, Magazine Articles.
10. Conducted an analysis of potential energy and carbon benefits from trading programs.
11. Continued the collaboration with state and federal agencies necessary for Trading Program implementation. Established a collaboration with Sweden's EPA and EPRI.
12. Applied for a U.S. EPA Targeted Watershed Grant to help sustain the Trading Program in the absence of a regulatory driver.

13. Sustained the support of the local agricultural community and the Ohio Farm Bureau Federation.

<u>Lessons Learned</u>

1. The potential for Trading Programs to produce energy savings and carbon benefits is substantial particularly when the traded credits originate from conversion to no-till.
2. Consistent timing and frequency of requests-for-project proposals
3. Site inspections to validate modeling.
4. The reverse auction approach used by the Trading Program generates agricultural practices is generating project costs that are comparable to existing agricultural conservation programs.

<u>Accomplishments vs. Project Goals</u>

The following summary of the work performed is organized in accordance with the project Actions and Milestones for the third and fourth quarters of Year 3. Note that grant project proceeded ahead of schedule and some of the Actions and Milestones included in the following discussion were not in the original application and agreement but are included here to create a consistent framework for this report.

Action: Request for BMP proposals.
Milestone: RFP created and released.

A fifth request-for-proposals (RFP) was released on August 11, 2008 with project proposals due on September 12, 2008. Only three RFPs were anticipated in the Grant. Only two project proposals were received. Both of those projects were under review at the end of the reporting period.

Action: Proposal review and selection.
Milestone: Project Advisory Group reviews BMP proposals and selects projects.

As indicated above, two more project rounds were completed than anticipated in the grant application. The review of project applications from the fourth round was completed On May 20th, awards were announced for projects approved by the Project Advisory Group (PAG). The PAG endorsed funding for 14, fourth-round projects which are expected to reduce nutrient discharges by 215,975.5 pounds over the life of the projects. The total proposed cost of the eight projects is $338,074.18. The announcement followed Ohio Department of Natural Resources (ODNR) staff verification of the nutrient reduction modeling provided with each project application. In addition, ODNR staff conducted several site inspections to verify that the conditions present at the proposed project sites were consistent with the site parameters used for modeling purposes. Some inconsistencies were identified and applications withdrawn as a result of the inspections.

MCD issued a fifth-round request for project proposals on August 11th with a due date of September 12th.

Action: Applicants notified of proposal selection and BMPs implemented.
Milestone: SWCDs contract with producers for BMP implementation.

In total, 50 projects were approved for funding by the Project Advisory Group during the three-year Grant period. The projects will reduce nutrient discharges by 647,889.5 pounds over the term of the agreements. The total approved payments for these projects including payments to SWCD staff supporting project implementation is $923,069.23. A spreadsheet of information about the projects is included as Appendix 1.

Based on the scope of nutrient reductions resulting from the 50 projects and the funds provided for the projects, a cost per pond of nutrient reduction (i.e. credit cost) can be determined at an average of $1.42.

A cost analysis was conducted to provide a preliminary assessment of the price for nutrient reductions paid by the Trading Program relative to the price for nutrient reductions paid in more traditional conservation programs. That analysis was conducted by Kieser and Associates and is included as Appendix 2. The comparison concludes that the reverse auction approach used by the Trading Program generates agricultural practices that are comparable in cost/unit of nutrient reduction to existing agricultural conservation programs.

Action: Water quality monitoring and analyses.
Milestone: Data collected and analyzed. (Year 3quarters 1-4)

The operation of four automated samplers collecting water samples every eight hours continued. In response to previously reported price increases for laboratory analyses, a new laboratory was evaluated and selected to analyze nutrient samples.

A revised sampling program has been drafted that places the four subwatersheds of the Great Miami River Watershed on a two-year rotation. The details of the sampling plan are included in the revised draft Operations Manual included in Appendix 3 of this report. The revised sampling approach will be instituted in 2009 and subsequent years unless the results indicate an alternative strategy is warranted.

Overall, the data collection during the Grant period has been highly illuminating. The results identified lower phosphorus discharges in the Stillwater subwatershed than previously estimated. A previously approved TMDL study for the Stillwater is now under revision (See Appendix 4). However, in comparison to other more recent studies, nutrient loads generated from the Great Miami River Watershed are higher than expected, particularly when compared on a contributing area basis. A more complete discussion of the results is included in the draft Operations Manual (Appendix 3).

Action: Biannual/Final report.
Milestone: Report distributed.

This is the 6th biannual and final report for the Grant.

Additional Accomplishments

<u>Collaboration with Trading Program Stakeholders</u>

USDA U. S. Forest Service

In August 2008, WCS staff met in Fort Collins Colorado with the Rocky Mountain Region Forestry Governance Council to discuss ecosystem services and in particular how forestry could become a factor in water quality trading markets. The Council fully funded travel and lodging for the meeting.

U. S. Environmental Protection Agency (USEPA)

Staff prepared and submitted an application for a Target Watershed Grant from U.S. EPA. The U.S. EPA is offering a total of $4.2 million to support proposals related to water quality trading or other market-based projects. For the grant application as submitted, $251,300 local cash and in-kind will leverage a $754,104 federal contribution for a total project value of just over one million dollars. The WCS's application has been nominated for consideration by Governor Strickland as required by the U.S. EPA. Grant awards expected before year's end.

At the request of U.S. EPA staff, MCD staff prepared an analysis of the energy conservation and greenhouse gas aspects of the Trading Program. The potential for energy savings and carbon benefits is substantial particularly when the traded credits originate from conversion to no-till. The presentation will be made at a workshop held in Fort Mitchell, Kentucky from November 18-20, 2008.

Ohio Environmental Protection Agency (Ohio EPA)

Discussions with Ohio EPA staff have continued relative to differences between WCS and Ohio EPA estimates of nutrient loads in the Stillwater River. The difference in the estimates was the subject of a front-page article in the Dayton Daily News on February18, 2008. In response to the on-going discussion, WCS staff was advised by Ohio EPA staff in March that the previously published study of nutrient pollution in the Stillwater River would be revised. On April 27, 2008, an article citing Ohio EPA's intent to revise the study was published in the Dayton Daily News (see Appendix 4). Additional discussion with Ohio EPA staff is on-going related to reducing the scope of the Trading Program's water quality sampling while sustaining or increasing the usefulness of the data. A proposed new sampling strategy is included in the draft Operations Manual (Appendix 3).

Ohio Department of Natural Resources (Ohio DNR)

WCS and Ohio DNR staff continued to explore options for upgrading the model used to calculate the number of credits generated by each project. In addition, Ohio DNR staff convened a meeting with representatives of the Ohio State University to discuss alternative drainage management and field-scale monitoring approaches. Pursuant to these discussions, WCS staff worked with ODNR staff to generate a project to investigate innovative agricultural drainage management techniques. The project provides for ODNR staff to oversee three innovative drainage management projects in Shelby County in cooperation with the Shelby SWCD. Field-scale monitoring will occur for each project and the spreadsheet model will be expanded to include drainage practices based on the monitoring results. Pursuant to the project agreement, all data and results generated by the project will be provided to the NRCS. Water quality credits generated by those projects will accrue as part of the "insurance pool" of credits in the Trading Program. The text of the agreement between the WCS and the ODNR is included in Appendix 5.

Electric Power Research Institute

MCD staff is currently discussing a partnership with the Electric Power Research Institute, Inc. (EPRI) in Palo Alto, California. EPRI is a nonprofit organization that conducts research and development for the electric power industry. (EPRI serves power companies that provide more than 90 percent of the electricity generated and delivered in the United States.) EPRI is promoting a project that builds on the success of our Trading Program and endeavors to expand water quality trading throughout the 204,000 mi^2, 14-state Ohio River watershed. In addition to MCD, EPRI has identified project partners to include the Ohio River Valley Water Sanitation Commission (ORSANCO), American Farm Bureau Federation, America Farmland Trust, Kieser and Associates, Hunton & Williams, University of California Santa Barbara, American Electric Power, and Duke Energy. When successful, this partnership should lead to the investment by coal-fired electric power plants in agricultural BMPs.

Texas A & M University

In September 2008, WCS staff hosted a team of agricultural economists from Texas A&M University. The economists are conducting an investigation of the Trading Program and in particular the function of the reverse-auction methods employed by the Trading Program to attract the lowest cost projects.

Swedish EPA

At the request of the Swedish Environmental Protection Agency, WCS staff spent three days meeting with staff of the Swedish EPA, Sweden's Ministry of Environment, and other Baltic Sea stakeholders. The Baltic Sea is adversely impacted by excessive nutrient loading and Swedish experts have identified the Trading Program as an approach that could be applied as a potential solution for the Baltic. Since the visit by WCS staff, Swedish EPA staff has submitted a proposed pilot project to their Ministry of Environment that is based on the WCS's Trading Program. Sweden fully funded the visit by WCS staff for the meetings.

Promote the Trading Program

WCS staff delivered invited presentations to the Water Management Association of Ohio annual meeting in Columbus Ohio on June 26, 2008 and to the CTIC Workshop on water quality credit trading in Troy, Ohio on August 19 and 20, 2008. Staff provide information for an article on water quality credit trading that appeared in the April 2008 edition of Corn & Soybean Digest. Written by Susan Winsor and titled "Get Paid to Hold Onto Those Nutrients", the article extensively references the Trading Program. Staff also provided input for an article on water quality credit trading that appeared in the July 2008 edition of Public Works magazine. The text of both of the articles appears in Appendix 6. In addition, the Gulf Hypoxia Action Plan, published in July 2008 by the Mississippi River/Gulf of Mexico Nutrient Task Force includes a sidebar on the Great Miami River Watershed Water Quality Credit Trading Program.

Payment Information

In the space below, provide the following in accordance with the Environmental Quality Incentives Program (EQIP) and CIG grant agreement provisions:
a. A listing of EQIP-eligible producers involved in the project, identified by name and social security number or taxpayer identification number;
b. The dollar amount of any direct or indirect payment made to each individual producer or entity for any structural, vegetative, or management practices. Both biennial and cumulative payment amounts must be submitted.
c. A self-certification statement indicating that each individual or entity receiving a direct or indirect payment for any structural, vegetative, or management practice through this grant is in compliance with the adjusted gross income (AGI) and highly-erodible lands and wetlands conservation (HEL/WC) compliance provisions of the Farm Bill.

Confidential Producer Payment Record

Name		Grant Period Year1 Qtr4	Grant Period Year2 Qtr1	Grant Period Year2 Qtr3	Grant Period Year2 Qtr4	Grant Period Year3 Qtr1	Grant Period Year3 Qtr2	Grant Period Year 3 Qtr3	Grant Period Year 3 Qtr 4	Cumulative Payment
Beavins, Jeff								$18,000.00 (6-23-08)	$75,000.00 (8-4-08)	$93,000.00
Beeler, Edward				$16,000.00 (5-15-07)						$16,000.00
Bowen, Adam					$582.00 (8-16-07)				$582.00 (7-16-08)	$1,164.00
Cornett, Eugene					$2,540.00 (9-19-07)					$2,540.00
Crowe, Steve		$2,827.44 (8-14-06)		$2,763.09 (6-28-07)						$5,590.53
Delaet, Chad										
Dillon, James		$343.53 (8-14-06)			$447.45 (7-12-07)					$790.98
Everman, Ed		$1,940.94 (8-1-06)		$1,940.95 (6-4-07)					$1,940.96 (7-7-08)	$5,822.85
Flory, Simon					$2,317.03 (8-16-07)					$2,317.03
Forsythe, Jerry		$469.50 (7-31-06)		$721.00 (6-20-07)						$1,190.50
Fullenkamp, Daniel									$10,211.00 (8-14-08)	$10,211.00
Leis, Steve										
Heckman, William		$1,600.00 (8-1-06)								$1,600.00
Henry, Joe										
La-Lyn Farms					$1,605.00 (8-16-07)				$1,605.00 (7-16-08)	$3,210.00
Luft, Andrew					$2,000.00 (8-20-07) $1,403.20 (9-5-07)	$900.00 (10-1-07)				$4,303.20
McGlinch, Gary									$1,247.15 (8-4-08)	$1,247.15
Neal Bros. Inc.		$1,262.03 (8-10-06)			$1,262.03 (8-30-07)					$2,524.06
Otte, Steve					$25,000.00 (8-6-07)	$26,090.00 (11-8-07)				$51,090.00
Rhoades, Robert		$5,145.00 (8-2-06)							$2,835.00 (7-11-08)	$7,980.00
Rismiller, James									$67,912.45 (9-8-08)	$67,912.45
Schmitmeyer, Todd								$35,000.00 (5-5-08)	$38,727.33 ((8-8-08)	$73,727.33
Spellmire Bros.			$6,229.03 (12-27-06)			$6,229.07 (10-31-07)				$12,458.10
Stuck, Carl										
White, Roy			$ 500.00 (10-3-06)							$500.00
Yost, Layton					$2,062.50 (8-16-07)				$2062.50 (7-16-08)	$4,125.00

Self-certification statements for producers receiving payments in the reporting period were previously provided.

Self Certifications

Self-certifications for all producers receiving their first payments within the reporting period follow. Self-certifications for other producers receiving payments have been included with previous reports.

Agreement Number darkeohio 2007 beavins

Self-Certification Statement (04/06)

Great Miami River Watershed Water Quality Credit Trading Program

USDA/NRCS Self-Certification Statement of Eligibility to Receive Payments Under The Environmental Quality Incentives Program (EQIP)

By signature below I certify that I am in compliance with the $450,000 Payment Limitation, the Adjusted Gross Income (AGI), and the Highly Erodible Land (HEL) and Wetlands Conservation Compliance provisions of EQIP.

$450,000 Payment Limitation: Section 1240G of the Food Security Act of 1985 (as amended by the Farm Security and Rural Investment Act of 2002), 16 U.S.C. 3839aa-7, imposes a $450,000 limitation for all cost-share or incentive payments disbursed to individuals or entities under an EQIP contract between 2002 and 2007. The limitation applies to funds provided from the Great Miami River Watershed Water Quality Credit Trading Program Project Fund.

Adjusted Gross Income: Section 1604 of the Farm Security and Rural Investment Act of 2002 (2002 Farm Bill) amended the Food Security Act of 1985 (1985 Farm Bill) by adding a new Adjusted Gross Income (AGI) provision that limits the eligibility of certain individuals and entities for commodity and conservation programs benefits. For the 2003 through 2007 crop, fiscal, or program years, an individual is not eligible for program payment or benefit if the individual's or entity's average adjusted gross income exceeds $2.5 million for the three tax years immediately preceding the applicable year. An exemption is provided in cases where 75 percent of the adjusted gross income is derived from farming, ranching, or forestry operations.

Highly Erodible Land (HEL) and Wetlands Conservation Compliance: The Food Security Act of 1985, as amended, requires that all persons that produce agriculture commodities must protect all cropland classified as being highly erodible from excessive erosion, as well as protecting wetlands. The provisions have been amended in the 1990, 1996, and 2002 Farm Bills.

Jeff Beavins
Print name

Jeffrey S. B[illegible]
Signature

4-5-07
Date

Address: 4902 St. Rt. 121
Greenville OH 45331

Soil and Water Conservation District: Darke

Send completed form to:

Manager of Program Development
Water Conservation Subdistrict
The Miami Conservancy District
38 E. Monument Ave.
Dayton, OH 45402

Agreement Number ______________________ Self-Certification Statement (04/06)

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Chad Delaet
Print name

Chad Delaet
Signature

7-30-08
Date

Address: 399 Redmond Rd. Russia, OH 45363

Soil and Water Conservation District: Darke

Send completed form to:

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Water Conservation Subdistrict
The Miami Conservancy District
38 E. Monument Ave.
Dayton, OH 45402

Agreement Number Mercerohio.007-fullenkamp Self-Certification Statement (04/06)

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DANIEL N FULLENKAMP
Print name

Dan N Fullenkamp
Signature

3-6-07
Date

Address: 8310 HUWER RD
MARIA STEIN, OH 45860

Soil and Water Conservation District: MERCER

Send completed form to:

Manager of Program Development
Water Conservation Subdistrict
The Miami Conservancy District
38 E. Monument Ave.
Dayton, OH 45402

Agreement Number darKeoh08 s&j farms

Self-Certification Statement (04/06)

Great Miami River Watershed Water Quality Credit Trading Program

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S & J Farms - Steve Leis
Print name

Steven J Leis for S+S Farms LTD
Signature

5-18-08
Date

Address: 10616 St. Rt. 49
Ansonia, OH 45303

Soil and Water Conservation District: Darke

Send completed form to:

Manager of Program Development
Water Conservation Subdistrict
The Miami Conservancy District
38 E. Monument Ave.
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JOE HENRY
Print name

Joe Henry
Signature

7-10-08
Date

Address: 10695 Wolf Rd.
Versailles, OH 45380

Soil and Water Conservation District: Darke

Send completed form to:

Manager of Program Development
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The Miami Conservancy District
38 E. Monument Ave.
Dayton, OH 45402

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GARY M^c GLINCH
Print name

X Gary M^c Glinch
Signature

4/28/08
Date

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Dayton, OH 45402

Agreement Number darKeoh 08 Rrismiller

Self-Certification Statement (04/06)

Great Miami River Watershed Water Quality Credit Trading Program

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Jim Rismiller
Print name

James L Rismiller
Signature

5-4-08
Date

Address: 13603 Rismiller Rd.
Rossburg, OH 45362

Soil and Water Conservation District: Darke

Send completed form to:

Manager of Program Development
Water Conservation Subdistrict
The Miami Conservancy District
38 E. Monument Ave.
Dayton, OH 45402

Agreement Number darkeoh08Schmitmeyer Self-Certification Statement (04/06)

Great Miami River Watershed Water Quality Credit Trading Program

USDA/NRCS Self-Certification Statement of Eligibility to Receive Payments Under The Environmental Quality Incentives Program (EQIP)

By signature below I certify that I am in compliance with the $450,000 Payment Limitation, the Adjusted Gross Income (AGI), and the Highly Erodible Land (HEL) and Wetlands Conservation Compliance provisions of EQIP.

$450,000 Payment Limitation: Section 1240G of the Food Security Act of 1985 (as amended by the Farm Security and Rural Investment Act of 2002), 16 U.S.C. 3839aa-7, imposes a $450,000 limitation for all cost-share or incentive payments disbursed to individuals or entities under an EQIP contract between 2002 and 2007. The limitation applies to funds provided from the Great Miami River Watershed Water Quality Credit Trading Program Project Fund.

Adjusted Gross Income: Section 1604 of the Farm Security and Rural Investment Act of 2002 (2002 Farm Bill) amended the Food Security Act of 1985 (1985 Farm Bill) by adding a new Adjusted Gross Income (AGI) provision that limits the eligibility of certain individuals and entities for commodity and conservation programs benefits. For the 2003 through 2007 crop, fiscal, or program years, an individual is not eligible for program payment or benefit if the individual's or entity's average adjusted gross income exceeds $2.5 million for the three tax years immediately preceding the applicable year. An exemption is provided in cases where 75 percent of the adjusted gross income is derived from farming, ranching, or forestry operations.

Highly Erodible Land (HEL) and Wetlands Conservation Compliance: The Food Security Act of 1985, as amended, requires that all persons that produce agriculture commodities must protect all cropland classified as being highly erodible from excessive erosion, as well as protecting wetlands. The provisions have been amended in the 1990, 1996, and 2002 Farm Bills.

Todd Schmitmeyer
Print name

Todd Schmitmeyer
Signature

5-1-08
Date

Address: 8582 SR 121
Greenville OH 45331

Soil and Water Conservation District: Darke

Send completed form to:

Manager of Program Development
Water Conservation Subdistrict
The Miami Conservancy District
38 E. Monument Ave.
Dayton, OH 45402

Great Miami River Watershed Water Quality Credit Trading Program

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CARL STUCK
Print name

Carl L. Stuck
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7/22/08
Date

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The Miami Conservancy District
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Dayton, OH 45402

Appendix 1
Water Quality Credit Generating Project Information Spreadsheet

Agreement Number	BMP	Annual TP	Annual TN	Length of practice	TOTAL TP	TOTAL TN	Total Pounds	Cost of Practice	Cost of Staff Activity	Payment to Producer	Funds requested	Cost per pound
ROUND 1												
miamioh2006neal	conservation crop rotation and field filter strips	1267	2481	5	6335	12405	18740	$6,858.84	$500.00	$6,310.13	$6,810.13	0.363400
montgomeryoh2006dillon	conservation crop rotation	116	231	5	580	1155	1735	$1,717.65	$200.00	$1,717.65	$1,917.65	1.105274
montgomeryoh2006crowe	no-till	954	1902	5	4770	9510	14280	$14,137.20	$1,800.00	$14,137.20	$15,937.20	1.116050
loganoh2006forsythe	hayland	240	481	5	1200	2405	3605	$3,605.00	$425.00	$3,605.00	$4,030.00	1.117892
darkeoh2006white	pasture seeding and prescribed grazing	17	34	10	170	340	510	$500.50	$250.00	$500.50	$750.50	1.471569
darkeoh2006everman1	no-till	138	277	5	690	1385	2075	$2,878.98	$209.00	$2,878.98	$3,087.98	1.488183
darkeoh2006rhoades	hayland	194	388	10	1940	3880	5820	$7,980.00	$750.00	$7,980.00	$8,730.00	1.500000
darkeoh2006heckman	pasture seeding and prescribed grazing	46	94	10	460	940	1400	$1,600.00	$500.00	$1,600.00	$2,100.00	1.500000
darkeoh2006everman3	no-till	130	260	5	650	1300	1950	$2,676.10	$262.50	$2,676.10	$2,938.60	1.506974
darkeoh2006everman4	no-till	69	139	5	345	695	1040	$1,458.38	$134.25	$1,458.38	$1,592.63	1.531375
darkeoh2006everman2	no-till	127	255	5	635	1275	1910	$2,691.30	$309.50	$2,691.30	$3,000.80	1.571099
darkeoh06luft	pasture seeding and prescribed grazing	90	181	12	1080	2172	3252	$4,303.20	$900.00	$4,303.20	$5,203.20	1.600000
warrenoh2006spellmire	no-till and cover crop	1057	2114	5	5285	10570	15855	$45,260.00	$0.00	$31,145.00	$31,145.00	2.000000
TOTALS		**4445**	**8837**		**24140**	**48032**	**72172**	**$95,667.15**	**$6,240.25**	**$81,003.44**	**$87,243.69**	
ROUND 2												
butleroh07beeler	conservation tillage	1938	3731	5	9690	18655	28345	$18,000.00	$350.00	$16,000.00	16350	0.576821309
prebleoh07cornett	conservation cover	211	422	5	1055	2110	3165	$2,540.00	$225.00	$2,540.00	$2,765.00	0.873617694
darkeoh07otte	milking parlor water/cowlot runoff	509.8	1848.6	20	10196	36972	47168	$51,102.00	$5,500.00	$51,102.00	$56,602.00	1.200008480
shelbyoh07bensman	sod establishment	55	102	10	550	1020	1570	$3,852.00	$0.00	$1,950.00	$1,950.00	1.242038217
shelbyoh07edwards	sod establishment	182	340	10	1820	3400	5220	$8,798.00	$0.00	$7,887.50	$7,887.50	1.511015326
shelbyoh07edwards2	sod establishment	103	193	10	1030	1930	2960	$7,644.00	$0.00	$4,487.50	$4,487.50	1.516047297
darkeoh07beavins	milk parlor water/cowlot runoff/manure storage	737.3	2799	20	14746	55980	70726	$107,661.00	$5,500.00	$107,661.00	$113,161.00	1.599991517
prebleoh07lalynfarms1	conservation tillage	137	274	5	685	1370	2055	$3,210.00	$225.00	$3,210.00	$3,435.00	1.671532847
prebleoh07yost3	conservation tillage	32.2	65.1	5	161	325.5	486.5	$1,104.00	$225.00	$684.00	$909.00	1.868448099
prebleoh07flory21	grid sampling with VRT/conservation crop rotation	99.7	193.3	5	498.5	966.5	1465	$4,984.00	$225.00	$2,317.03	$2,542.03	1.735174061
prebleoh07yost2	conservation tillage	98	196	5	490	980	1470	$2,337.00	$225.00	$2,337.00	$2,562.00	1.742857143
prebleoh07yost1	conservation tillage	50	100	5	250	500	750	$1,104.00	$225.00	$1,104.00	$1,329.00	1.772000000
prebleoh07bowen4	conservation tillage and conservation crop rotation	52	103	5	260	515	775	$1,164.00	$225.00	$1,164.00	$1,389.00	1.792258065
prebleoh07hayslett	agreement canceleld	0	0	0	0	0	0	$0.00	$225.00	$0.00	$225.00	0.000000000
merceroh07fullenkamp	milkhouse treatment	114.5	230.4	15	1717.5	3456	5173.5	$10,211.00	$0.00	$10,211.00	$10,211.00	1.973712187
TOTALS		**4319.5**	**10597.4**		**43149**	**128180**	**171329**	**$223,711.00**	**$13,150.00**	**$212,655.03**	**$225,805.03**	

ROUND 3												
miamioh08rectenwald	conservation crop rotation	65	130	5	325	650	975	$975.00	$107.50	$967.50	$1,075.00	1.102564103
darkeoh08schmitmeyer	cowlot runoff/milk parlor waste	1000.2	3843.6	15	15003	57654	72657	88727.53	$5,000.00	$88,727.53	$93,727.53	1.290000000
darkeoh08spitler	wastewater collection pit and transfer pump	101	451	15	1515	6765	8280	$9,264.00	$1,500.00	$9,264.00	$10,764.00	1.300000000
darkeoh08mcglinch	notill	334	669	5	1670	3345	5015	$6,235.75	$400.00	$6,235.75	$6,635.75	1.323180459
darkeoh08rismiller	animal waste pond	642	2855	15	9630	42825	52455	$67,912.45	$5,000.00	$67,912.45	$72,912.45	1.390000000
darkeoh08heckman	milk parlor waste	133.6	268.8	15	2004	4032	6036	$8,207.60	$1,450.00	$8,207.60	$9,657.60	1.600000000
shelbyoh08cotterman	ditch bank stabilization/grassed waterway	145	289	10	1450	2890	4340	$35,788.00	$0.00	$7,595.00	$7,595.00	1.750000000
darkeoh08s&jfarms	roof over concrete lot	473	2104	15	7095	31560	38655	$65,079.00	$4,500.00	$65,079.00	$69,579.00	1.800000000
TOTALS		**2893.8**	**10610.4**		**38692**	**149721**	**188413**	**$282,189.33**	**$17,957.50**	**$253,988.83**	**$271,946.33**	
ROUND 4												
clarkoh08pence	hayfield establishment	96	192	10	960	1920	2880	$3,878.50	$700.00	$2,733.88	$3,433.88	1.192319444
darkeoh08stuck	conversion of row crops to alfalfa, grass seeding	158	318	5	790	1590	2380	$2,913.00	$300.00	$2,913.00	$3,213.00	1.350000000
darkeoh08henry	cowlot runoff collection & manure storage and milking parlor water collection	1087.5	5206.8	15	16312.5	78102	94414.5	$125,736.16	$5,500.00	$125,736.16	$131,236.16	1.390000053
darkeoh08delaet	conversion of row crops to alfalfa, grass seeding	30	60	5	150	300	450	$527.00	$175.00	$527.00	$702.00	1.560000000
clarkoh08jewell	hayfield establishment	202	404	10	2020	4040	6060	$12,030.52	$700.00	$8,847.89	$9,547.89	1.575559406
miamioh08kerns	grassed waterway	300	600	5	1500	3000	4500	$11,900.00	$425.00	$6,750.00	$7,175.00	1.594444444
shelbyoh08gerber	stream bank stabilization	54.4	108.8	10	544	1088	1632	$5,500.00	$0.00	$2,750.00	$2,750.00	1.685049020
darkeoh08rismiller	roof over concrete feedlot, milking parlor irrigation system	712.8	2749.6	15	10692	41244	51936	$85,000.00	$4,500.00	$85,000.00	$89,500.00	1.723274800
miamioh08hodge	residue management, no-till corn after soybeans	617	1234	5	3085	6170	9255	$33,575.00	$450.00	$15,746.25	$16,196.25	1.750000000
miamioh08hawthorne	residue management, no-till corn after soybeans	66	131	5	330	655	985	$3,076.00	$275.00	$1,448.75	$1,723.75	1.750000000
shelbyoh08roe	grade stabilization structure, grassed waterway, filter strips, ditch bank stabilization	620	1215	10	6200	12150	18350	$59,703.00	$0.00	$32,112.50	$32,112.50	1.750000000
shelbyoh08knouff	ditch bank stabilization	348	693	10	3480	6930	10410	$37,700.00	$0.00	$18,218.00	$18,218.00	1.750048031
shelbyoh08ahrns	ditch bank stabilization	157.8	315.6	10	1578	3156	4734	$20,500.00	$0.00	$8,285.00	$8,285.00	1.750105619
darkeoh08rhoades	grassed waterway	282.5	566.9	10 & 5	5329	2660	7989	$12,780.75	$1,200.00	$12,780.75	$13,980.75	1.750000000
TOTALS		**4732**	**13794.7**		**52970.5**	**163005**	**215975.5**	**$414,819.93**	**$14,225.00**	**$323,849.18**	**$338,074.18**	
ALL 4 ROUNDS TOTALS		**16390.3**	**43839.5**		**158951.5**	**488938**	**647889.5**	**$1,016,387.41**	**$51,572.75**	**$871,496.48**	**$923,069.23**	

Appendix 2
Kieser & Associates
Nutrient Reduction Cost Comparison

An Economic Comparison of the USDA-NCRS Environmental Quality Incentives Program Payments and Water Quality Credit Trading in the Great Miami River Watershed of Ohio

Prepared for:

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December 31, 2008

An Economic Comparison of the USDA-NRCS Environmental Quality Incentives Program Payments and Water Quality Credit Trading in the Great Miami River Watershed of Ohio

Executive Summary

Kieser & Associates, LLC has prepared a brief economic analysis of payments made to farmers in Ohio under two separate, environmentally-focused programs: Water Quality Credit Trading (WQCT) in the Great Miami River (GMR) and the Environmental Quality Incentives Program (EQIP) in Ohio. Credit trading costs are associated with payment awards from reverse auctions conducted by the Miami Conservancy District (MCD) from 2006 to 2008 under a 10-year WQCT Pilot Program[1]. EQIP costs were obtained from the U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS) using the economic cost data presented in the Ohio electronic Field Office Technical Guide[2] (eFOTG) for average payments made to farmers in Darke County 2005 and in Ohio Statewide during 2007 and 2008. This comparison has been conducted as part of a 2005 USDA-NRCS Conservation Innovation Grant awarded to the MCD.

Trading focuses on those practices which achieve the highest loading reductions of total phosphorus (TP) and total nitrogen (TN) in relation to the buyer's location in a watershed and point of water quality concern. For the GMR WQCT program, these locations are upstream of wastewater treatment plant (WWTP) buyers. EQIP funding focuses more on farmers interested in implementing conservation plans and considers numerous conservation benefits of all environmental resources. These resources include water quality issues in a ranking system that makes awards based on cumulative benefits. While both programs fund Best Management Practices (BMPs) that may result in water quality benefits, trading programs using reverse auctions focus on those BMPs that deliver the greatest water quality benefits per dollar expended. This contrasts with the EQIP program that more fully considers the resource manager's desires and other natural resource benefits in the ranking systems. Thus, use of these cost comparisons must explicitly recognize these programmatic differences.

The GMR WQCT program has funded forty-nine BMPs since 2006 such as conservation crop rotation, conservation cover, cowlot runoff and milking parlor water management, grassed waterways, grid sampling, high residue management, pasture establishment and grazing management. This particular economic analysis focused on costs from five types of BMPs including high residue management, hayfield and grass establishment, pasture establishment combined with grazing management, alfalfa establishment and grassed waterways. Equivalent EQIP practices exist for all of these five selected BMP types.

Costs from the trading program are typically expressed as cost/pound of nutrient (phosphorus and/or nitrogen) reduced. Those from EQIP are expressed as cost/per acre or cost/linear foot of practice (e.g., buffers in cost/acre and terraces in cost/linear foot). For comparison purposes, trading credit costs were converted to similar cost expressions used for EQIP. For instance, hayfield and grass establishment BMPs cost expressions use a computation that divides the cost of the practice by the acres of the BMP

[1] Great Miami River Watershed Water Quality Credit Trading Program web page http://www.miamiconservancy.org/water/quality_credit.asp
[2] USDA NRCS (Ohio) electronic Field Office Technical Guide web address http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=OH

established. Two of the five BMP types analyzed in this report have different unit cost expressions. The first is grassed waterways, which are sometimes reported in linear feet instead of acres. When the linear foot comparison occurs for grassed waterways, the acreage of the waterway is divided by the width to obtain a cost per linear foot installed. The second BMP type is grazing management, which awards payments on a flat annual rate. When grazing management is part of a system of BMPs being implemented, the annual payment total is subtracted from the cost awarded the producer before the pasture establishment payment computation is made. The pasture establishment payment is a per acre rate as described above.

In all cost comparisons, only the BMP payment to the land manager is considered. This eliminates the differences that occur between counties, where some billed the WQCT program for staff technical assistance, and some did not. This also simplifies cost comparisons with the EQIP program. EQIP has a full complement of technical support staff available, subsidized by the national Food, Conservation, and Energy Act of 2008 (Farm Bill) and/or state cost share programs common to Soil and Water Conservation District (SWCD) offices. Table ES-1 summarizes cost comparisons of EQIP payments in Darke County and statewide in Ohio and WQCT for the GMR Watershed. Results show the average cost for BMP payments in both programs were generally comparable.

Table ES-1. Cost Comparisons for Selected BMPs for EQIP and GMR WQCT Program. (*The range of EQIP represents the range of payments for Darke County and statewide in Ohio).

BMP Type	EQIP*	GMR WQCT Program
High Residue	$8 per acre	$5 per acre
Hayfield and Grass Establishment	$137 to $191 per acre	$183.25 per acre
Pasture Establishment/Grazing Management	$137 to $191 per acre $15 per acre per year	$92.10 per acre $8.12 per acre per year
Alfalfa Establishment	$95 per acre	$37 per acre
Grassed Waterways	$2.80 per linear foot Base payment Items like tile intakes, filter fabric and stone outfalls are additional	$3671.62 per acre or $5.06 per linear foot

These comparisons suggest that farmers will ultimately choose a program that best suits their immediate and long-range planning needs. WQCT programs will account for these farmer interests but focus more explicitly on those practices that yield the greatest water quality benefits at prices comparable to similar EQIP subsidized practices. As WQCT programs grow more robust with increasing credit demand, trading credit payments to farmers could rise (on a per unit basis). This may spawn the need to consider longer-term, more highly incentivized contracts to continue to garner farmer interest in trading programs. Because of the varying program goals, it is likely that Farm Bill incentive programs and credit trading will both continue to add value to farmer operations. However, participation will likely vary based on the geographic and physical characteristics of the setting in each watershed given the WQCT program focus on explicit water quality outcomes associated with greater nutrient load reductions from agricultural BMPs.

Introduction

The USDA-NRCS and the U.S. Environmental Protection Agency (EPA) both promote the use of market-based incentives. In addition, support for further development of these programs is written into the current 2008 Farm Bill. Increased conservation protection, new ways to expand participation, and hopes to leverage federal dollars with private resources are seen as some of the potential benefits these programs offer. Cautious optimism exists that market-based incentive programs like WQCT can provide these attributes at scale. The Farm Bill also supports programs like EQIP which holds different, yet complementary environmental resource objectives. Since both programs seek to implement BMPs, farmers can choose to participate in either program.

Comparable cost information on payments to farmers, however, is typically unavailable where both programs are available in the same watershed. Moreover, few WQCT programs have generated sufficient market-based information for a broad range of competitively bid agricultural BMPs with the exception of the GMR pilot trading program. As such, BMP cost data from the GMR WQCT program can for the first time, be compared to similar BMPs funded by EQIP.

To make economic comparisons of the EQIP and GMR WQCT program, this analysis provides the following evaluations:

- GMR WQCT and EQIP program objectives and ranking methods
- EQIP objectives and ranking methods
- Limitations that prevent a direct program cost comparison
- Cost-effective BMPs in the GMR WQCT program
- Common BMP types funded by each program
- BMP cost comparisons
- Findings and conclusions

The Great Miami River Watershed Water Quality Credit Trading Program

The GMR WQCT program focuses on watershed-based solutions to reduce nutrient loadings using the most cost-effective means available. Nutrient loading issues in the basin are the result of multiple types and sources in many different locations. The differences in requirements placed on buyers (WWTPs) to control their release of nutrients also vary dramatically. Thus, the cost of reduction per pound between source types and source locations can be dramatically different.

A market feasibility study[3] estimated potential cost savings for GMR WWTPs to be in the hundreds of millions if WQCT were implemented. The nutrient reduction desired by implementing potential WWTP upgrades for approximately $422 million could be accomplished by engaging with agricultural managers for equivalent reductions for approximately $38 million. Even when these nonpoint source cost estimates are more than doubled or tripled, the cost saving potential of WQCT is significant.

The GMR WQCT program facilitates a fully operating market structure that supplies nutrient credits driven by the potential for future more stringent nutrient effluent limits placed on the wastewater treatment facilities. To partially fund this structure the MCD was awarded a USDA-NRCS Conservation Innovation Grant with matching support from WWTP partners. These included five municipal partners in the basin which operate nine wastewater treatment plants. MCD staff and partners operate a reverse auction

[3] Kieser & Associates, *Preliminary Economic Analysis of Water Quality Trading Opportunities in the Great Miami River Watershed*, Prepared for the Miami Conservancy District, 2004.

market framework to solicit agricultural BMP proposals. The SWCD staff work with the farmers to prepare a BMP package for the auction that bundles TP and TN credits for the best (lowest) cost given that particular farmer's needs and desires for his operations. The credit value of TP and TN for the BMP is computed using a standardized estimation process. The BMP proposal is submitted into a pool of proposals that are then:

1. Checked for completeness and accuracy
2. Ranked based on combined TP and TN credits generated across the life of the proposed contract divided by the cost of the contract
3. Awarded based on a selected cost range predetermined for that round of proposals

To date, the MCD WQCT pilot program has awarded 49 contracts stemming from four reverse auction requests for proposals. The projects have generated 158,951.5 TP credits and 488,938 TN credits. The final awards provide 647,889.5 combined TN and TP credits at a total purchase cost of $1,016,387.41. The program's average cost for a combined credit is $1.49. (For a separate TP and TN market, the average cost per pound would be $6.39 and $2.08, respectively.)

The Farm Bill and Environmental Quality Incentive Program

Conservation programs authorized by Farm Bill provisions contain numerous goals. It is therefore important to recognize the varying purposes and priorities of each program authorized by the Farm Bill before assuming that a conservation program is based on the most cost-effective payout to address a given priority. This can be contrasted with the GMR WQCT program that targets the lowest cost nutrient loading reduction. Under the Farm Bill, EQIP proposal applications for example, are reviewed using worksheets developed to fulfill national guidance and statutes, statewide requirements and local priorities. Thus, for purposes of comparing costs of EQIP and GMR WQCT a brief review of typical EQIP ranking worksheets is provided here.

A process has been developed by USDA-NRCS to comply with the Farm Bill section on EQIP applications. The USDA-NRCS must consider overall cost-effectiveness of anticipated environmental benefits and how the proposal will provide for conservation improvements over existing systems operated by the applicants. In addition, the review of the proposal must include consideration of how effectively and comprehensively the project addresses the designated resources of concern and best fulfills the EQIP program purpose[4].

To provide guidance on how to implement the requirements of the Farm Bill, USDA-NRCS created a Strategic Plan[5] that identifies six goals to be targeted for conservation. The strategic plan relays these goals in two tiers: foundation goals and venture goals.

Foundation Goals

1. High-quality, productive soils
2. Clean and abundant water
3. Healthy plant and animal communities

[4] Farm Bill, SEC. 1240c. Evaluation of Applications
[5] American Farmland Trust, History of the Farm Bill Farm Policy 101 http://www.farmland.org/programs/farm bill/history/farmpolicy.asp

Venture Goals

4. Clean Air
5. Adequate energy supply
6. Working farm and ranch lands

Protection of water quality is identified by the USDA-NRCS as a goal in the higher tier, sharing this prioritization with conservation goals for soil, plant and animal communities. In Ohio, a successful EQIP proposal undergoes two independent ranking evaluations. One evaluation is for the county level priorities and the other is for compliance with the identified statewide issues.

The USDA-NRCS state office for Ohio and County SWCDs independently develop ranking worksheets which are designed to effectively blend the achievement of the national requirements with their own identified state and county conservation issues. Specific worksheets for Darke County and the State of Ohio (for 2007) used for program payment comparisons in this report are provided in Appendix A (and available online[6]). Overall, these worksheets illustrate the differences between GMR WQCT program objectives and those that are applicable to Darke County EQIP contracts in the GMR Watershed.

Limitations Preventing Direct Cost Comparisons

Due to the variety of policy issues and goals for each of the Farm Bill conservation programs, particularly EQIP, certain limitations are placed on individual contract awards to producers. Such limitations prevent direct cost comparisons to WQCT payments. These limitations are determined by factors such as the producer's adjusted gross income, incentive awards made by other Farm Bill programs, and eligibility determinations regarding special payment features or the land in question[7]. For this reason, a complete cost benefit analysis is not possible without full access to the producer's financial records and linking all programs back to BMP costs, total Farm Bill payments received, and the farmer's income. This type of disclosure is not typically allowed without permission by the Farm Bill itself[8].

To overcome this limitation, this economic analysis uses information in statistical or aggregated form from the eFOTG for the state of Ohio and from Darke County[9]. This includes average results and 2008 maximum payments.

Other limitations exist with these EQIP cost data for making a direct cost comparison with WQCT, including:

- Inability to account for administrative staff overhead (e.g., federal, state and/or local government support of staffing needs at the SWCD level)
- EQIP has limitations on the length of time the practice will be in place
- A cap on the number of acres for which the BMP can be enrolled
- Cost share payments made by the farmer (though such costs are not reflected in county or state data, it is assumed that farmers also have some in-kind costs to be competitive in WQCT reverse auctions)

[6] Darke County EQIP ranking worksheet: ftp://ftp-fc.sc.egov.usda.gov/OH/pub/Programs/EQIP/FY2007/Darke_County_2007_EQIP_LWG_Doc.pdf
Ohio NRCS State Office EQIP ranking worksheet: ftp://ftp-fc.sc.egov.usda.gov/OH/pub/Admin/Bulletins/FY-07/Bulletins-Adobe/2008_EQIP_State_Ranking_Worksheet_Revised.pdf

[7] 110th Congress Food, Conservation and Energy Act of 2008 Title I, Subpart F Section 1604, and Title II Subpart B Section 2102

[8] Title I Subtitle F SEC. 1619. (b)(2) INFORMATION GATHERING.

[9] http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=OH

Regarding practice duration considerations, WQCT management often finds it more desirable to keep the BMP in place for longer durations as a risk management technique. For instance, high residue management is limited to two or three years of annual EQIP payments based on acres (Bennett, personal communication[10]). In the GMR WQCT program, contracts are typically five years in length. Likewise, WQCT may wish to exceed the trial base acreage allowed by EQIP in order to maximize credits generated. In this case, an entire farm may be enrolled in high residue management for trading instead of a limited number of acres based under an enrollment cap in EQIP.

In addition to administrative costs and practice duration, other limitations may arise when comparing BMPs with significant variation in costs due to site-specific design needs, differences in operational costs associated with the farm equipment and/or materials, allowances for the farmer not wishing to introduce the lowest cost BMP or recapturing lost opportunity income.

GMR WQCT Program BMP Costs

As discussed previously, the objective for reverse auctions in the GMR WQCT program is to fund and implement the most cost-effective combined TP and TN reductions. Although numerous bids have been received, all of the contracts awarded in this program have been based on the lowest cost per pound of reduction. Illustrated in Table 1 are the rankings for each BMP type based on cost-effectiveness, from all awarded bids. The unit price for these contracts ranges from 36 cents to $2.00.

It can be noted that select BMP types that exist at the lowest end of the cost range (higher rank) can also be found in contracts at the higher end (lower rank) of the contract range. This variability within the BMP type can result from limitations in site-specific conditions and erosion characteristics associated with varying natural features. This could also relate to added costs due to the producer's management structure (existing equipment, debt load or other factors that limit transition into the use of the BMP).

Table 1. Cost-effective Ranking for Winning Proposals in the GMR WQCT Program.

Cost-effective Rank	BMP(s) by Type	Cost per Pound of Combined TP & TN Reduced ($)
1	Conservation crop rotation/field filter strips (fs)	0.36
2	Conservation tillage	0.58
3	Conservation cover	0.87
4	Conservation crop rotation	1.10
5	Conservation crop rotation	1.11
6	No-till	1.12
7	Hayland	1.12
8	Hayfield establishment	1.19
9	Milking parlor water/cowlot runoff	1.20
10	Sod establishment	1.24

[10] Jim Bennett, District Conservationist, NRCS, Greenville, OH, December 22, 2008.

Table 1 Continued.

Cost-effective Rank	BMP(s) by Type	Cost per Pound of Combined TP & TN Reduced ($)
11	Cowlot runoff/milk parlor waste	1.29
12	Wastewater collection pit/transfer pump	1.30
13	No-till	1.32
14	Conversion of row crops to alfalfa/grass seeding	1.35
15	Animal waste pond	1.39
16	Milk parlor water/cowlot runoff/manure storage	1.39
17	Pasture seeding/prescribed grazing	1.47
18	No-till	1.49
19	Hayland	1.50
20	Pasture seeding/prescribed grazing	1.50
21	No-till	1.51
22	Sod establishment	1.51
23	Sod establishment	1.52
24	No-till	1.53
25	Conversion of row crops to alfalfa/grass seeding	1.56
26	No-till	1.57
27	Hayfield establishment	1.58
28	Grassed waterway	1.59
29	Milk parlor water/cowlot runoff/manure storage	1.60
30	Pasture seeding/prescribed grazing	1.60
31	Milk parlor waste	1.60
32	Conservation tillage	1.67
33	Stream bank stabilization	1.69
34	Roof over concrete feedlot/milking parlor irrigation system	1.72
35	Grid sampling with VRT/conservation crop rotation	1.74
36	Conservation tillage	1.74
37	Ditch bank stabilization/grassed waterway	1.75
38	Residue management/no-till corn after soybeans	1.75
39	Residue management/no-till corn after soybeans	1.75
40	Grade stab. structure/grassed waterway/fs/ditch bank stab.	1.75

Table 1 Continued.		
Cost-effective Rank	**BMP(s) by Type**	**Cost per Pound of Combined TP & TN Reduced ($)**
41	Grassed waterways	1.75
42	Ditch bank stabilization	1.75
43	Ditch bank stabilization	1.75
44	Conservation tillage	1.77
45	Conservation tillage and conservation crop rotation	1.79
46	Roof over concrete lot	1.80
47	Conservation tillage	1.87
48	Milkhouse treatment	1.97
49	No-till and cover crop	2.00

As of this writing, the most cost-effective BMP used in the WQCT program is conservation crop rotation. This BMP was typically bundled with other BMPs. As such, a discrete BMP cost cannot be calculated. However, cost data suggest that other BMPs packaged with conservation crop rotation provide less nutrient reduction and are applied over smaller areas than this rotation practice provides in the contracts. This practice was found in the contracts ranked first, fourth, fifth and forty-fifth of the forty-nine contracts awarded.

The second most cost-effective BMP is high residue management (no-till or conservation tillage). The twelve awarded contracts have a wide range of cost-effectiveness from a rank of second, then evenly distributed through forty-seventh. The cost range spanned from 58 cents to $1.87 and averaged $1.50 per combined pound of TP and TN reductions.

The third most cost-effective BMP type found in the GMR WQCT program was the conversion of row cropping systems into hayfield, sod, grass or alfalfa crops. This BMP type was found in twelve contracts, sometimes packaged with other BMPs and ranked from seventh to thirtieth. Using only the sites that did not include other BMPs in the contract, these costs ranged from $1.12 up to $1.58 and averaged $1.40 per combined TN and TP unit.

The fourth most cost-effective BMP type addressed cowlot runoff and/or milking parlor water. These types of BMPs were very site-specific both in designs used to address the nutrient loading and in site factors (such as numbers of animals). This BMP was awarded ten contracts which ranged in rank from ninth to forty-eighth. The cost per combined pounds ranged from $1.20 up to $1.97, averaging $1.53.

There is a noticeable break before the other two BMP types appear; grassed waterways ranked twenty-eighth and streambank stabilization ranked thirty-third. This could be associated with the requirement and expense of earthmoving, or the lack of nutrients in subsoils. However, as mentioned above, all practices selected are viewed as the most cost-effective as they out-competed other proposals to receive funding at this early stage of the WQCT program.

The BMP types that either introduced perennial vegetative cover or increased the amount of plant residue left behind from year to year provided the lowest cost per pound of combined TN and TP. However, some of the sites using these types of BMPs were out-competed by other contracts introducing structural practices addressing cowlot runoff, milking parlor water or stream/ditch bank erosion.

BMPs Common to Both Programs

A subset of the BMPs implemented by EQIP are also funded in the GMR WQCT program. These overlapping BMP types include:

- o Manure and milk house facilities
- o Grid sampling
- o Conservation cover
- o Filter strips
- o Hayfield and alfalfa/grass establishment
- o Conservation crop rotation
- o High residue management
- o Ditch/stream bank stabilization
- o Grade stabilization structures
- o Grassed waterways
- o Pasture seeding and prescribed grazing

Some of these BMP types were excluded from further economic comparison here because of the need for site-specific design details to make adequate comparisons (e.g., manure and milk house facilities, ditch and stream bank stabilization and grade stabilization structures). Other BMP sets were not used because of inclusion of multiple BMPs in the projects as awarded (e.g., individual sites containing grassed waterways, conservation crop rotation and filter strips). Finally, a small number of WQCT projects were eliminated because they were implemented at the only site awarded a contract for that particular BMP, and use of these data may have disclosed the identity of this WQCT program participant without their expressed permission.

Therefore, the BMP categories selected for comparison between the WQCT and EQIP programs were:

- o High residue management
- o Hayfield, alfalfa or grass establishment
- o Pasture establishment/grazing management
- o Alfalfa establishment
- o Grassed waterways

To compare cost of practices, BMP contracts funded under the GMR WQCT program were converted into units defined by the EQIP program. Appendices B, C and D include details of these average costs as provided by USDA-NRCS. EQIP payments are paid out to agricultural producers either as a one-time payment or in annual installments. Payments are based on linear or areal units which vary by BMP type. High residue management under EQIP paid $8 per acre in Darke County for 2005; however, payments were limited to 2 or 3 years (Bennett, personal communication).

Summary of Average Cost of BMPs for Each Program

Table 2 summarizes the average cost of the five BMP types selected for comparison between the EQIP and GMR WQCT programs. The high residue management BMP type had eleven trading contracts that allowed for evaluation of only that BMP using the EQIP payment structure. The cost per year of the trading contract was $5.00 per acre for five years. This is a lower annual payment than the EQIP payment but extends the payment period out two to three years in comparison to the Farm Bill subsidy.

Hayfield, alfalfa or grass establishment is a one-time payment for implementation under EQIP unless a maintenance plan (like prescribed grazing plan at $15 per acre per year) is also packaged as part of the contract. Average rates in Darke County for legumes or switchgrass are $95 per acre. However, if the vegetation is warm season grasses, the average increases to $191 and $137 per acre with and without chemical treatment, respectively.

On average, warm season grass establishment was $183.25 per acre for the trading program. This was at the high end of the comparable EQIP payment range. Pasture establishment with prescribed grazing averaged $92.10 per acre and $8.12 per acre per year for the prescribed grazing management under the WQCT pilot program. Establishment of alfalfa where row cropping previously existed cost $37 per acre on average. All of these practices appear to be very comparable in cost to the EQIP payment rates with some notable advantages for WQCT when implementing alfalfa establishment.

Grassed waterways are reported as an average of projects constructing greater than 40-foot wide practices using a cost per linear foot. Practices installed under the GMR Watershed WQCT program typically installed 60-foot wide grassed waterways, which place them at a slight disadvantage when comparing these to average EQIP costs. The EQIP payment is a one-time establishment payment for ten years of expected practice life. Under EQIP, the base average cost is $2.80 per linear foot and rises when rock check dams, filter fabric, stone outlet control structures, blind inlets, tiles and old tile removal are considered.

The limited number of grass waterway systems that could be isolated from other BMPs in the trading program cost an average of $3,671.62 per acre or $5.06 per linear foot to install. This is marginally higher than Darke County average 2005 data, but closer to the 2007 and 2008 statewide cost averages.

Overall, Darke County 2005 data compare favorably in these BMP types to the 2007 and 2008 statewide EQIP averages. The statewide numbers indicate high residue tillage ranges from $8 to $10. Statewide grass waterways greater than 40 feet in width averaged $5 a linear foot in 2007 and $3,100 to $6,175 per acre in 2008. An acre of grass waterway 40 feet wide would be 1,089 feet long and would have a base cost of $3,050 in Darke County and $5,450 in 2007 using the statewide figures. Hayfield, alfalfa and grass establishment increased in cost using statewide averages from a range of $135 to $200 in 2007 up to $127.56 to $233.93 in 2008. In all cases, using the 2005 Darke County costs as a baseline comparison is conservative.

Table 2. Cost Comparisons for Selected BMPs for EQIP and GMR WQCT Program.

BMP Type	EQIP	GMR WQCT Program
High Residue	$8 per acre	$5 per acre
Hayfield and Grass Establishment	$137 to $191 per acre	$183.25 per acre
Pasture Establishment/Grazing Management	$137 to $191 per acre $15 per acre per year	$92.10 per acre $8.12 per acre per year
Alfalfa Establishment	$95 per acre	$37 per acre
Grassed Waterways	$2.80 per linear foot Base payment Items such as tile intakes, filter fabric and stone outfalls are additional	$3671.62 per acre or $5.06 per linear foot

Findings and Conclusions

Costs for practices implemented in both WQCT and EQIP programs are generally comparable. This suggests that the two programs offer competitive options for farmers (though it is worth noting the limited size of WQCT sample populations used for this analysis). These findings are a strong indication of the ability of WQCT programs to successfully provide:

- Alternatives to producers which do not wish to participate in Farm Bill programs
- Flexible mechanisms for permitting cost-effective nutrient load reductions
- Watershed managers a tool to cost-effectively manage nutrient reductions

Operational practices like switching to perennial vegetation or high residue have a slight advantage, in some cases, over structural practices like stream or ditch bank stabilization and grade control structures. However, geographic and physical characteristics of individual BMP sites introduce substantial variability in cost for a combined pound of TP and TN reduction. This variability keeps the potential for all of the WQCT BMP types to be within a cost-effective range. The high nutrient content in manure management and milk parlor water keeps associated BMPs highly competitive in cost-effective rankings. In addition, comparable costs suggest that producers may participate in one or the other program based on their individual preferences. Variables such as fund sequencing with project timing, duration of BMP payment period, comfort in the partnership with the paying entity, and flexibility with other uses (like cash cropping) are considerations that will likely surface when evaluating program participation.

These comparisons suggest that farmers will ultimately choose a program that best suits their immediate and long-range planning needs. WQCT in the GMR will account for these farmer interests but primarily focuses on water quality benefits (though still at prices comparable to similar Farm Bill programs). As WQCT programs grow more robust with increasing credit demand, trading credit payments to farmers could rise (on a per unit basis). This may spawn the need to consider longer-term, more highly incentivized contracts to continue to garner farmer interest in trading programs. Because of the varying program goals, it is likely that Farm Bill incentive programs and credit trading will both continue to add value to farming operations. However, opportunities to participate in trading will likely vary based on the geographic and physical characteristics of the setting in each watershed. This relates specifically to the WQCT program focus on explicit water quality outcomes associated with greater nutrient load reductions from agricultural BMPs.

Appendix A

Darke County and NRCS State Issues Ranking Worksheets

EQIP Evaluation 2007—Darke County, Ohio

The Darke County local workgroup completed the EQIP evaluation worksheet for local resource concerns. EQIP applicants can receive up to 100 ranking points for local resource concerns. The local workgroup agreed on priority concerns and practices that would best address the resource concerns of Darke County. These prioritized concerns were then assigned a point value based on water quality issues in each area.

Practices were prioritized by the local workgroup according to the number of requests, need for the practices, projected future requests, and projected future environmental benefits. Water and Air Quality concerns created by livestock, poultry and cropland erosion were the top priorities. Protecting Darke County's high quality streams from potential farm pollutants, while still maintaining a healthy agricultural economy was also included as a specific priority. Waste storage structures, dead animal composters, nutrient management, heavy use areas for livestock, chemical handling facilities, no-till corn implementation, field borders, livestock exclusion from streams and windbreaks were also identified as priority practices. Points were assigned to each practice or scoring category based on the importance it was given by the local workgroup. Finally, the workgroup assigned points based on the cost-effectiveness of all cost shared practices.

Limited resource farmer concerns are to be addressed by setting aside $5,000.00 of the funds for allocation specifically to this group. These applications (Limited Resource Farmer Applications) will be ranked separately. Once all applications have been ranked, the first $5,000 of the county allocation will go to limited resource farmers. In the event that there are no limited resource farmers applying, 100% of the funds will be distributed to the top ranking application(s).

Applicant's Name:____

Address: ____

Phone Number: ____

Farm #: ________________ **Tract #:** ________________

Score all items that apply to your farming operation.

LIVESTOCK (Manure Nutrient Management) (55 Points Max)

1. Age Of Operation

0-2 Years	(0 Points)
2+ Years	(3 Points)

2a. Existing Facility Distance To The Creek

0-500 Feet	(5 Points)
500-1500 Feet	(3 Points)
1500-2500 Feet	(1Point
2500+ Feet	(0 Points)

2b. New Facility Distance To The Creek

2500+ Feet	(5 Points)
1500-2500 Feet	(3 Points)
500-1500 Feet	(1 Point)
0-500 Feet	(0 Points)

****Points can only be received from 2a or 2b.**

3. Cowlot/Milkparlor Wastewater In Creek

Direct Discharge Present	(5 Points)
Potential For Direct Discharge	(2 Points)

No Discharge Present (0 Points)

4. Installation Of Pumpout Ports/Purchase Tile Plugs

Yes (7 Points)
No (0 Points)

5a. Manure Handling Facility - New Planned

Current Storage Facility

0-3 Months (5 Points)
3-6 Months (3 Points)
6-12 Months (1 Point)

12+ Months (0 Points)

Planned Storage Facility

12+ Months (5 Points)
6-12 Months (3 Points)
3-6 Months (1 Point)

0-3 Months (0 Points)

5b. Manure Handling Facility - No New Facility Planned

Current Storage Facility

12+ Months (5 Points)
6-12 Months (3 Points)
3-6 Months (1 Point)

0-3 Months (0 Points)

****Points can only be received from 5a or 5b.**

6. Constructing New Composter

Yes (5 Points)
No (0 Points)

7. Complete Grazing System

Yes (5 Points)
No (0 Points)

8. Site Condion Restrictions

Yes (15 Points)
No (0 Points)

(Soil Erosion Management) (25 Points Max)

1. Percent Of Cropland Consisting Of B And C Slopes Or Steeper

Greater Than 80% (5 Points)
60% To 80% (4 Points)
40% To 60% (3 Points)
20% To 40 % (2 Points)
Less Than 20% (1Point)

2. 50% Or More Of Soils With Erodibility Factor (K):

.40 Or Greater (5 Points)

.30 To .40	(3 Points)
Less Than .30	(1 Point)

3. Permanent Erosion Control Structure:

Yes	(5 Points)
No	(0 Points)

4. Fertilizer Containment Facility

Yes	(5 Points)
No	(0 Points)

5. Conservation Tillage Practices

Yes	(5 Points)
No	(0 Points)

(Air Quality Management) (10 Points Max)

1. Practices To Improve Air Quality (Field Windbreaks, Site Screen-Odor & Dust Control)

Yes	(10 Points)
No	(0 Points)

(Wildlife Habitat Management) (10 Points Max)

1. Practices To Improve Wildlife Habitat (Field Borders - Minimum Of 30 Feet Wide)

Yes	(10 Points)
No	(0 Points)

Maximum Points = 100 pts.
Total Local Points ___________
For questions regarding the program contact Jim Bennett, District Conservationist/NRCS, Tim Brunswick, Darke SWCD MNM Specialist or Jenelle Ott, Soil Conservationist/NRCS.
Applicant Signature____
NRCS Representative____

2008 EQIP STATE ISSUES RANKING WORKSHEET

(300 MAXIMUM POINTS)

Applicant: ________________________________ ProTracts Application #: ___________________

Practice(s): ________________________________ **Total State Issues Score:** __________

I. WATER QUALITY RESOURCE CONCERNS

(300 Points Maximum)

Select points for only one: (A, B, C, or D)

A. Develop a CNMP 300 Base Points

Producer wishes to complete planning on their livestock operation prior to requesting incentive payments for practices. These plans will be "**automatically"** approved at the time of application at the county office as long as **funds** are available **(no other practices will be considered for incentive payments with these type applications)!**

B. Livestock Waste Storage and Facility. Applicants must have and be utilizing an existing CNMP in order to receive incentive payments on any type of waste storage structure.

or

B. Producer has an approved "CNMP" completed prior to 09/17/07 or has been accepted in a prior EQIP sign-up to have one completed.

35 Base Points

Additional Points

B-1. Existing facility/operations is polluting the "Waters of the State." (This applies to livestock

waste storage or waste water and runoff management) **35**

or

B-2. Expanding manure storage facility that has a high potential for pollution. (If facility has

expanded more than 50 percent in the last five years or since 2002 then consider it a new

facility below) **20**

or

B-3. New facility or existing facility with 51 percent or greater expansion in the last

five years, (since 2002). **0**

B-4. Existing storage facility is located within 100 feet of a stream. **20**

B-5. Milk house waste water and clean run-off water around the facility and buildings are

properly managed. **4**

B-6. New storage facility located more than 250 feet from a stream. **15**

B-7. Attended LEAP I **or** Equine LEAP **3**

B-8. Attended LEAP II **6**

Total Additional Points

Base Points (35)

Total Points (maximum of 100)

C. Develop a Grazing Management Plan 300 Base Points

Producer wishes to complete planning on their livestock grazing operation prior to requesting incentive payments for practices. These plans will be "**automatically"** approved at the time of application at the county office as long as **funds** are available **(no other practices will be considered for incentive payments with these type applications)!**

D. Pasture Operations: Applicants must have and be utilizing an existing Grazing Management Plan in order to receive incentive payments on any type on any pasture type practices.

or

D. Producer has an approved "Grazing Management Plan" completed prior to 09/17/07 or has been accepted in a prior EQIP sign-up to have one completed.

30 Base Points

Additional Points

D-1. Producer will convert cropfields to pasture acres. **15**

or

D-2. Producer will convert highly erodible cropfields to pasture acres. **21**

D-3. Grazing system has a grazing period of 3 days or less with prescribed rest periods. **10**

or

D-4. Provides increased paddocks to allow for a weekly rotational grazing with

prescribed rest periods. **5**

D-5. All stream corridors will be protected by fences. **31**

D-6. Provides water to all paddocks. **6**

D-7. Improves forages in 60% of the paddocks. **6**

D-8. Attended LEAP Pasture **or** Attended Equine LEAP **3**

D-9. Attended Grazing Schools. **6**

Total Additional Points

Base Points (30pts)

Total Points (maximum of 100)

E. Non-point Source Water Quality 10 Base Points

(Can be used in combination with A, B, C, or D)

Additional Points

E-1. Applicant is located in a watershed with a Draft or Final TMDL where causes such as nutrients, sediment, pesticides attributable to agriculture are identified.

(See reference links/websites on next page for identifying watersheds that meet these criteria) 50

or

E-2. Applicant is located in a TMDL watershed TMDL where causes such as nutrients, sediment, pesticides attributable to agriculture are identified, but neither a Draft or Final TMDL has been completed; OR applicant is located in a non-TMDL watershed but other action plans (e.g., NPS (§319), Maumee and Black River RAPs, Lake Erie LaMP) endorsed by U.S. EPA, Ohio EPA or ODNR have identified causes to impairment attributable to agriculture, such as nutrients, sediment, pesticides.

(See reference links/websites on next page for identifying watersheds that meet these criteria and Attachment F, ODNR Watershed Action Plan Areas and Endorsement Status Map) 40

or

E-3. Applicant located in a 303(d) watershed where causes such as nutrients, sediment, pesticides attributable to agriculture are identified,

(See reference links/websites on next page for identifying watersheds that meet these criteria) 30

PLUS

-Bonus Points-

E-4. Applicant is located in a watershed that is a part of a CREP watershed, State Resource Water watershed, or WRP priority Watershed.

(See reference links/websites on next page for identifying watersheds that meet these criteria)

20

E-5. Applicant is located in a watershed utilized for drinking water with Pesticides and

Nitrates MCL Exceedance. **(See Attachment F) 20**

E-6. Applicant is located in a watershed utilized for drinking water with Nitrates MCL

Exceedance. **(See Attachment F) 10**

E-7. Applicant is located in a watershed utilized for drinking water with Elevated

Pesticides **(See Attachment F) 5**

Total Additional Points: ____________ Base Points (10pts): ____________
Bonus Points (max 50): ____________

Total Points (maximum of 100)

Contact Rick Wilson, Environmental Specialist, OEPA @ 614-644-2032 for information on websites on next page

Main Page to Ohio's TMDL program:

http://www.epa.state.oh.us/dsw/tmdl/index.html#TMDL%20Projects

BEST LINK!

This is a document that lists the causes and sources of impairment for each 303(d) listed streams

http://www.epa.state.oh.us/dsw/tmdl/2006IntReport/IR06_app_E2.pdf

TMDL Status map w/links to each TMDL (where the background on impairment is described...updated 11-8-05).

http://www.epa.state.oh.us/dsw/tmdl/OhioTMDLs_InProgress.html

Map of TMDL Status

http://www.epa.state.oh.us/dsw/tmdl/2006IntReport/IR06_map1_TMDLstatus.pdf

Map of Ohio listed 303(d) streams (i.e, impaired streams)

http://www.epa.state.oh.us/dsw/tmdl/2006IntReport/IR06_map2_porsmOverallCats.pdf

List of 303(d) streams:

http://www.epa.state.oh.us/dsw/tmdl/2006IntReport/IR06_app_D_2.pdf

F. Soil Resource Concerns

(40 Points Maximum)

F. Soil Erosion

F-1. Treatment of sheet and rill erosion will reduce erosion to 1/2 “T” or less. **20**

or

F-2. Treatment of sheet and rill erosion will reduce erosion to “T” or less. **10**

F. Soil Quality (Assumes sheet and rill erosion at or below “T”).

F-3. Excellent Soil Quality

High residue crops, pasture, or hayland 66% of time. Planting uses conservation tillage with > 20% residue after planting. **20**

or

F-4. High residue crops, pasture, or hayland 50% of time. Planting uses continuous no tillage with > 30% residue after planting. **25**

F-5. Good Soil Quality

High residue crops, pasture, or hayland 66% of time. Planting uses conventional tillage with < 20% residue after planting. **10**

or

F-6. High residue crops, pasture, or hayland 50% of time. Planting uses mulch tillage with < 30% residue after planting. **10**

F-7. Minimum Soil Quality

High residue crops, pasture, or hayland 50% of time. Planting uses conventional tillage with < 20% residue after planting. **5**

Total Additional Points (max 40 pts.) ________

G. Habitat Recovery for At-Risk Species

(30 Points Maximum)

G. Application will address at-risk species by improvement of habitat. Practices will be specific to the at-risk species which will be identified in the required wildlife management plan. Applies to cropland, grassland, or expiring CRP. See Attachment F.

G-1. Planned practices benefit Federal endangered, threatened, or candidate and species

in selected counties. **30**

or

G-2. Planned practices benefit declining habitats on contract acres to be treated. **20**

Total Points (maximum 30 pts.) ___________

Page Total Points (maximum of 70 pts.) _____________

H. Air Quality

(20 Points Maximum)

H. Application will address air quality concerns dealing with particulates, chemical drift, or odors.

H-1. Practices will address soil particulates in counties that have soils susceptible

to wind erosion. **20**

or

H-1. Practices will address chemical drift from agricultural operations through a

pest management plan. **20**

or

H-1. Practices will address odor from livestock waste storage and application

systems (must be included in the CNMP). **20**

Total Points (maximum 20 pts.)

I. Bonus Points for Addressing Multiple Resource Concerns

(20 Points Maximum)

Three points per resource concern

I. Applicants can get up to 20 additional points for addressing multiple concerns, including soil erosion, soil quality, water quality, air quality odors, air quality particulates,

air quality chemical drift, animal grazing or water, or animal wildlife habitat.

I-1: One resource concern: ________________ **I-2:** Second resource concern: _____________

I-3: Third resource concern: _______________ **I-4:** Fourth resource concern: ______________

I-5: Fifth resource concern: _______________ **I-6:** Sixth resource concern: _______________

I-7: Seventh resource concern: ________________

Bonus Points (maximum 20 pts.)

TOTAL STATE ISSUES POINTS

Page 1 Total:

Page 2 Total:

Page 3 Total:

Page 4 Total:

Page 5 Total:

Total State Issues Points (pgs. 1-6, maximum 300 points): _____

Appendix B

Darke County, Ohio Conservation Practices

		FY 2005 DARKE COUNTY PRACTICE, COMPONENT, & AVG COST LIST			
Practice Code	Practice_Name	Component	Unit_Type	Unit_Cost	Cost_Type
313	WASTE STORAGE FACILITY	Concrete apron	sq ft	2.75	AC
313	WASTE STORAGE FACILITY	Curbing	ft	4.75	AC
313	WASTE STORAGE FACILITY	Holding Pond w/sand bedding	1000cf	420	AA
313	WASTE STORAGE FACILITY	Holding Pond w/surf manure trnsfr	1000cf	175	AA
313	WASTE STORAGE FACILITY	Holding Pond w/undrgrnd manure transfr	1000cf	225	AA
313	WASTE STORAGE FACILITY	Holding Tank, Milk House/Silage Leachate	cu ft	4.50	AA
313	WASTE STORAGE FACILITY	Liquid Manure Pit	cu ft	3.50	AA
313	WASTE STORAGE FACILITY	Manure Pack with roof concrete walls	1000cf	3600	AA
313	WASTE STORAGE FACILITY	Manure Pack with roof plank walls	1000cf	2750	AA
313	WASTE STORAGE FACILITY	Pump and valve	each	5000	AC
313	WASTE STORAGE FACILITY	Pumping Pipeline	ft	6.00	AC
313	WASTE STORAGE FACILITY	Roof only for Waste Storage	sq ft	6.00	AC
313	WASTE STORAGE FACILITY	Settling Basin	sq ft	6.00	AC
313	WASTE STORAGE FACILITY	Siphon	each	650	AC
313	WASTE STORAGE FACILITY	Storage Struc w/ roof, concrete walls	1000cf	3500	AA
313	WASTE STORAGE FACILITY	Storage Struc w/ roof, plank walls	1000cf	2500	AA
313	WASTE STORAGE FACILITY	Storage Struc w/o roof, concrete walls	1000cf	1500	AA
313	WASTE STORAGE FACILITY	Storage Struc w/o roof, plank walls	1000cf	1000	AA
314	BRUSH MANAGEMENT	Brush Control	ac	25	FR
317	COMPOSTING FACILITY	w/o roof,w/o concrete floor,w/o bins	sq ft	1.50	AC
317	COMPOSTING FACILITY	w/o roof,w/o concrete floor, w/bins	sq ft	4.50	AC
317	COMPOSTING FACILITY	w/roof,w/concrete floor, w/bins	sq ft	18	AC
317	COMPOSTING FACILITY	w/o roof,w/concrete floor, w/bins	sq ft	7	AC
317	COMPOSTING FACILITY	w/roof,w/concrete floor,w/o bins	sq ft	11	AC
317	COMPOSTING FACILITY	w/roof,w/o concrete floor,w/o bins	sq ft	6.50	AC
317	COMPOSTING FACILITY	w/roof,w/o concrete floor,w/bin	sq ft	9.50	AC
327	CONSERVATION COVER	CSG grass mix	ac	95	AC
327	CONSERVATION COVER	WSG Grass Mix A&B slopes	ac	122	AC
327	CONSERVATION COVER	WSG Grass Mix A&B slopes w/Plateau	ac	170	AC
327	CONSERVATION COVER	WSG Grass Mix C&D slopes	ac	137	AC
327	CONSERVATION COVER	WSG Grass Mix C&D slopes w/Plateau	ac	191	AC
328	CONSERVATION CROP ROTATION	Conservation Crop Rotation	ac	5	FR

329A	RESIDUE MANAGEMENT, NO-TILL AND STRIP TILL	No-till / Strip Till	ac	8	FR
329B	RESIDUE MANAGEMENT, MULCH TILL	Mulch Till	ac	8	FR
329C	RESIDUE MANAGEMENT, RIDGE TILL	Ridge Till	ac	8	FR
330	CONTOUR FARMING	Establish Contouring	ac	12	FR
332	CONTOUR BUFFER STRIPS	Establish contour buffer strips	ac	12	FR
338	PRESCRIBED BURNING	Prescribed burning of warm season grasses	ac	30	FR
340	COVER AND GREEN MANURE CROP	Establish Cover Crop	ac	15	FR
342	CRITICAL AREA PLANTING	Crit. Area Seed w/o earthmoving	ac	300	AC
342	CRITICAL AREA PLANTING	Crit. Area Seed w/ earthmoving	ac	480	AC
344	RESIDUE MANAGEMENT, SEASONAL	Crop Residue Mgt	ac	5	FR
350	SEDIMENT BASIN	Sediment Basin	each	5000	AC
356	DIKE	Dike 3 ft. high	ft	3.90	AC
356	DIKE	Dike 3 ft. high w/chain link rodent control	ft	5.90	AC
356	DIKE	Dike 4 ft high	ft	6.40	AC
356	DIKE	Dike 4 ft high w/chain link rodent control	ft	8.40	AC
356	DIKE	Dike 5 ft. high	ft	9	AC
356	DIKE	Dike 5 ft high w/chain link rodent control	ft	11	AC
356	DIKE	Dike 6 ft. high	ft	12.30	AC
356	DIKE	Dike 6 ft high w/chain link rodent control	ft	14.30	AC
359	LAGOON SYSTEM	Lagoon System w/surface Manure Transfer	1000cf	40	AA
359	LAGOON SYSTEM	Lagoon System w/underground Manure Transfer	1000cf	50	AA
362	DIVERSION	Diversion	ft	2.50	AC
378	POND	Pond, Livestock	each	6000	AC
380	WINDBREAK/SHELTERBELT ESTABLISHMENT	Farmstead Windbreak, seedlings	ac	500	AC
380	WINDBREAK/SHELTERBELT ESTABLISHMENT	Field Windbreak, seedlings	ft	0.37	AC
382	FENCE	Barbed Wire, 3 strands	ft	2.00	AC
382	FENCE	Barbed Wire, 4 strands	ft	2.20	AC
382	FENCE	Woven Wire	ft	3.00	AC
382	FENCE	High Tensile, 6 strands	ft	2.50	AC
382	FENCE	High Tensile, 8-10 strands	ft	3.10	AC
382	FENCE	High Tensile, Electric, 1-2 strands	ft	1.25	AC
382	FENCE	High Tensile, Electric, 3-4 strands	ft	1.60	AC
382	FENCE	High Tensile, Electric, 5 or more strands	ft	2.20	AC
382	FENCE	Feedlot Fence	ft	3.80	AC
382	FENCE	Gate 10 ft to 16 ft wide	each	70	AC

386	FIELD BORDER	Establish CSG/Legumes	ac	95	AC
386	FIELD BORDER	Establish WSG w/o Chemical Trtmt	ac	137	AC
386	FIELD BORDER	Establish WSG with Chemical Trtmt	ac	191	AC
391	RIPARIAN FOREST BUFFER	Trees - Conifer or softwood deciduous	ac	460	AC
391	RIPARIAN FOREST BUFFER	Trees - Hardwood	ac	610	AC
391	RIPARIAN FOREST BUFFER	Trees - Planting only, free trees	ac	250	AC
391	RIPARIAN FOREST BUFFER	Shrub Planting Only	ac	460	AC
393	FILTER STRIP	Establish Cool Season Grasses/Legumes	ac	95	AC
393	FILTER STRIP	Establish Warm Season Grasses w/o Chemical	ac	137	AC
393	FILTER STRIP	Establish Warm Season Grasses with Chemical	ac	191	AC
393	FILTER STRIP	Grassed Infiltration Strip for waste trtmt	sq ft	0.20	AC
394	FIREBREAK	Establish firebreak	ac	95.00	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab Estab with sod	each	1200	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab Estab with seed	each	600	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab RipRap <10 cfs	each	400	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab RipRap 10-30 cfs	each	1500	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab. RipRap 30-60 cfs	each	3000	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab. RipRap >60cfs	each	4500	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab. Concrete Struct.	each	6200	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab. Wood	each	2000	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab. Aluminum	each	4500	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab Pipe <18"	each	1500	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab Pipe 18"	each	2000	AC
410	GRADE STABILIZATION STRUCTURE	Grade Stab Pipe >18"	each	2500	AC
412	GRASSED WATERWAY	Grass WW, <30 ft, no tile	ft	1.75	AC
412	GRASSED WATERWAY	Rock Ck for Gr WW, <30 ft, no tile	each	120	AC
412	GRASSED WATERWAY	Filter Fabric Ck for Gr WW, <30 ft, no tile	each	100	AC
412	GRASSED WATERWAY	Stone Cntrd Outlet for Gr WW, <30 ft, no tile	ft	60	AC
412	GRASSED WATERWAY	Grass WW, 30-40 ft, no tile	ft	2.50	AC
412	GRASSED WATERWAY	Rock Ck for Gr WW, 30-40 ft, no tile	each	140	AC
412	GRASSED WATERWAY	Filter Fabric Ck for Gr WW, 30-40 ft, no tile	each	120	AC
412	GRASSED WATERWAY	Stone Cntrd Outlet for Gr WW, 30-40 ft, no tile	ft	70	AC
412	GRASSED WATERWAY	Grass WW, >40 ft, no tile	ft	2.80	AC
412	GRASSED WATERWAY	Rock Ck for Gr WW, >40 ft, no tile	each	150	AC
412	GRASSED WATERWAY	Filter Fabric Ck for Gr WW,>40 ft, no tile	each	130	AC
412	GRASSED WATERWAY	Stone Cntrd Outlet for Gr WW, >40 ft, no tile	ft	75	AC

412	GRASSED WATERWAY	Mulch netting	sq ft	0.08	AC
412	GRASSED WATERWAY	Mulch netting w/ interwoven straw or coir	sq ft	0.14	AC
412	GRASSED WATERWAY	Old tile search & destroy	ft	0.55	AC
412	GRASSED WATERWAY	Blind Inlet	each	600	AC
422	HEDGEROW PLANTING	Hedgerow Planting	ft	0.34	AC
468	LINED WATERWAY OR OUTLET	Lined WW, Outlet	ft	70	AC
472	USE EXCLUSION	Streambank Exclusion	1000 ft	200	AC
472	USE EXCLUSION	Woodlot Exclusion	1000 ft	200	AC
490	FOREST SITE PREPARATION	Woodland Site Preparation	ac	120	AC
512	PASTURE AND HAY PLANTING	Establish CSG/Legumes -or- Switchgrass	ac	95	AC
512	PASTURE AND HAY PLANTING	Establish Warm Season Grasses w/o Chemical Trtmt	ac	137	AC
512	PASTURE AND HAY PLANTING	Establish Warm Season Grasses with Chemical Trtmt	ac	191	AC
516	PIPELINE	Pipeline, Livestock Water 0.75"	ft	1.40	AC
516	PIPELINE	Pipeline, Livestock Water 1.25"	ft	1.90	AC
528A	PRESCRIBED GRAZING	Prescribed Grazing	ac	15	FR
528	PRESCRIBED GRAZING	Grazing Management Plan - less than 20 animal units	each	0	FR
528	PRESCRIBED GRAZING	Grazing Management Plan - 20-50 animal units	each	250	FR
528	PRESCRIBED GRAZING	Grazing Management Plan - 50-100 animal units	each	500	FR
528	PRESCRIBED GRAZING	Grazing Management Plan - >100 animal units	each	750	FR
533	PUMPING PLANT FOR WATER CONTROL	Pumping Plant, <1000 gallon	each	1000	AC
533	PUMPING PLANT FOR WATER CONTROL	Pumping Plant, >1000 gallon	each	1500	AC
554	DRAINAGE WATER MANAGEMENT	Mamagement of system	ac	0	FR
558	ROOF RUNOFF MANAGEMENT	Roof runoff mgt - Gutters & Spouting	ft	3.10	AC
558	ROOF RUNOFF MANAGEMENT	Roof runoff mgt -Stone for drip trench	cu ft	1.50	AC
560	ACCESS ROAD	Access Road	sq ft	1.30	AC
560	ACCESS ROAD	Livestock Stream Crossing	ft	30	AC
561	HEAVY USE AREA PROTECTION	Non- Livestock Gravel Pad Surface Treatment	sq ft	1.30	AC
561	HEAVY USE AREA PROTECTION	Non-Livestock Concrete Pad Surface Treatment	sq ft	2.75	AC
561	HEAVY USE AREA PROTECTION	Gravel Livestock Pad	sq ft	1.30	AC
561	HEAVY USE AREA PROTECTION	Concrete Livestock Pad	sq ft	2.75	AC
574	SPRING DEVELOPMENT	Spring Development	each	1500	AC
580	STREAMBANK AND SHORELINE PROTECTION	Streambank Stab. Riprap	sq ft	10.00	AC
580	STREAMBANK AND SHORELINE PROTECTION	Streambank Stab. Seeding Only	ac	600	AC
580	STREAMBANK AND SHORELINE PROTECTION	Streambank stab w/ bioengineering	ft	50	AC
585	STRIPCROPPING, CONTOUR	Stripcropping, Contour	ac	15	FR

586	STRIPCROPPING, FIELD	Stripcropping, Field	ac	10	FR
587	WATER CONTROL STRUCTURE	Wetland Water Control Struc < 10" pipe	each	936	AC
587	WATER CONTROL STRUCTURE	Wetland Water Control Struc 10"- 15" pipe	each	1434	AC
587	WATER CONTROL STRUCTURE	Wetland Water Control Struc > 15" pipe	each	1800	AC
587	WATER CONTROL STRUCTURE	Perm Struc 8" tile w/o storage	each	850	AC
587	WATER CONTROL STRUCTURE	Perm Struc 8" tile w storage	each	1200	AC
587	WATER CONTROL STRUCTURE	Perm Struc 10" tile w/o storage	each	950	AC
587	WATER CONTROL STRUCTURE	Perm Struc 10" tile storage	each	1450	AC
587	WATER CONTROL STRUCTURE	Perm Struc 12" tile w/o storage	each	1050	AC
587	WATER CONTROL STRUCTURE	Perm Struc 12" tile w storage	each	1550	AC
587	WATER CONTROL STRUCTURE	Perm Struc 15" tile w/o storage	each	1175	AC
587	WATER CONTROL STRUCTURE	Perm Struc 15" tile w storage	each	2100	AC
587	WATER CONTROL STRUCTURE	Perm Struc 18" tile w/o storage	each	1300	AC
587	WATER CONTROL STRUCTURE	Perm Struc 18" tile w storage	each	2100	AC
587	WATER CONTROL STRUCTURE	Temp Tile Blocks 4" - 8"	each	210	AC
587	WATER CONTROL STRUCTURE	Temp Tile Blocks 8" - 16"	each	385	AC
587	WATER CONTROL STRUCTURE	Temp Tile Blocks 12" - 21"	each	535	AC
587	WATER CONTROL STRUCTURE	Temp Tile Blocks 20" - 40"	each	1285	AC
587	WATER CONTROL STRUCTURE	22 psi Single "Y" Controller w 35' of Blue Hose	each	160	AC
587	WATER CONTROL STRUCTURE	36 psi Single "Y" Controller w 35' of Red Hose	each	160	AC
589B	STRIPCROPPING, WIND	Stripcropping, Wind	ac	10	FR
590	NUTRIENT MANAGEMENT	CNMP less than 100 AUs	each	500	FR
590	NUTRIENT MANAGEMENT	CNMP 100-250 AUs	each	1000	FR
590	NUTRIENT MANAGEMENT	CNMP 250 AUs+	each	1500	FR
590	NUTRIENT MANAGEMENT	Nutrnt Mgt w/ Precision Farm	ac	6	FR
590	NUTRIENT MANAGEMENT	Nutrient Management	ac	5	FR
595	PEST MANAGEMENT	Pest Management	ac	5	FR
606	SUBSURFACE DRAIN	4" Tile	ft	1.30	AC
606	SUBSURFACE DRAIN	4" Smoothwall	ft	1.40	AC
606	SUBSURFACE DRAIN	5" Tile	ft	1.30	AC
606	SUBSURFACE DRAIN	6" Tile	ft	2.01	AC
606	SUBSURFACE DRAIN	6" Smoothwall	ft	2.89	AC
606	SUBSURFACE DRAIN	8" Tile	ft	3.20	AC
606	SUBSURFACE DRAIN	8" Smoothwall	ft	4.41	AC
606	SUBSURFACE DRAIN	10" Tile	ft	5.00	AC
606	SUBSURFACE DRAIN	10" Smoothwall	ft	5.93	AC

606	SUBSURFACE DRAIN	12" Tile	ft	5.93	AC
606	SUBSURFACE DRAIN	12" Smoothwall	ft	6.86	AC
612	TREE/SHRUB ESTABLISHMENT	Shrub Planting Only	ac	520	AC
612	TREE/SHRUB ESTABLISHMENT	Trees - Conifer or softwood deciduous	ac	460	AC
612	TREE/SHRUB ESTABLISHMENT	Trees - Hardwood	ac	610	AC
612	TREE/SHRUB ESTABLISHMENT	Trees - Planting only, free trees	ac	250	AC
614	WATERING FACILITY	Concrete Tank	each	600	AC
614	WATERING FACILITY	Plastic Tank	each	415	AC
614	WATERING FACILITY	Automatic Waterer	each	450	AC
620	UNDERGROUND OUTLET	Outlet Box	each	400	AC
620	UNDERGROUND OUTLET	4" Tile	ft	1.30	AC
620	UNDERGROUND OUTLET	4" Smoothwall	ft	1.40	AC
620	UNDERGROUND OUTLET	5" Tile	ft	1.30	AC
620	UNDERGROUND OUTLET	6" Tile	ft	2.01	AC
620	UNDERGROUND OUTLET	6" Smoothwall	ft	2.89	AC
620	UNDERGROUND OUTLET	8" Tile	ft	3.20	AC
620	UNDERGROUND OUTLET	8" Smoothwall	ft	4.41	AC
620	UNDERGROUND OUTLET	10" Tile	ft	5.00	AC
620	UNDERGROUND OUTLET	10" Smoothwall	ft	5.93	AC
620	UNDERGROUND OUTLET	12" Tile	ft	5.93	AC
620	UNDERGROUND OUTLET	12" Smoothwall	ft	6.86	AC
633	WASTE UTILIZATION	< 1.9 mile hauling	ac	4	FR
633	WASTE UTILIZATION	2.0 to 4.9 mile hauling	ac	7	FR
633	WASTE UTILIZATION	5.0 plus miles hauling	ac	8	FR
638	WATER AND SEDIMENT CONTROL BASIN	WASCOB System, Grassed Slopes	each	3250	AC
638	WATER AND SEDIMENT CONTROL BASIN	WASCOB System, Farmed Slopes	each	3250	AC
642	WELL	Well for Livestock Water	ft	25	AC
643	RESTORATION AND MANAGEMENT OF DECLINING HABITATS	Control of woody invasives	ac	4000	AM
643	RESTORATION AND MANAGEMENT OF DECLINING HABITATS	Control of herbaceous invasives	ac	2000	AM
643	RESTORATION AND MANAGEMENT OF DECLINING HABITATS	Establishment of native plant community	ac	2000	AM
644	WETLAND WILDLIFE HABITAT MANAGEMENT	Wetland Mgt. for Wildlife	ac	10	FR
645	UPLAND WILDLIFE HABITAT MANAGEMENT	Upland Mgt. for Wildlife	ac	10	FR
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Discing	ac	20	AC
647	EARLY SUCCESSIONAL HABITAT	Spraying	ac	50	AC

	DEVELOPMENT/MANAGEMENT				
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Mowing	ac	5	AC
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Forest openings for wildlife	ac	150	AC
648	WILDLIFE WATERING FACILITY	Wildlife Water Facility	each	250	AC
650	WINDBREAK/SHELTERBELT RENOVATION	Farmstead Windbreak Renovation	ac	44	AC
650	WINDBREAK/SHELTERBELT RENOVATION	Field Windbreak Renovation	ac	63	AC
657	WETLAND RESTORATION	Excavation	cu yd	2	AC
657	WETLAND RESTORATION	Rodent control chain link fence	ft	3	AC
657	WETLAND RESTORATION	Tile Search (Trenching)	ft	0.55	AC
657	WETLAND RESTORATION	Tile Blocking	each	50	AC
657	WETLAND RESTORATION	WRP Sign Post	each	3	FR
658	WETLAND CREATION	Excavation	cu yd	2	AC
658	WETLAND CREATION	Rodent control chain link fence	ft	3	AC
658	WETLAND CREATION	Tile Search (Trenching)	ft	.55	AC
658	WETLAND CREATION	Tile Blocking	each	50	AC
658	WETLAND CREATION	WRP Sign Post	each	3	FR
659	WETLAND ENHANCEMENT	Excavation	cu yd	2	AC
659	WETLAND ENHANCEMENT	Rodent control chain link fence	ft	3	AC
659	WETLAND ENHANCEMENT	Tile Search (Trenching)	ft	0.55	AC
659	WETLAND ENHANCEMENT	Tile Blocking	each	50	AC
659	WETLAND ENHANCEMENT	WRP Sign Post	each	3	FR
660	TREE/SHRUB PRUNING	Woodland Pruning 0-9 ft high	ac	84	AC
660	TREE/SHRUB PRUNING	Woodland Pruning 9-17 ft high	ac	90	AC
660	TREE/SHRUB PRUNING	Woodland Pruning >17 ft high	ac	170	AC
666	FOREST STAND IMPROVEMENT	Woodland Imp TSI - Thinning	ac	140	AC
666	FOREST STAND IMPROVEMENT	Woodland Imp TSI - Grape Vine Control, light	ac	50	AC
666	FOREST STAND IMPROVEMENT	Woodland Imp TSI - Grape Vine Control, moderate	ac	70	AC
666	FOREST STAND IMPROVEMENT	Woodland Imp TSI - Grape Vine Control, heavy	ac	100	AC
666	FOREST STAND IMPROVEMENT	Woodland Imp TSI - Crop Tree Release	ac	90	AC
666	FOREST STAND IMPROVEMENT	Woodland Imp TSI - Crop Tree Release and Grapevine Control (same acreage)	ac	130	AC
702	AGRICHEMICAL HANDLING FACILITY	< 7500 gal. Fert Containment Largest Tank	each	2500	FR
702	AGRICHEMICAL HANDLING FACILITY	7500 gal. to 14,999 gal. Fert Contnmt Largest Tank	each	4200	FR
702	AGRICHEMICAL HANDLING FACILITY	15,000+ gal. Fert Containment Largest Tank	each	6000	FR
910	TA PLANNING	TA Planning	no.	NTE	AM
911	TA DESIGN	TA Design	no.	NTE	AM

912	TA APPLICATION	TA Application	no.	NTE	AM
913	TA CHECK-OUT	TA Check-out	no.	NTE	AM

Appendix C

2007 Statewide Ohio EQIP Average Costs

2007 Statewide Ohio EQIP Average Costs

Practice Code	Practice Name	Component	Unit Type	Unit Cost	Cost Type	Share Rate
100	COMPREHENSIVE NUTRIENT MANAGEMENT PLAN	CNMP less than 100 AUs	no	500	FR	100
100	COMPREHENSIVE NUTRIENT MANAGEMENT PLAN	CNMP 100-249 AUs	no	1000	FR	100
100	COMPREHENSIVE NUTRIENT MANAGEMENT PLAN	CNMP 250 AUs or greater	no	1500	FR	100
100	COMPREHENSIVE NUTRIENT MANAGEMENT PLAN	CNMP FA Initiative Acres	ac	0.00	AM	100
100	COMPREHENSIVE NUTRIENT MANAGEMENT PLAN	CNMP FA Initiative Animal Units	au	0.00	AM	100
313	WASTE STORAGE FACILITY	Storage - Concrete Slab Only	sq ft	3.5	AC	65
313	WASTE STORAGE FACILITY	Storage - Structural Roof	sq ft	7.5	AC	65
313	WASTE STORAGE FACILITY	Storage - Wall / Curb - Concrete Wall 2' or less (includes footer)	sq ft	6	AC	65
313	WASTE STORAGE FACILITY	Storage - Wall / Curb - Concrete Wall greater than 2' (includes footer)	sq ft	9	AC	65
313	WASTE STORAGE FACILITY	Storage - Wall / Curb - Plank	sq ft	7.5	AC	65
313	WASTE STORAGE FACILITY	Storage - Earthen Pond	cu ft	0.12	AC	65
313	WASTE STORAGE FACILITY	Storage - Earthen Pond w/ Synthetic Liner or Cover	cu ft	0.25	AC	65
313	WASTE STORAGE FACILITY	Storage Tank / Structure - 10,000 or greater	cu ft	2.2	AC	65
313	WASTE STORAGE FACILITY	Storage Tank / Structure - 10,000 or greater w/ Slats or Top	cu ft	4	AC	65
313	WASTE STORAGE FACILITY	Storage Tank / Structure - less than 10,000 gallons	cu ft	7.5	AC	65
313	WASTE STORAGE FACILITY	Transfer - Underground Pipe - 20" or greater	ft	27	AC	65
313	WASTE STORAGE FACILITY	Transfer - Underground Pipe - 12" - 18"	ft	20	AC	65
313	WASTE STORAGE FACILITY	Transfer - Underground Pipe - less than 12"	ft	9	AC	65
313	WASTE STORAGE FACILITY	Transfer - Pump - Large (Manure Pump)	no	11000	AC	65
313	WASTE STORAGE FACILITY	Transfer - Pump - Small (Milkhouse / Runoff Water)	no	3500	AC	65
313	WASTE STORAGE FACILITY	Treatment - Constructed Wetland	sq ft	0.35	AC	65
313	WASTE STORAGE FACILITY	Treatment - Settling Basin	sq ft	12	AC	65
313	WASTE STORAGE FACILITY	Treatment - Filter Strip / Infiltration Area	sq ft	0.25	AC	65
314	BRUSH MANAGEMENT	Brush Management	ac	25	FR	100
317	COMPOSTING FACILITY	Composting Facility - Gravel Pad	sq ft	1.6	AC	65
317	COMPOSTING FACILITY	Composting Facility - Concrete Pad	sq ft	3.5	AC	65
317	COMPOSTING FACILITY	Composting Facility - Roof Only	sq ft	6.5	AC	65
317	COMPOSTING FACILITY	Composting - Wall / Curb - Concrete (includes footer/foundation)	sq ft	9	AC	65
317	COMPOSTING FACILITY	Composting - Wall / Curb - Plank	sq ft	7.5	AC	65
327	CONSERVATION COVER	WSG Mix w/o Chemical Trtmt	ac	150	AC	50
327	CONSERVATION COVER	WSG Mix w/ Chemical Trtmt	ac	200	AC	50
327	CONSERVATION COVER	Cool Season Grasses / Legumes	ac	135	AC	50

328	CONSERVATION CROP ROTATION	Conservation Crop Rotation	ac	5	FR	100
329	RESIDUE MANAGEMENT, NO-TILL/STRIP TILL	Residue Management, No-Till/Strip Till	ac	8	FR	100
330	CONTOUR FARMING	Establish Contouring	ac	12	FR	100
332	CONTOUR BUFFER STRIPS	Establish Contour Buffer Strips	ac	12	FR	100
338	PRESCRIBED BURNING	Prescribed Burning of WSGs	ac	30	FR	100
340	COVER CROP	Establish Cover Crop	ac	15	FR	100
342	CRITICAL AREA PLANTING	Critical Area Seeding - w/ earthmoving	ac	600	AC	50
342	CRITICAL AREA PLANTING	Critical Area Seeding - w/o earthmoving	ac	400	AC	50
344	RESIDUE MANAGEMENT, SEASONAL	Crop Residue Mgt	ac	5	FR	100
345	RESIDUE MANAGEMENT, MULCH TILL	Residue Management, Mulch Till	ac	8	FR	100
346	RESIDUE MANAGEMENT, RIDGE TILL	Residue Management, Ridge Till	ac	8	FR	100
350	SEDIMENT BASIN	Sediment Basin	no	5000	AC	50
356	DIKE	Chain Link Fence along Dike for Rodent Control	sq ft	0.75	AC	50
356	DIKE	Dike	cu yd	3.25	AC	50
359	WASTE TREATMENT LAGOON	Waste Treatment Lagoon System	cu ft	0.11	AC	65
362	DIVERSION	Diversion	ft	4	AC	50
378	POND	Pond - for Livestock Water	ac	6000	AC	50
380	WINDBREAK/SHELTERBELT ESTABLISHMENT	Farm Windbreak HQ / Feedlot - Large Potted Stock	ft	0.44	AC	50
380	WINDBREAK/SHELTERBELT ESTABLISHMENT	Farm Windbreak HQ / Feedlot - Seedlings	ft	0.21	AC	50
380	WINDBREAK/SHELTERBELT ESTABLISHMENT	Field Windbreak - Mineral Soils	ft	0.37	AC	50
380	WINDBREAK/SHELTERBELT ESTABLISHMENT	Field Windbreak - Marsh Muck Soils	ft	2.8	AC	50
380	WINDBREAK/SHELTERBELT ESTABLISHMENT	Field Windbreak, seedlings	ft	0.37	AC	50
382	FENCE	Fence - Barbed Wire	ft	2.25	AC	50
382	FENCE	Fence - Feedlot Fence	ft	3.75	AC	50
382	FENCE	Fence - High Tensile	ft	2.8	AC	50
382	FENCE	Fence - Electric - Less than 3 strands	ft	1.1	AC	50
382	FENCE	Fence - Electric - 3 or more strands	ft	1.5	AC	50
382	FENCE	Fence - Woven Wire	ft	3	AC	50
386	FIELD BORDER	Cool Season Grasses / Legumes	ac	135	AC	50
386	FIELD BORDER	WSG Mix w/o Chemical Trtmt	ac	150	AC	50
386	FIELD BORDER	WSG Mix w/ Chemical Trtmt	ac	200	AC	50
391	RIPARIAN FOREST BUFFER	Establish Conifer Trees	ac	500	AC	50
391	RIPARIAN FOREST BUFFER	Establish Hardwood Trees	ac	650	AC	50
391	RIPARIAN FOREST BUFFER	Establish Trees - (free trees)	ac	275	AC	50
391	RIPARIAN FOREST BUFFER	Establish - Direct Seeding Establishment Method	ac	660	AC	50

391	RIPARIAN FOREST BUFFER	Establish Trees with Weed Control - Between Row Cover	ac	20	AC	50
391	RIPARIAN FOREST BUFFER	Establish Trees with Weed Control - Chemical / Mechanical Treatment	ac	700	AC	50
391	RIPARIAN FOREST BUFFER	Shrub Planting Only	ft	0.3	AC	50
393	FILTER STRIP	Cool Season Grasses / Legumes	ac	135	AC	50
393	FILTER STRIP	WSG Mix w/o Chemical Trtmt	ac	150	AC	50
393	FILTER STRIP	WSG Mix w/ Chemical Trtmt	ac	200	AC	50
394	FIREBREAK	Establish Firebreak	ac	115	AC	50
410	GRADE STABILIZATION STRUCTURE	Grade Stab - Concrete Structure 150 CFS or greater	no	6000	AC	50
410	GRADE STABILIZATION STRUCTURE	Grade Stab - Concrete Structure less than 150 CFS	no	4500	AC	50
410	GRADE STABILIZATION STRUCTURE	Grade Stab - Straight Pipe or Pipe Drop <18"	no	2000	AC	50
410	GRADE STABILIZATION STRUCTURE	Grade Stab - Straight Pipe or Pipe Drop 18" or more	no	2900	AC	50
410	GRADE STABILIZATION STRUCTURE	Grade Stab - Riprap	sq ft	4.25	AC	50
410	GRADE STABILIZATION STRUCTURE	Grade Stab - Structure Wood	no	2500	AC	50
410	GRADE STABILIZATION STRUCTURE	Grade Stab - Aluminum	no	5000	AC	50
410	GRADE STABILIZATION STRUCTURE	Grade Stab - Sod - Established with sod	no	1300	AC	50
412	GRASSED WATERWAY	Grass WW, 30 ft or less, no tile	ft	3.25	AC	50
412	GRASSED WATERWAY	Grass WW, 31ft - 40 ft, no tile	ft	4.25	AC	50
412	GRASSED WATERWAY	Grass WW, > 40 ft, no tile	ft	5	AC	50
412	GRASSED WATERWAY	Blind Inlet	no	700	AC	50
412	GRASSED WATERWAY	Riser Inlet	no	210	AC	50
412	GRASSED WATERWAY	Buffer Strips Adj. to WW, Cool Season mix	ac	135	AC	50
412	GRASSED WATERWAY	Mulch Netting	sq ft	0.05	AC	50
412	GRASSED WATERWAY	Erosion Control Blanket	sq ft	0.1	AC	50
412	GRASSED WATERWAY	Rock Check for Grass WW - 40 ft wide or less, no tile	no	140	AC	50
412	GRASSED WATERWAY	Rock Check for Grass WW, greater than 40 ft wide, no tile	no	155	AC	50
412	GRASSED WATERWAY	Stone Centered Outlet - 30 ft wide or less	ft	65	AC	50
412	GRASSED WATERWAY	Stone Centered Outlet - 31 ft to 40 ft wide	ft	75	AC	50
412	GRASSED WATERWAY	Stone Centered Outlet - greater than 40 ft wide	ft	80	AC	50
422	HEDGEROW PLANTING	Hedgerow Planting	ft	0.34	AC	50
468	LINED WATERWAY OR OUTLET	Rock Lined WW, Outlet	sq ft	3.5	AC	50
472	USE EXCLUSION	Exclusion	ft	0.2	AC	50
490	TREE/SHRUB SITE PREPARATION	Woodland Site Preparation	ac	120	AC	50
512	PASTURE AND HAY PLANTING	Cool Season Grasses / Legumes	ac	135	AC	50
512	PASTURE AND HAY PLANTING	WSG Mix w/o Chemical Trtmt	ac	150	AC	50
512	PASTURE AND HAY PLANTING	WSG Mix w/ Chemical Trtmt	ac	200	AC	50

516	PIPELINE	Pipeline - Boring	ft	15	AC	50
516	PIPELINE	Pipeline - Less than 2" pipeline	ft	1.75	AC	50
516	PIPELINE	Pipeline - 2" pipeline or greater	ft	2.4	AC	50
516	PIPELINE	Pipeline - Pond Intake/Siphon System to Toe	no	485	AC	50
528	PRESCRIBED GRAZING	Prescribed Grazing Management	ac	25	FR	100
528	PRESCRIBED GRAZING	Grazing Management Plan - Less than 50 AUs	no	250	FR	100
528	PRESCRIBED GRAZING	Grazing Management Plan - 50-100 AUs	no	500	FR	100
528	PRESCRIBED GRAZING	Grazing Management Plan - More than 100 AUs	no	750	FR	100
533	PUMPING PLANT	Pumping Plant - 1000 gallon or less / hr	no	1000	AC	50
533	PUMPING PLANT	Pumping Plant - >1000 gallon / hr	no	1500	AC	50
533	PUMPING PLANT	Pumping Plant - Ram Pump	no	420	AC	50
533	PUMPING PLANT	Pumping Plant - Solar Pump	no	2900	AC	50
533	PUMPING PLANT	Pumping Plant - Electric Pump	no	725	AC	50
554	DRAINAGE WATER MANAGEMENT	Operation of Structure	no	100	FR	100
558	ROOF RUNOFF STRUCTURE	Roof Runoff Mgt - Gutters and Spouting	ft	5.5	AC	50
558	ROOF RUNOFF STRUCTURE	Roof Runoff Mgt - Rock Filled Trench	ft	6	AC	50
560	ACCESS ROAD	Access Road - Culvert for Drainage (length)	ft	10	AC	50
560	ACCESS ROAD	Access Road - Surface Treatment - Gravel	sq ft	1.6	AC	50
560	ACCESS ROAD	Access Road - Livestock Stream Crossing	sq ft	3.5	AC	50
560	ACCESS ROAD	Access Road - Culvert Crossing Only (length)	ft	13.5	AC	50
561	HEAVY USE AREA PROTECTION	HUA - Surface Treatment - Concrete	sq ft	3.5	AC	50
561	HEAVY USE AREA PROTECTION	HUA - Surface Treatment - Gravel	sq ft	1.6	AC	50
574	SPRING DEVELOPMENT	Spring Development	no	2200	AC	50
580	STREAMBANK AND SHORELINE PROTECTION	Streambank Stabilization - w/ bioengineering	sq ft	3.5	AC	50
580	STREAMBANK AND SHORELINE PROTECTION	Streambank Stabilization - Riprap	sq ft	3.5	AC	50
580	STREAMBANK AND SHORELINE PROTECTION	Streambank Stabilization - Grading and Seeding	ac	600	AC	50
585	STRIPCROPPING	Stripcropping - Contour	ac	15	FR	100
585	STRIPCROPPING	Stripcropping - Field	ac	10	FR	100
587	STRUCTURE FOR WATER CONTROL	Earthmoving	cu yd	3.25	AC	50
587	STRUCTURE FOR WATER CONTROL	Perm Structure - 8" tile or less w/ storage	no	1600	AC	50
587	STRUCTURE FOR WATER CONTROL	Perm Structure - 8" tile or less w/o storage	no	1050	AC	50
587	STRUCTURE FOR WATER CONTROL	Perm Structure - 10" to 12" tile w/ storage	no	1725	AC	50
587	STRUCTURE FOR WATER CONTROL	Perm Structure - 10" to 12" tile w/o storage	no	1150	AC	50
587	STRUCTURE FOR WATER CONTROL	Perm Structure - Greater than 12" tile w/ storage	no	1925	AC	50
587	STRUCTURE FOR WATER CONTROL	Perm Structure - Greater than 12" tile w/o storage	no	1350	AC	50

587	STRUCTURE FOR WATER CONTROL	Slide Gate Valve - Less than 15" tile	no	775	AC	50
587	STRUCTURE FOR WATER CONTROL	Slide Gate Valve - 15" tile or greater Tile	no	1200	AC	50
587	STRUCTURE FOR WATER CONTROL	Straight Pipe or Pipe Drop - Less than 10" pipe	no	1000	AC	50
587	STRUCTURE FOR WATER CONTROL	Straight Pipe or Pipe Drop - 10" pipe or greater	no	1200	AC	50
590	NUTRIENT MANAGEMENT	Nutrient Management	ac	5	FR	100
590	NUTRIENT MANAGEMENT	Nutrient Mgt w/ Precision (Grid) Farming	ac	10	FR	100
595	PEST MANAGEMENT	Pest Management	ac	12	FR	100
595	PEST MANAGEMENT	Pest Management - Slug Sampling and Pest Control	ac	20	FR	100
595	PEST MANAGEMENT	Pest Management - w/ Precision (Grid) Farming	ac	15	FR	100
606	SUBSURFACE DRAIN	Subsurface Drain - 4" Tile	ft	1.25	AC	50
606	SUBSURFACE DRAIN	Subsurface Drain - 6" Tile	ft	1.75	AC	50
606	SUBSURFACE DRAIN	Subsurface Drain - 8" Tile	ft	2.5	AC	50
606	SUBSURFACE DRAIN	Subsurface Drain - 10" Tile	ft	4	AC	50
606	SUBSURFACE DRAIN	Subsurface Drain - 12" Tile or Greater	ft	6	AC	50
606	SUBSURFACE DRAIN	Subsurface Drain - 4" PVC	ft	3.6	AC	50
606	SUBSURFACE DRAIN	Subsurface Drain - 6" PVC	ft	4.8	AC	50
606	SUBSURFACE DRAIN	Subsurface Drain - 8" PVC	ft	9	AC	50
606	SUBSURFACE DRAIN	Subsurface Drain - 10" PVC	ft	12.4	AC	50
606	SUBSURFACE DRAIN	Subsurface Drain - 12" PVC or Greater	ft	19	AC	50
612	TREE/SHRUB ESTABLISHMENT	Establish Conifer Trees	ac	500	AC	50
612	TREE/SHRUB ESTABLISHMENT	Establish Hardwood Trees	ac	650	AC	50
612	TREE/SHRUB ESTABLISHMENT	Establish Trees - (free trees)	ac	275	AC	50
612	TREE/SHRUB ESTABLISHMENT	Establish - Direct Seeding Establishment Method	ac	660	AC	50
612	TREE/SHRUB ESTABLISHMENT	Establish Trees with Weed Control - Between Row Cover	ac	20	AC	50
612	TREE/SHRUB ESTABLISHMENT	Establish Trees with Weed Control - Chemical / Mechanical Treatment	ac	700	AC	50
612	TREE/SHRUB ESTABLISHMENT	Shrub Planting Only	ft	0.3	AC	50
614	WATERING FACILITY	Watering Facility - Frost Free Hydrant	no	100	AC	50
614	WATERING FACILITY	Watering Facility - Automatic Waterer	no	600	AC	50
614	WATERING FACILITY	Watering Facility - Tank / Trough	no	800	AC	50
614	WATERING FACILITY	Watering Facility - Concrete Frost Free Tank	no	850	AC	50
614	WATERING FACILITY	Watering Facility - Portable Plastic Tank	no	225	AC	50
614	WATERING FACILITY	Watering Facility - Storage Tank	no	1600	AC	50
620	UNDERGROUND OUTLET	Underground Outlet - Less than 8" tile	ft	2	AC	50
620	UNDERGROUND OUTLET	Underground Outlet - 8" tile or greater	ft	3.75	AC	50
620	UNDERGROUND OUTLET	Underground Outlet - Blind Inlet	no	700	AC	50

620	UNDERGROUND OUTLET	Underground Outlet - Catch Basin	no	450	AC	50
620	UNDERGROUND OUTLET	Underground Outlet - Riser Inlet	no	210	AC	50
633	WASTE UTILIZATION	Waste Utilization - Less than 1.9 mile hauling	ac	5	FR	100
633	WASTE UTILIZATION	Waste Utilization - 2.0 to 4.9 mile hauling	ac	7.5	FR	100
633	WASTE UTILIZATION	Waste Utilization - 5.0 plus miles hauling	ac	10	FR	100
638	WATER AND SEDIMENT CONTROL BASIN	WASCOB - Farmed Slopes	no	3700	AC	50
638	WATER AND SEDIMENT CONTROL BASIN	WASCOB - Grassed Slopes	no	3100	AC	50
642	WATER WELL	Water Well - Livestock Water w/casing (includes pump and installation)	ft	26	AC	50
643	RESTORATION AND MANAGEMENT OF RARE OR DECLINING HABITATS	Control of Herbaceous Invasives	ac	500	FR	100
643	RESTORATION AND MANAGEMENT OF RARE OR DECLINING HABITATS	Control of Woody Invasives	ac	225	FR	100
643	RESTORATION AND MANAGEMENT OF RARE OR DECLINING HABITATS	Establish Native Plant Community	ac	1000	FR	100
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Forest Openings for Wildlife	ac	150	FR	100
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Light Disking to Renovate Habitat	ac	20	FR	100
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Mowing	ac	10	FR	100
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Prescribed Burning of Warm Season Grasses	ac	30	FR	100
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Spraying	ac	50	FR	100
648	WILDLIFE WATERING FACILITY	Wildlife Water Facility	no	250	FR	100
650	WINDBREAK/SHELTERBELT RENOVATION	Farmstead Windbreak Renovation	ac	44	AC	50
650	WINDBREAK/SHELTERBELT RENOVATION	Field Windbreak Renovation	ac	63	AC	50
657	WETLAND RESTORATION	Chain Link Fence along Dike for Rodent Control	sq ft	0.75	AC	50
657	WETLAND RESTORATION	Excavation	cu yd	2.75	AC	50
657	WETLAND RESTORATION	Tile Blocking	no	50	AC	50
657	WETLAND RESTORATION	Tile Search (Trenching)	ft	1	AC	50
657	WETLAND RESTORATION	Vernal Pool	no	2000	AC	50
658	WETLAND CREATION	Chain Link Fence along Dike for Rodent Control	sq ft	0.75	AC	50
658	WETLAND CREATION	Excavation	cu yd	2.75	AC	50
658	WETLAND CREATION	Tile Blocking	no	50	AC	50

658	WETLAND CREATION	Tile Search (Trenching)	ft	1	AC	50
658	WETLAND CREATION	Vernal Pool	no	2000	AC	50
659	WETLAND ENHANCEMENT	Chain Link Fence along Dike for Rodent Control	sq ft	0.75	AC	50
659	WETLAND ENHANCEMENT	Excavation	cu yd	2.75	AC	50
659	WETLAND ENHANCEMENT	Tile Blocking	no	50	AC	50
659	WETLAND ENHANCEMENT	Tile Search (Trenching)	ft	1	AC	50
659	WETLAND ENHANCEMENT	Vernal Pool	no	2000	AC	50
660	TREE/SHRUB PRUNING	Woodland Pruning	ac	110	AC	50
666	FOREST STAND IMPROVEMENT	Woodland Improvement TSI - Crop Tree Release	ac	90	FR	100
666	FOREST STAND IMPROVEMENT	Woodland Improvement TSI - Grape Vine Control	ac	70	FR	100
666	FOREST STAND IMPROVEMENT	Woodland Improvement TSI - Thinning	ac	140	FR	100
702	AGRICHEMICAL MIXING FACILITY	Containment - Largest Tank <7500 gal	no	6000	AC	50
702	AGRICHEMICAL MIXING FACILITY	Containment - Largest Tank 7500-14999 gal	no	9000	AC	50
702	AGRICHEMICAL MIXING FACILITY	Containment - Largest Tank >15000 gal	no	13000	AC	50
702	AGRICHEMICAL MIXING FACILITY	Roof only for Loading / Mixing Area	sq ft	6.75	AC	50
702	AGRICHEMICAL MIXING FACILITY	Concrete Pad for Loading / Mixing Area	sq ft	3.5	AC	50
910	TA PLANNING	TA Planning	no	0	AM	100
911	TA DESIGN	TA Design	no	0	AM	100
912	TA APPLICATION	TA Application	no	0	AM	100
913	TA CHECK-OUT	TA Check-out	no	0	AM	100

Appendix D

2008 Statewide Ohio EQIP Average Costs

2008 Statewide Ohio EQIP Average Costs

Practice Code	Practice Name	Component	Unit Type	Unit Cost	Share Rate
100	COMPREHENSIVE NUTRIENT MANAGEMENT PLAN	CNMP less than 100 AUs	no	500	100
100	COMPREHENSIVE NUTRIENT MANAGEMENT PLAN	CNMP 100-249 AUs	no	1000	100
100	COMPREHENSIVE NUTRIENT MANAGEMENT PLAN	CNMP 250 AUs or greater	no	1500	100
313	WASTE STORAGE FACILITY	Concrete Pad for Earthen Holding Pond - Sand Laden Manure Only	sq ft	2.41	100
313	WASTE STORAGE FACILITY	Manure Storage Plank or Concrete Walls with Roof	cu ft	2.43	100
313	WASTE STORAGE FACILITY	Manure Storage Plank or Concrete Walls without Roof	cu ft	1.33	100
313	WASTE STORAGE FACILITY	Manure Storage Tank	cu ft	1.77	100
313	WASTE STORAGE FACILITY	Storage - Structural Roof only	sq ft	5.25	100
313	WASTE STORAGE FACILITY	Waste Storage Facility - Earthen Pond	cu ft	0.09	100
313	WASTE STORAGE FACILITY	Waste Storage Facility - Concrete Pad	sq ft	2.64	100
314	BRUSH MANAGEMENT	Biological, Brush Control	ac	25	100
314	BRUSH MANAGEMENT	Mowing, Brush Control	ac	13.35	100
314	BRUSH MANAGEMENT	Mowing - Spraying, Brush Control	ac	158.68	100
314	BRUSH MANAGEMENT	Clearing - Mowing - Spraying, Brush Control	ac	192.10	100
317	COMPOSTING FACILITY	Bins, Concrete or Plank Walls, Concrete Floor with Roof	cu ft	2.17	100
317	COMPOSTING FACILITY	Bins, Concrete or Plank Walls, Concrete Floor without Roof	cu ft	1.64	100
317	COMPOSTING FACILITY	No Bins, Concrete Floor with Roof	sq ft	7.25	100
317	COMPOSTING FACILITY	Gravel Pad	sq ft	1.20	100
317	COMPOSTING FACILITY	Concrete Pad	sq ft	2.64	100
327	CONSERVATION COVER	Warm Season Grass/Forb w/Herbicide	ac	125.11	100
327	CONSERVATION COVER	Warm Season Grass/Forb w/Fertilizer, No Herbicide	ac	179.45	100
327	CONSERVATION COVER	Warm Season Grass/Forb w/Fertilizer and Herbicide	ac	196.73	100
327	CONSERVATION COVER	Cool Season Grass/Legume	ac	127.99	100
328	CONSERVATION CROP ROTATION	Conservation Crop Rotation	ac	7	100
329	RESIDUE MANAGEMENT, NO-TILL/STRIP TILL	Residue Management, No-Till/Strip Till	ac	10	100
330	CONTOUR FARMING	Establish Contouring	ac	12	100
332	CONTOUR BUFFER STRIPS	Establish Contour Buffer Strips	ac	12	100
338	PRESCRIBED BURNING	Prescribed Burning of WSGs	ac	50	100
340	COVER CROP	Cover Crop - Aerial Seeded Grass	ac	23.21	100
340	COVER CROP	Cover Crop - Cool Season Grasses/Legumes	ac	28.87	100
340	COVER CROP	Cover Crop - Cool Season Grasses	ac	21.36	100
342	CRITICAL AREA PLANTING	Critical Area Seeding - w/Earthmoving	ac	672.26	100

342	CRITICAL AREA PLANTING	Critical Area Seeding - w/o Earthmoving	ac	519.52	100
344	RESIDUE MANAGEMENT, SEASONAL	Residue Management, Seasonal	ac	5	100
345	RESIDUE MANAGEMENT, MULCH TILL	Residue Management, Mulch Till	ac	8	100
346	RESIDUE MANAGEMENT, RIDGE TILL	Residue Management, Ridge Till	ac	10	100
350	SEDIMENT BASIN	Sediment Basin	no	3269.76	100
356	DIKE	Dike with Rodent Protection	cu yd	2.94	100
356	DIKE	Dike	cu yd	2.24	100
359	WASTE TREATMENT LAGOON	Waste Treatment Lagoon System	cu ft	0.07	100
362	DIVERSION	Diversion	ft	2.82	100
367	WASTE FACILITY COVER	Earthen Pond Synthetic Liner or Cover	sq ft	0.49	100
378	POND	Pond for Livestock Water	ac	22708.63	100
380	WINDBREAK/SHELTERBELT ESTABLISHMENT	Field Windbreak / HQ / Feedlot - Seedlings	ft	.20	100
380	WINDBREAK/SHELTERBELT ESTABLISHMENT	Field Windbreak / HQ / Feedlot - Large Stock	ft	.86	100
382	FENCE	Fence - Barbed Wire	ft	1.15	100
382	FENCE	Fence - Feedlot Fence	ft	5.92	100
382	FENCE	Fence - Electric - 4 strand or less	ft	1.11	100
382	FENCE	Fence - Electric - 5 strand or more	ft	1.42	100
382	FENCE	Fence - Electric - 6 strand High Tensile	ft	1.74	100
382	FENCE	Fence - Woven Wire	ft	2.00	100
386	FIELD BORDER	Cool Season Grasses / Legumes	ac	127.99	100
386	FIELD BORDER	WSG/Forbs w/Herbicide, No Fertilizer	ac	125.11	100
386	FIELD BORDER	WSG/Forbs w/Fertilizer, No Herbicide	ac	179.45	100
386	FIELD BORDER	WSG/Forbs w/Herbicide and Fertilizer	ac	196.73	100
391	RIPARIAN FOREST BUFFER	Establish Conifer Trees/Shrubs	ac	345.55	100
391	RIPARIAN FOREST BUFFER	Establish Hardwood Trees/Shrubs	ac	419.94	100
391	RIPARIAN FOREST BUFFER	Establish Trees - (free trees)	ac	196.76	100
391	RIPARIAN FOREST BUFFER	Establish - Direct Seeding Establishment Method	ac	182.47	100
391	RIPARIAN FOREST BUFFER	Establish Hardwood Trees/Shrubs with Weed Control	ac	454.51	100
391	RIPARIAN FOREST BUFFER	Establish Conifer Trees/Shrubs with Weed Control	ac	380.12	100
393	FILTER STRIP	Cool Season Grasses / Legumes w/Lime, Fertilizer, and Herbicide	ac	153.99	100
393	FILTER STRIP	WSG w/Herbicide, No Fertilizer	ac	170.93	100
393	FILTER STRIP	WSG w/Fertilizer, No Herbicide	ac	223.23	100
393	FILTER STRIP	WSG w/Fertilizer and Herbicide	ac	239.69	100
394	FIREBREAK	Bare Firebreak	ac	15.09	100
394	FIREBREAK	Sod Firebreak	ac	134.49	100

410	GRADE STABILIZATION STRUCTURE	Grade Stab - Straight Pipe or Pipe Drop < 18"	no	1268.2	100
410	GRADE STABILIZATION STRUCTURE	Grade Stab - Straight Pipe or Pipe Drop 18" or greater	no	1938.9	100
410	GRADE STABILIZATION STRUCTURE	Grade Stab - Concrete/Aluminum/Plank Drop Structure	no	3910.59	100
410	GRADE STABILIZATION STRUCTURE	Grade Stab - Riprap Chute	sq ft	2.83	100
410	GRADE STABILIZATION STRUCTURE	Stone Centered Outlet for Grassed Waterway	sq ft	2.28	100
412	GRASSED WATERWAY	Grass WW	ac	3505.79	100
412	GRASSED WATERWAY	Grass WW with Mulch Netting or Surface Inlets or Rock/Fabric Checks	ac	4062.15	100
412	GRASSED WATERWAY	Grass WW with Erosion Control Blanket	ac	5500.53	100
412	GRASSED WATERWAY	Grass WW with Surface Inlets and Mulch Netting or Rock/Fabric Checks	ac	4736.94	100
412	GRASSED WATERWAY	Grass WW with Surface Inlets and Erosion Control Blanket	ac	6174.87	100
422	HEDGEROW PLANTING	Hedgerow Planting	ft	.20	100
468	LINED WATERWAY OR OUTLET	Rock Lined WW or Outlet	sq ft	2.21	100
472	USE EXCLUSION	Exclusion	ft	.41	100
490	TREE/SHRUB SITE PREPARATION	Woodland Site Preparation	ac	120	100
512	PASTURE AND HAY PLANTING	Cool Season Grasses / Legumes	ac	127.56	100
512	PASTURE AND HAY PLANTING	WSG-Legume No Herbicide	ac	216.64	100
512	PASTURE AND HAY PLANTING	WSG-Legume with Herbicide	ac	233.93	100
516	PIPELINE	Pipeline - Boring	ft	11.56	100
516	PIPELINE	Pipeline - 1.25" pipeline or less	ft	1.44	100
516	PIPELINE	Pipeline - 1.5" pipeline or greater	ft	1.85	100
516	PIPELINE	Pipeline - Pond Intake/Siphon System to Toe	no	414.68	100
521A	POND SEALING OR LINER	Flexible Membrane Lining	sq ft	1.15	100
521D	POND SEALING OR LINER	Compacted Earth Liner	sq ft	0.25	100
528	PRESCRIBED GRAZING	Prescribed Grazing Management - Moderate (meet standard)	ac	15	100
528	PRESCRIBED GRAZING	Prescribed Grazing Management - Intensive (meet standard plus 3 days or less grazing period OR extend grazing season for 60 days or more)	ac	25	100
528	PRESCRIBED GRAZING	Grazing Management Plan - Less than 50 AUs	no	250	100
528	PRESCRIBED GRAZING	Grazing Management Plan - 50-100 AUs	no	500	100
528	PRESCRIBED GRAZING	Grazing Management Plan - More than 100 AUs	no	750	100
533	PUMPING PLANT	Pumping Plant - Drainage - 1000 gpm or less	no	4233.55	100
533	PUMPING PLANT	Pumping Plant - Drainage - >1000 gpm	no	8483.62	100
533	PUMPING PLANT	Pumping Plant - Ram Pump	no	613.23	100
533	PUMPING PLANT	Pumping Plant - Solar Pump	no	2193.77	100
533	PUMPING PLANT	Pumping Plant - Electric Pump	no	726.11	100
554	DRAINAGE WATER MANAGEMENT	Operation of Structure	no	100	100

558	ROOF RUNOFF STRUCTURE	Roof Runoff Mgt - Gutters and Spouting	ft	3.69	100
558	ROOF RUNOFF STRUCTURE	Roof Runoff Mgt - Trench Gutter	ft	7.20	100
560	ACCESS ROAD	Access Road - Gravel Surface	sq ft	1.02	100
560	ACCESS ROAD	Access Road - Gravel with Culvert for Drainage	sq ft	1.07	100
560	ACCESS ROAD	Access Road - Gravel with Large Culvert Crossing	sq ft	1.12	100
561	HEAVY USE AREA PROTECTION	HUA - Surface Treatment - Concrete	sq ft	2.29	100
561	HEAVY USE AREA PROTECTION	HUA - Surface Treatment - Gravel	sq ft	1.05	100
574	SPRING DEVELOPMENT	Spring Development	no	1740.47	100
578	STREAM CROSSING	Stream Crossing - Livestock Stream Crossing	sq ft	2.45	100
580	STREAMBANK AND SHORELINE PROTECTION	Streambank Stabilization - w/ bioengineering	sq ft	2.26	100
580	STREAMBANK AND SHORELINE PROTECTION	Streambank Stabilization - Riprap	sq ft	2.29	100
580	STREAMBANK AND SHORELINE PROTECTION	Streambank Stabilization - Grading and Seeding	ac	8215.48	100
585	STRIPCROPPING	Stripcropping - Contour	ac	15	100
585	STRIPCROPPING	Stripcropping - Field	ac	10	100
587	STRUCTURE FOR WATER CONTROL	Perm Structure - 8" tile or less w/ storage	no	1192.5	100
587	STRUCTURE FOR WATER CONTROL	Perm Structure - 8" tile or less w/o storage	no	766.91	100
587	STRUCTURE FOR WATER CONTROL	Perm Structure - 10" tile or greater w/ storage	no	1385.47	100
587	STRUCTURE FOR WATER CONTROL	Perm Structure - 10" tile or greater w/o storage	no	985.34	100
587	STRUCTURE FOR WATER CONTROL	Slide Gate Valve w/ storage - All sizes	no	964.05	100
587	STRUCTURE FOR WATER CONTROL	Slide Gate Valve w/o storage - All sizes	no	582.78	100
587	STRUCTURE FOR WATER CONTROL	Straight Pipe or Pipe Drop	no	477.62	100
590	NUTRIENT MANAGEMENT	Nutrient Management	ac	5	100
590	NUTRIENT MANAGEMENT	Nutrient Mgt w/ Precision (Grid) Farming	ac	10	100
595	PEST MANAGEMENT	Pest Management - Medium Mgt.	ac	12	100
595	PEST MANAGEMENT	Pest Management - High Mgt.	ac	15	100
595	PEST MANAGEMENT	Pest Management - Slug Control	ac	20	100
595	PEST MANAGEMENT	Control of Herbaceous Invasives	ac	73.88	100
595	PEST MANAGEMENT	Control of Woody Invasives	ac	192.10	100
606	SUBSURFACE DRAIN	Subsurface Drain - 4" Tile	ft	.83	100
606	SUBSURFACE DRAIN	Subsurface Drain - 6" Tile	ft	1.15	100
606	SUBSURFACE DRAIN	Subsurface Drain - 8" or 10" Tile	ft	1.72	100
606	SUBSURFACE DRAIN	Subsurface Drain - 12" Tile or Greater	ft	3.92	100
606	SUBSURFACE DRAIN	Subsurface Drain - 4" or 6" PVC	ft	3.06	100
606	SUBSURFACE DRAIN	Subsurface Drain - 8" PVC or Greater	ft	7.12	100
612	TREE/SHRUB ESTABLISHMENT	Establish Conifer Trees/Shrubs	ac	345.55	100

612	TREE/SHRUB ESTABLISHMENT	Establish Hardwood Trees/Shrubs	ac	419.94	100
612	TREE/SHRUB ESTABLISHMENT	Establish Trees - (free trees)	ac	196.76	100
612	TREE/SHRUB ESTABLISHMENT	Establish - Direct Seeding Establishment Method	ac	182.47	100
612	TREE/SHRUB ESTABLISHMENT	Establish Hardwood Trees/Shrubs with Weed Control	ac	454.51	100
612	TREE/SHRUB ESTABLISHMENT	Establish Conifer Trees/Shrubs with Weed Control	ac	380.12	100
614	WATERING FACILITY	Watering Facility - Frost Free Hydrant	no	76.53	100
614	WATERING FACILITY	Watering Facility - Automatic Waterer	no	936.60	100
614	WATERING FACILITY	Watering Facility - Tank / Trough	no	865.60	100
614	WATERING FACILITY	Watering Facility - Concrete Frost Free Tank	no	1203.02	100
614	WATERING FACILITY	Watering Facility - Portable Plastic Tank	no	185.51	100
614	WATERING FACILITY	Watering Facility - Storage Tank	no	2209.80	100
620	UNDERGROUND OUTLET	Underground Outlet - Less than 8" tile	ft	1.31	100
620	UNDERGROUND OUTLET	Underground Outlet - 8" tile or greater	ft	2.28	100
620	UNDERGROUND OUTLET	Underground Outlet - Blind Inlet	no	546.51	100
620	UNDERGROUND OUTLET	Underground Outlet - Catch Basin	no	308.71	100
620	UNDERGROUND OUTLET	Underground Outlet - Riser Inlet	no	208.11	100
632	SOLID/LIQUID WASTE SEPARATION FACILITY	Treatment - Manure/Runoff Concrete Settling Basin	sq ft	7.69	100
633	WASTE UTILIZATION	Waste Utilization - Less than 1.9 mile hauling	ac	7.50	100
633	WASTE UTILIZATION	Waste Utilization - 2.0 to 4.9 mile hauling	ac	10.00	100
633	WASTE UTILIZATION	Waste Utilization - 5.0 plus miles hauling	ac	15.00	100
634	MANURE TRANSFER	Transfer - Scrape Alley - Concrete Wall/Curb 2' or less with alley	sq ft	3.53	100
634	MANURE TRANSFER	Reception Pit - Concrete Tank - Less than 10,000 gallons	cu ft	4.89	100
634	MANURE TRANSFER	Transfer - Underground Pipe - 12" or greater	ft	15.66	100
634	MANURE TRANSFER	Transfer - Underground Pipe - Less than 12"	ft	5.98	100
634	MANURE TRANSFER	Transfer - Pump - Large (Manure Pump)	no	3189.54	100
634	MANURE TRANSFER	Transfer - Pump - Small (Milkhouse / Runoff Water)	no	480.88	100
635	WASTEWATER TREATMENT STRIP	Treatment - Manure/Runoff Filter Strip / Infiltration Area	sq ft	.23	100
638	WATER AND SEDIMENT CONTROL BASIN	WASCOB - Farmed Slopes	no	2347.15	100
638	WATER AND SEDIMENT CONTROL BASIN	WASCOB - Grassed Slopes	no	2038.21	100
642	WATER WELL	Water Well - Livestock Water w/casing (includes pump and installation)	no	2868.75	100
643	RESTORATION AND MANAGEMENT OF RARE OR DECLINING HABITATS	Tall Grass Prairie	ac	199.98	100
643	RESTORATION AND MANAGEMENT OF RARE OR DECLINING HABITATS	Oak Savanna	ac	739.98	100

643	RESTORATION AND MANAGEMENT OF RARE OR DECLINING HABITATS	Establish Rare Plant Community	ac	500.00	100
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Forest Openings with Edge Feathering for Wildlife	ac	150.00	100
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Forest Openings with Edge Feathering and Additional Control for Wildlife	ac	180.65	100
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Light Disking to Renovate Habitat	ac	16.95	100
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Mowing	ac	13.35	100
647	EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT	Spraying	ac	25.33	100
648	WILDLIFE WATERING FACILITY	Wildlife Water Facility	cu yd	2.16	100
650	WINDBREAK/SHELTERBELT RENOVATION	Field Windbreak Renovation	ac	40.63	100
656	CONSTRUCTED WETLAND	Constructed Wetland - Treatment Animal Waste	sq ft	.46	100
657	WETLAND RESTORATION	Vernal Pool Restoration	no	1300	100
657	WETLAND RESTORATION	Macrotopography Restoration	cu ft	1.88	100
657	WETLAND RESTORATION	Tiled Cropland Restoration	ac	92	100
657	WETLAND RESTORATION	Depressional Wetland Restoration	ac	168.22	100
658	WETLAND CREATION	Vernal Pool Creation	no	1300	100
658	WETLAND CREATION	Macrotopography Creation	cu ft	1.88	100
658	WETLAND CREATION	Tiled Cropland Wetland Creation	ac	92	100
658	WETLAND CREATION	Depressional Wetland Creation	ac	168.22	100
659	WETLAND ENHANCEMENT	Vernal Pool Enhancement	no	1300	100
659	WETLAND ENHANCEMENT	Macrotopography Enhancement	cu ft	1.88	100
659	WETLAND ENHANCEMENT	Tiled Cropland Wetland Enhancement	ac	92	100
659	WETLAND ENHANCEMENT	Depressional Wetland Enhancement	ac	168.22	100
660	TREE/SHRUB PRUNING	Woodland Pruning	ac	110	100
666	FOREST STAND IMPROVEMENT	Woodland Improvement TSI - Crop Tree Release	ac	90	100
666	FOREST STAND IMPROVEMENT	Woodland Improvement TSI - Grape Vine Control	ac	70	100
666	FOREST STAND IMPROVEMENT	Woodland Improvement TSI - Thinning	ac	140	100
702	AGRICHEMICAL HANDLING FACILITY	Containment - Largest Tank <7500 gal	no	3883.51	100
702	AGRICHEMICAL HANDLING FACILITY	Containment - Largest Tank 7500-14999 gal	no	5828.82	100
702	AGRICHEMICAL HANDLING FACILITY	Containment - Largest Tank >15000 gal	no	8285.24	100

702	AGRICHEMICAL HANDLING FACILITY	Roof only for Loading / Mixing Area	sq ft	4.23	100
702	AGRICHEMICAL HANDLING FACILITY	Concrete Pad for Loading / Mixing Area	sq ft	2.89	100
910	TA PLANNING	TA Planning	no	0	100
911	TA DESIGN	TA Design	no	0	100
912	TA APPLICATION	TA Application	no	0	100
913	TA CHECK-OUT	TA Check-out	no	0	100

Appendix E

Cost Computations for GMR WQCT Proposals

Cost Computations for GMR WQCT Proposals

In order to protect the privacy of the participants in the GMR WQCT program the costs are summarized in the tables below by providing the BMP category, participating acres, an average of the contract length, total payments made in the category and the annual payments per acre. The annual payments given are an average of the average payments made to the producers on a per acre basis and do not equal the total payment divided by the total acres which in general is less than the average of the averages. The difference occurs due to varying costs, acreages enrolled and contract lengths.

High Residue Management

BMP	Acres	Contract Length	Total Payment	Annual Payments Per Acre
Conservation tillage	818.5	5	$23,335.00	$5.70
No-Till	1435.7	5	$25,928.03	$3.61
Residue management, no-till corn after soybeans	402.3	5	$17,195.00	$8.55
			Average	$6.66

Pasture Seeding and Prescribed Grazing

BMP	Acres Established	Average Length of practice per Acre (Years under Contract)	Payment to Producer	Grazing Management ($15 per year)	Pasture Establishment
Pasture seeding and prescribed grazing	22	11.63636364	$4,803.70	$ 8.18	$92.10

BMP	Acres Established	Average Length of practice per Acre (Years under Contract)	Payment to Producer	Annual Payments Per Acre
Sod establishment	85	10	$14,325.00	$160.39

BMP	Acres Established	Average Length of practice per Acre (Years under Contract)	Payment to Producer	Annual Payments Per Acre
Conversion of row crops to alfalfa, grass seeding	93	5	$3,440.00	$31.85

BMP	Acres Established	Average Length of practice per Acre (Years under Contract)	Payment to Producer	Annual Payments Per Acre
Hayland/Hayfield Establishment	76.05	7.912557528	$15,186.77	$210.27

BMP	Acres Established	Average Length of practice per Acre (Years under Contract)	Payment to Producer	Per Acre
Grassed waterway, 60 feet wide	3.48	8.017241379	$ 11,899.06	$ 3,671.62

One acre of a sixty foot wide grassed waterway is 726 feet.

Appendix 3
Draft Operations Manual

Miami Conservancy District

Operations Manual

Great Miami River Watershed
Water Quality Credit Trading Program

Operations Manual
Great Miami River Watershed
Water Quality Credit Trading Program

Second Edition

Produced by the
Water Conservation Subdistrict of the Miami Conservancy District

January 2009

This manual is designed to be printed to double-sided paper. Please consider the environment before printing.

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http://www.miamiconservancy.org/water/quality_credit.asp

Contents

I. Statement of Purpose

The purpose of the Great Miami River Watershed Water Quality Credit Trading Program is to promote timely and cost-effective reductions in nutrient discharges to surface waters within the Great Miami River Watershed.

Throughout the U.S, tremendous improvements in surface water quality have been made over the last three decades. This progress has primarily been the result of reducing pollution that originates from industry and wastewater treatment plants. Despite these gains, about half of the nation's rivers, streams, and lakes still fail to meet water quality standards. Market-based strategies can help meet the remaining water quality challenges.

Because the land use is dominated by agriculture, many of the rivers and streams in the Great Miami River Watershed are impaired by nutrients, such as nitrogen and phosphorus, which run off of the land. By implementing agricultural best management practices (BMPs), nutrient discharges can be reduced. The Great Miami River Watershed Water Quality Credit Trading Program (Trading Program) is designed to be a market-based strategy to reduce the discharge of nutrients, specifically total phosphorus (TP) and total nitrogen (TN), to rivers and streams.

The Miami Conservancy District (MCD) is a conservancy district, a political subdivision of the State of Ohio, and works as a regional government agency throughout the 15-county Great Miami River Watershed. Formed in 1915, MCD provides flood protection, water resource monitoring and information, and recreational opportunities. MCD's Water Conservation Subdistrict responded to requests from community members to provide a flexible and cost-effective option to improve surface water quality and address regulatory requirements. The Water Conservation Subdistrict used an inclusive process to involve all relevant stakeholders and design a program that would respond these requests. The Great Miami River Watershed Water Quality Credit Trading Program (Trading Program) is the result of this process.

The Trading Program provides a framework where wastewater treatment plants provide funds to soil and water conservation districts that contract with agricultural producers to implement and maintain activities that reduce nutrient runoff. These activities are best management practices (BMPs) that can reduce more nutrients than a wastewater treatment plant could accomplish at their direct discharge location. BMPs also produce more environmental benefits, such as improving the river corridor, than just reducing nutrients that flow from a pipe. The wastewater treatment plants will then

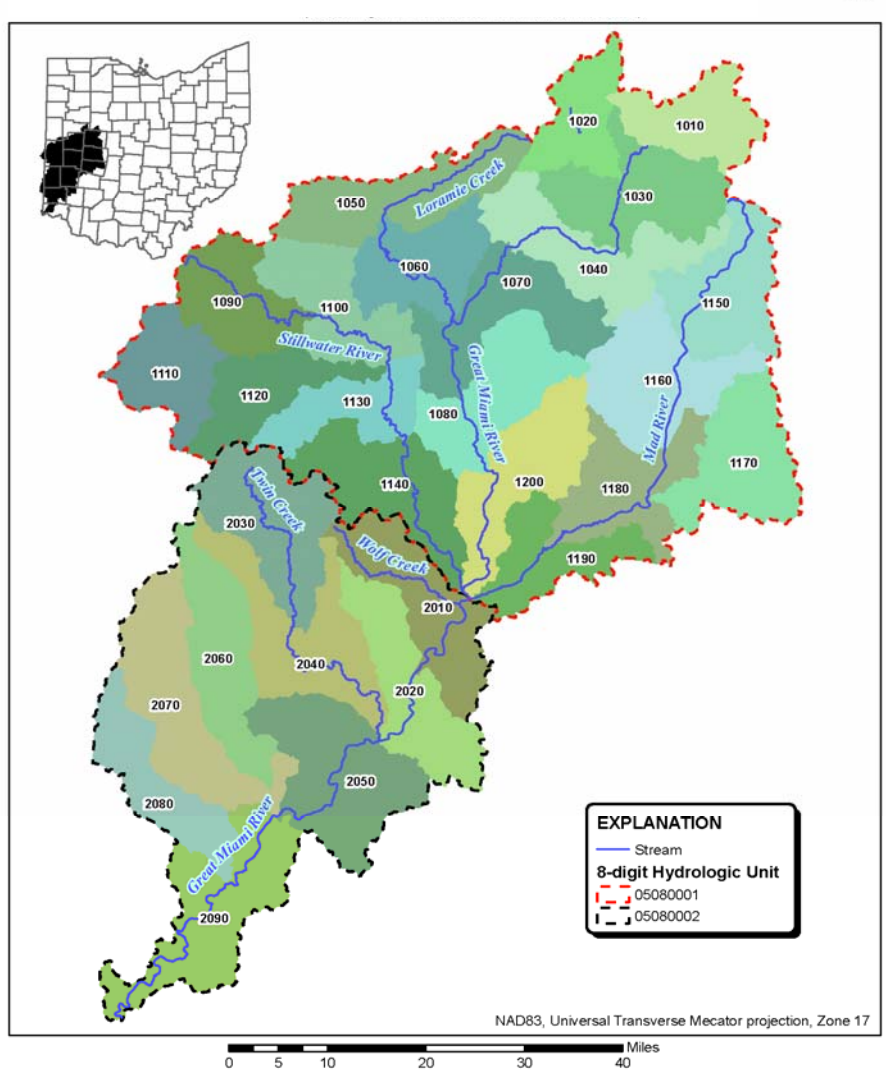
A. Background on Ohio's Great Miami River Watershed

Although the Great Miami River Watershed drains portions of both southwestern Ohio and southeastern Indiana, the Trading Program operates within just the Ohio boundaries. The watershed drains nearly 4,000 square miles on portions of 15 counties within Ohio.

Great Miami River and tributaries

The Great Miami River originates just above Indian Lake in Logan County, Ohio and flows for 170.3 miles to the Ohio River west of Cincinnati in Hamilton County, Ohio. Principal tributaries to the Great Miami River include the Stillwater River (67.2 miles in length) and the Mad River (60.2 miles in length). Downtown Dayton, Ohio marks the confluence of the Mad and Stillwater Rivers with the Great Miami River. In addition to the larger rivers, there are approximately 6,300 miles of perennial rivers and streams within the watershed. Therefore, there is about 21 miles of smaller streams for every one mile of large river. The watershed is divided into 29 11-digit hydrologic unit codes. A hydrologic unit code is a geographic area representing part of all of a watershed, a combination of watersheds, or a distinct hydrologic feature (see map 1).

Map 1 - Great Miami River Watershed
11-Digit Hydrologic Unit Codes



Demographics

In the Great Miami River Watershed, the population exceeds more than 1.5 million people with 75% of the population residing in the urban areas. These urban areas include Bellefontaine, Brookville, Carlisle, Dayton, Eaton, Englewood, Fairfield, Franklin, Germantown, Greenville, Hamilton, Huber Heights, Miamisburg, Middletown, Monroe, Moraine, New Carlisle, Oxford, Piqua, Riverside, Sidney, Springboro, Springfield, Tipp City, Trenton, Trotwood, Troy, Urbana, Vandalia, and West Carrollton.

Approximately 70 percent of the land use is agriculture, primarily row-crop production of corn, soybeans, and wheat (see map 2). Typical livestock include swine, cattle, and poultry. Low to high density development covers about 8 percent of the watershed while developed open spaces (large-lot single-family, golf courses etc.) cover about 9.5 percent. Forests, surface water, and wetlands cover between 12 and 13 percent of the watershed. Major industries produce automobile parts, chemicals, household goods, paper products, and processed foods and beverages.

Buried Valley Aquifer

The U.S. Environmental Protection Agency has designated much of the buried valley aquifer system that underlies the Great Miami River Watershed as a Sole Source Aquifer. The permeable sand and gravel deposits within the buried valley aquifer lead to the exchange of large quantities of water between ground and surface water. Many municipalities have located their well fields on top of the buried valley aquifer. Private wells and smaller public water systems also draw water from the aquifers. The connection between surface and ground water is so extensive that Ohio EPA has designated a portion of Dayton's drinking water wells, which serve more than 440,000 consumers, as producing "Ground Water Under the Influence of Surface Water."

Ohio's 303(d) List and Schedule

Each State is required by Section 303(d) of the Clean Water Act (33 U.S.C. 1313), to submit a prioritized list of impaired waters to U.S. EPA for approval (the "303(d) list"). The list indicates the waters of Ohio that are currently impaired and may require TMDL development in order to meet water quality standards.

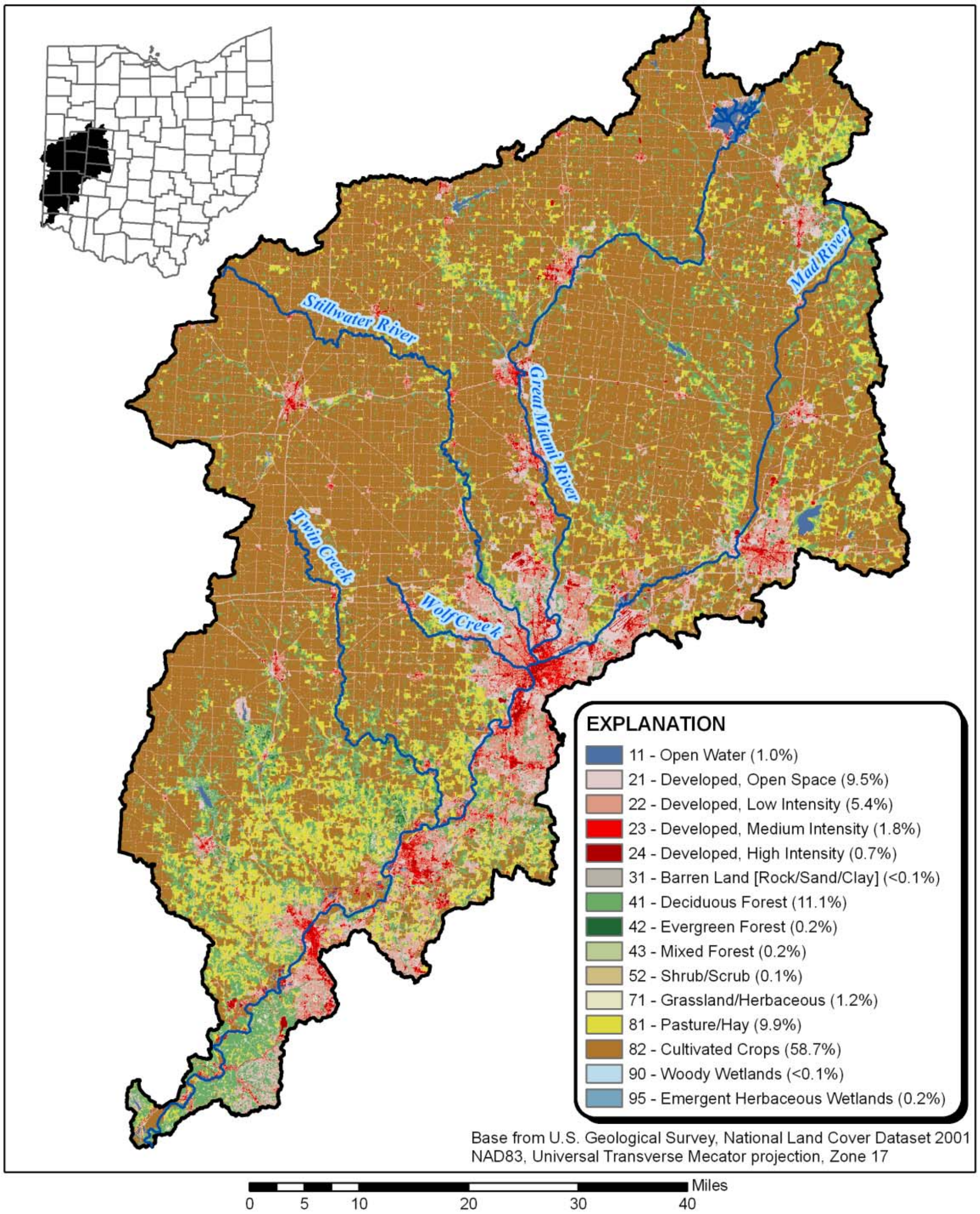
Ohio's 2008 TMDL priority list was approved by U.S. EPA on May 5, 2008. The list and schedule are contained in Section L4 of the 2008 Integrated Water Quality Monitoring and Assessment Report. The report describes the procedure that Ohio EPA used to develop the list and indicates which areas have been selected for TMDL development during FFY 2009 through 2010.

TMDL development began in the Stillwater Watershed in 2001 and was approved by the United States Environmental Protection Agency (U.S. EPA) in 2004. That study is under revision (as of January, 2009). The TMDL reports for the Mad River Watershed, Twin Creek Watershed, Indian Creek, and Fourmile Creek Watershed are under preparation (as of January, 2009).

According to the Biological and Water Quality Reports published by the Ohio EPA, nonpoint source pollution and habitat alterations cause or contribute to most of the impairment in the rivers and streams of the Great Miami River Watershed. These problems come from residential, commercial, industrial, and agricultural land uses. Nutrients can run off of farm fields, residential lawns, and golf courses. The removal of streamside vegetation may allow sediment, chemicals, pathogens, and nutrients to enter the stream. Storm water runoff from impervious surfaces and exposed soil on construction sites also contributes to water quality problems.

Rivers and streams within the Great Miami River Watershed are also the tributaries to the Ohio River, Mississippi River, and the Gulf of Mexico. A recent report on Gulf of Mexico hypoxia by the United States Geological Survey (USGS) identifies Ohio as one of nine states contributing more than 75 percent of the excess nutrients to the Gulf (http://water.usgs.gov/nawqa/sparrow/gulf_findings/).

Map 2 - Great Miami River Watershed Land Cover



B. Summary of Ohio EPA Water Quality Reports

i. Upper Great Miami River Subwatershed

According to previous studies, published in 1982 and 1994, very significant improvements in aquatic community performance and water quality were reported over that time period for the mainstem of the Upper Great Miami River. A report entitled Biological and Water Quality Study of the Upper Great Miami River and Selected Tributaries, December 6, 1996, (Ohio EPA Technical Report MAS/1995-12-13) attributes the improvements in water quality to wastewater treatment plant upgrades. Fish and macroinvertebrate communities met or exceeded exceptional warmwater habitat (EWH) aquatic life use designation throughout much of the mainstem study area.

The report cited improvements in the Indian Lake tributaries resulting from implementation of nonpoint source pollution abatement efforts. The report also cited ongoing impairment of the Loramie Creek due to habitat modifications, channelization, siltation, impoundment, and enrichment from agricultural and municipal sources. The upper portion of Loramie Creek was identified as particularly degraded. The report identified the Bokengehalas Creek subwatershed as considerably improved**.**

ii. Lower Great Miami River Subwatershed

According to the Ohio EPA report entitled Biological and Water Quality Study of the Middle to Lower Great Miami River and Selected Tributaries, 1995, (OEPA Technical Report MAS/1996-12-8) of the approximately 90 miles of the Great Miami River mainstem assessed, 55.3 percent were in full attainment, 40.3 percent were in partial attainment, and 4.4 percent were in non-attainment of the applicable biological criteria.

Pools and other habitat alteration associated with low dams were identified as a cause of the majority of partial and nonattainment in the Great Miami River between Dayton and Middletown. The nonattainment in the pools corresponded to increased deformities, erosions, lesions, and tumor anomalies in fish related to nutrient enrichment and marginal dissolved oxygen. Otherwise, that segment was cited as “improved markedly since 1980 and 1989” as a result of improved wastewater treatment. A combination of combined sewer overflows, contaminated sediment, and inadequately treated effluent were identified as causing partial and nonattainment in the Great Miami River between Middletown and the Ohio River.

TMDL Reports are under preparation for the Twin Creek, Fourmile Creek, and Indian Creek Watersheds.

iii. Stillwater River Subwatershed

According to a report entitled Biological and Water Quality Study of the Stillwater River Basin, 1999 (OEPA Technical Report Number MAS/2001-12-8, November 6, 2001) “Biological and water quality conditions vary widely in the Stillwater River basin from the best of the best to the worst of the worst measured within Ohio…”.

According to the report, the stream segments with the highest biological and water quality within the watershed benefit from wastewater treatment plant upgrades, intact riparian forest, and agricultural best management practices such as no-till, filter strips, and conservation easements. The report indicates that the poorest water quality within the subwatershed is in areas with habitat destruction from channelization, failed sewage systems, and organic enrichment from land-applied manure. Channelization combined with land applied manure was cited as being particularly problematic.

The Biological and Water Quality Study of the Stillwater River Basin, 1999, provided the technical basis for the Total Maximum Daily Loads for the Stillwater River Basin final report (April 2004), approved by U.S. EPA on June 15, 2004. This report offers possible solutions to water quality challenges in the Stillwater such as increasing the width and amount of stream buffers, stream habitat restoration, nutrient management planning, septic system improvements, education and cost-sharing for conservation and nutrient management.

iv. Mad River Subwatershed

The Mad River Subwatershed of the Great Miami River Watershed was assessed in 1994 and 2003. The results of the 2003 assessment were published in a 2005 report entitled Biological and Water Quality Study of the Mad River and Selected Tributaries, 2003 (OEPA Technical Report EAS/2005-5-5). The report concludes that nearly 80 percent of sites assessed met or exceeded aquatic life standards.

The macroinvertebrate and fish communities were relatively stable or showed slight improvement between the 1994 and 2003 studies. The report identified significant impairment relative to recreational use standards as a result of elevated bacteria. The report attributes the elevated bacteria to high precipitation levels during 2003 and identified the primary sources as agriculture, combined sewer overflows, and urban runoff.

The TMDL Report is under preparation.

C. Trading Program Water Quality Monitoring

The Trading Program began in-stream water quality monitoring in 2006. Automated samplers are used to collect water samples for nutrient analyses at four locations (see map 3). These locations collect data in order to gain a better understanding of the nutrient concentrations in the rivers and streams of each contributing major subwatershed.

The samplers are programmed to collect samples every eight hours which produces 21 samples per week. Not all 21 samples are submitted for laboratory analysis. Samples are selected based discharge, turbidity, and precipitation measurements.

Map 3 – Automated Sampler Locations

The surface water samples are analyzed for ammonia, nitrite, nitrate, total Kjeldahl nitrogen, orthophosphate, total phosphorus, and suspended solids. The data is used to evaluate trends in nutrient concentrations and to calculate annual pollutant loads for the Trading Program.

A Quality Assurance Project Plan (QAPP) written by The Miami Conservancy District guides the water quality monitoring activities.

i. Water Quality Monitoring Results

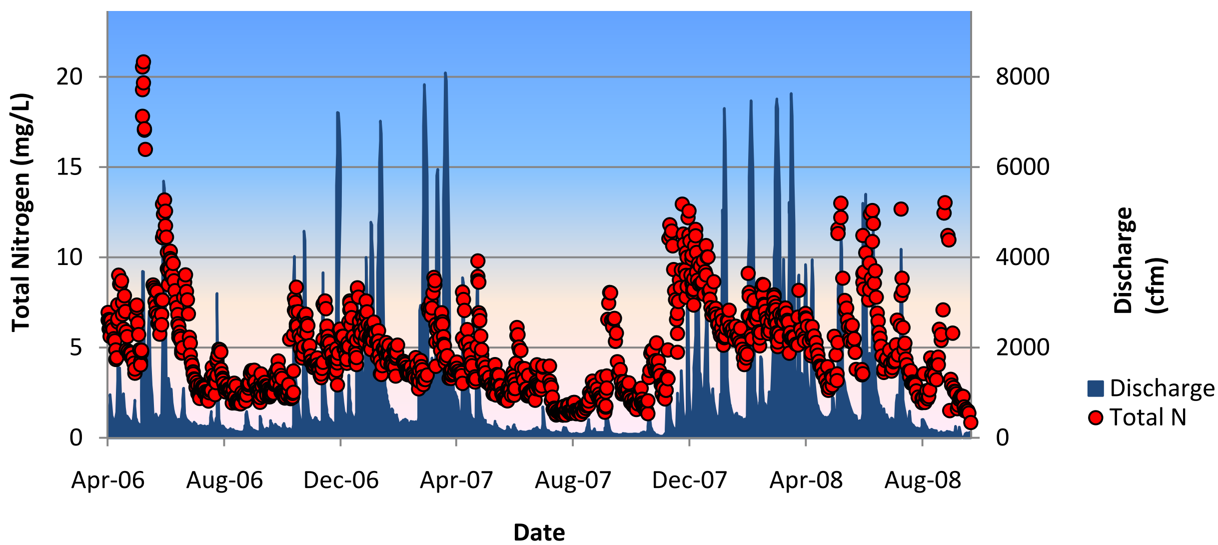
This section summarizes the data that was collected for the Trading Program from 2006 through 2008 and compares it to previous studies by the United States Geological Survey (USGS).

Total Nitrogen

Figure 1 shows total nitrogen concentrations in the Stillwater River from April 2006 through September 2008.

Potential sources of nitrate include septic systems, animal waste, commercial fertilizer, and

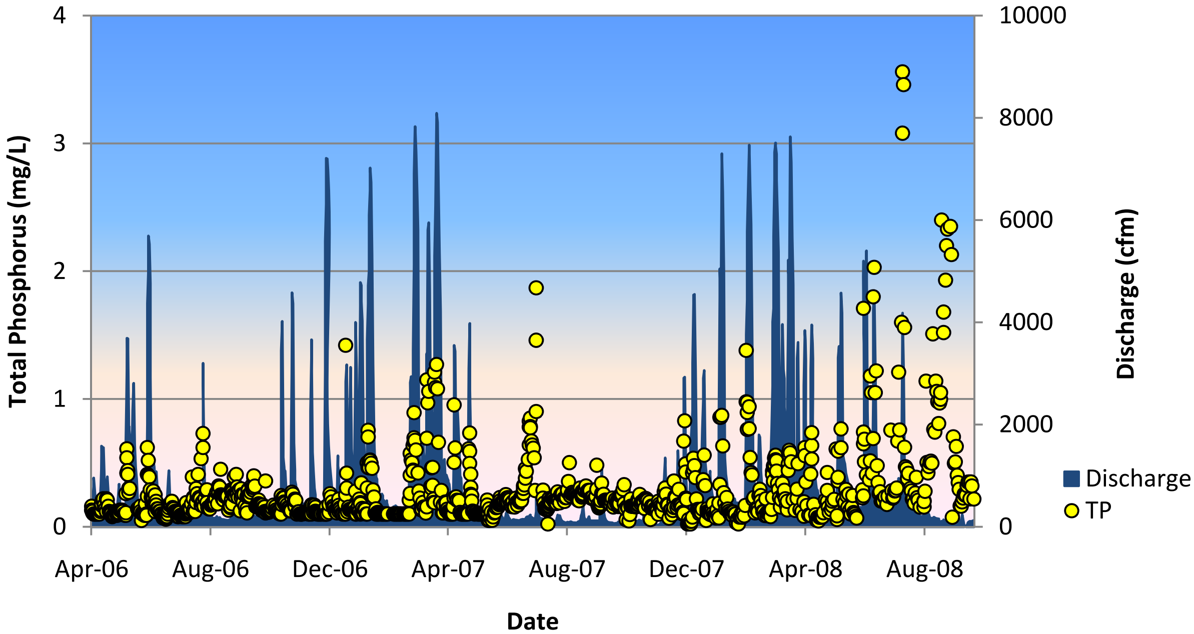
Figure 1 – Total Nitrogen and Discharge



Total Phosphorus

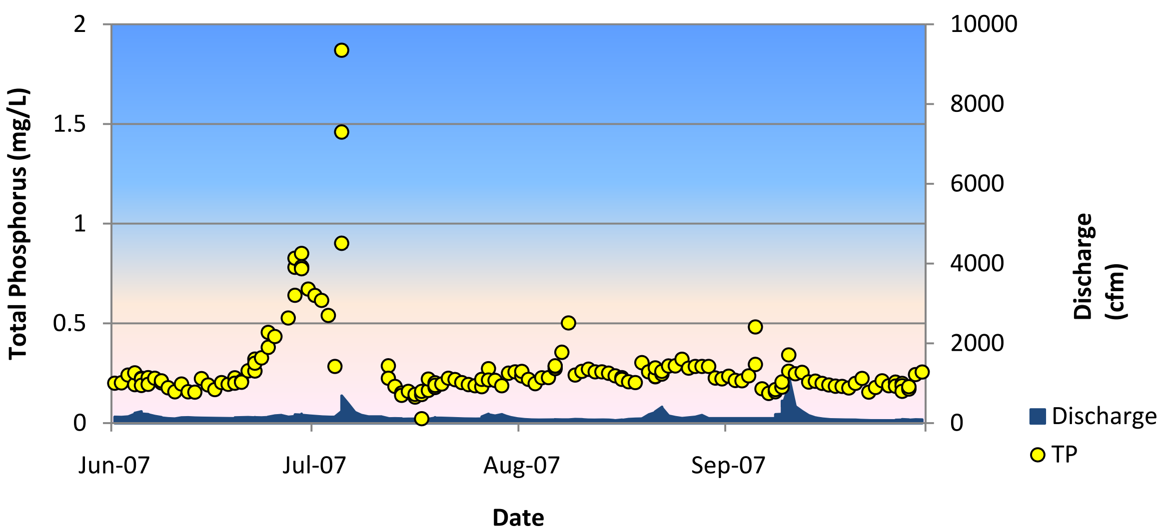
According to this data, phosphorus concentrations in the Stillwater River are generally higher in the summer and lower in the winter (see figure 2). In-stream phosphorus concentrations are affected by precipitation and flow. The highest total phosphorus concentration observed in the Stillwater River was 3.56 mg/L and the average concentration was 0.27 mg/L.

Figure 2 – Annual Total Phosphorus Concentrations and Discharge



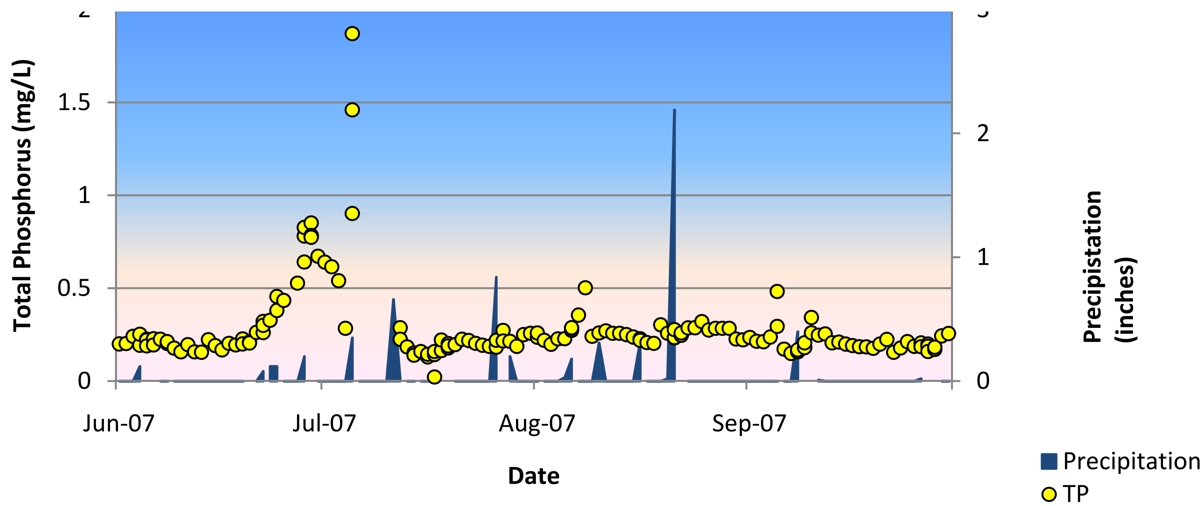
While most of the phosphorus loading occurs during times of increased flow, some spikes in phosphorus concentration occur during periods of critical low flow. Figure 3 shows the total phosphorus data during the summer months (June through September 2007) for the Stillwater River. The river flow rate is consistently low with the exception of a few instances. However, these increased flow periods are short and the river quickly returns to low flow. The data illustrates that while the river is not experiencing significant flow increases related to precipitation, surges of total phosphorus concentration still occur.

Figure 3 – Summer Months Total Phosphorus and Discharge



The local precipitation data for this time period show a number of small precipitation events that produced an aggregate total of almost 1.5 inches of rain. Figure 4 illustrates that some increases in phosphorus concentrations correspond to the rain events during those months. This data illustrates that small summer storms that occur during low-flow conditions may lead to high in-stream phosphorus concentrations.

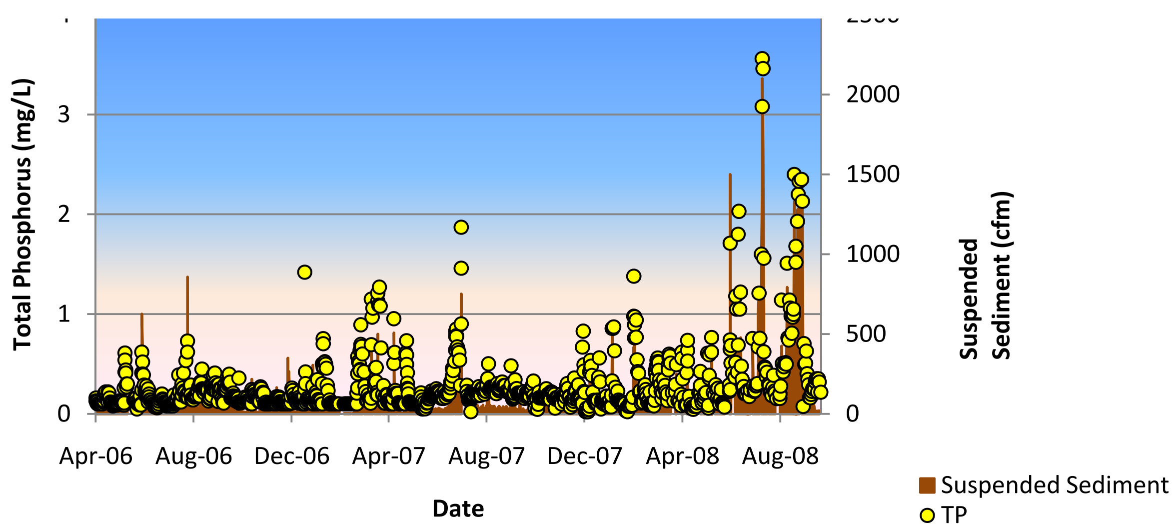
Figure 4 – Summer Months Total Phosphorus and Precipitation



Suspended Sediment

Suspended sediment is a measure of the dry weight of all the solids present in water. The solids can be inorganic (silt, clay, or sand particles) or organic (such as algae). Figure 5 illustrates the relationship between suspended sediment and total phosphorus concentrations in the Stillwater River. Suspended sediment is consistently present in the Stillwater River during the summer months.

Figure 5 – Annual Total Phosphorus and Suspended Sediments



Annual Nutrient Loading

Load calculations determine the total amounts, or loads, of a substance that flows past a specific location in a river or stream during a defined period of time. Information on stream flow, chemical concentration, and time are necessary to calculate the load.

According to a United States Geological Survey study, Ohio contributes 1,082.3 kg/km²/year of total nitrogen and 72.1 kg/km²/year of total phosphorus to the Mississippi River Basin and the Gulf of Mexico. However, water quality data collected for the Trading Program from 2006 to 2008 show significantly higher loading rates than those estimated by the USGS (see table 1).

Table 1. Measured & Extrapolated Annual Nutrient Load Estimates for the Great Miami River Watershed

2006

Location	Area (km²)	TP(kg)/km²	TN (kg)/km²	TP (MT)	TN (MT)
Hamilton	9,402	104	2,046	975	19,240
Extrapolated to GMR*	14,499	104	2,046	1,504	29,670

*Entire Great Miami River Watershed including Whitewater River Subwatershed

2007

Location	Area (km²)	TP(kg)/km²	TN (kg)/km²	TP (MT)	TN (MT)
Hamilton	9,402	192	2,186	1,809	20,553
Extrapolated to GMR*	14,499	192	2,186	2,790	31,695

2008

Location	Area (km²)	TP(kg)/km²	TN (kg)/km²	TP (MT)	TN (MT)
Hamilton	9,402	315	3,739	2,963	35,150
Extrapolated to GMR*	14,499	315	3,739	4,569	54,205

Table 2 illustrates the annual nitrogen and phosphorus loads calculated from data collected for the Trading Program from 2006 through 2008.

For comparison, the average annual load of total nitrogen calculated by the USGS for the years 1974 to 1993 was 20,400 metric tons (USGS, 2003). The highest annual load calculated for this time period was 31,900 metric tons (USGS, 2003). As Table 2 illustrates, the calculated 2008 total nitrogen load for the Lower Great Miami River surpassed the estimated previous high. The 2008 total phosphorus load of 2,963 metric tons, calculated at Fairfield, is also above the highest annual phosphorus load of 2,200 metric tons estimated in 1980 (USGS 2003).

Table 2 – Annual Nitrogen and Phosphorus Loads in Metric Tons

Constituent	**Stillwater River**			**Upper Great Miami River**		
	2006	2007	2008	2006	2007	2008
Total Flow (acre feet)	830,711	662,501	965,346	N/A	629,637	1,928,364
Ammonia	59	172	148	N/A	40	341
Nitrite	50	59	134	N/A	34	284
Nitrate	3806	2846	5383	N/A	3265	8504
TKN	1348	1416	2504	N/A	1428	4097
Total Nitrogen	**5263**	**4494**	**8169**	**N/A**	**4768**	**13226**
Total Phosphorus	**155**	**345**	**690**	**N/A**	**238**	**967**
Constituent	**Mad River**			**Lower Great Miami River**		
	2006	2007	2008	2006	2007	2008
Total Flow (acre feet)	573,520	705,396	868,278	3,225,385	3,473,502	5,202,463
Ammonia	52	66	275	285	472	874
Nitrite	34	36	88	181	246	672
Nitrate	2308	2067	2808	12,087	12,330	21,881
TKN	1074	1073	1369	6686	7505	11,723
Total Nitrogen	**3468**	**3241**	**4540**	**19,240**	**20,553**	**35,150**
Total Phosphorus	**133**	**205**	**301**	**975**	**1809**	**2963**

Table 3 illustrates the nutrient loads per square kilometer for each of the major subwatersheds of the Great Miami River Watershed.

Table 3 – Annual Nitrogen and Phosphorus Loads in Metric Tons/ km^2

Constituent	**Stillwater River (1683 km^2)**			**Upper Great Miami River (2976 km^2)**		
	2006	2007	2008	2006	2007	2008
Total Flow (acre feet)	830,711	662,501	965,346	N/A	629,637	1,928,364
Ammonia	0.03	0.10	0.09	N/A	0.01	0.11
Nitrite	0.03	0.04	0.08	N/A	0.01	0.10
Nitrate	2.26	1.69	3.20	N/A	1.10	2.86
TKN	0.80	0.84	1.49	N/A	0.48	1.38
Total Nitrogen	**3.13**	**2.67**	**4.85**	**N/A**	**1.60**	**4.44**
Total Phosphorus	**0.09**	**0.20**	**0.41**	**N/A**	**0.08**	**0.32**

Constituent	Mad River (1645 km^2)			Lower Great Miami River (9402 km^2)		
	2006	2007	2008	2006	2007	2008
Total Flow (acre feet)	573,520	705,807	868,278	3,225,385	3,473,502	5,202,463
Ammonia	0.03	0.04	0.17	0.03	0.05	0.09
Nitrite	0.02	0.02	0.05	0.02	0.03	0.07
Nitrate	1.40	1.26	1.71	1.29	1.31	2.33
TKN	0.65	0.65	0.83	0.71	0.80	1.25
Total Nitrogen	**2.11**	**1.97**	**2.76**	**2.05**	**2.19**	**3.74**
Total Phosphorus	**0.08**	**0.12**	**0.18**	**0.10**	**0.19**	**0.32**

Table 4 illustrates how the loading is distributed throughout the Great Miami River Watershed by comparing the relative contributions of the upstream subwatersheds to the downstream load calculated for the Lower Great Miami River.

Table 4 – 2008 Annual Nutrient Load Values for each subwatershed

Constituent	Stillwater River	Upper Great Miami River	Mad River	Lower Great Miami River
Total Flow (acre feet)	965,346	1,928,364	868,278	5,202,463
Ammonia	148	341	275	874
Nitrite	134	284	88	672
Nitrate	5383	8504	2808	21,881
TKN	2504	4097	1369	11,723
Total Nitrogen	**8,169**	**13,226**	**4,540**	**35,150**
Total Phosphorus	**690**	**967**	**301**	**2963**

In 2008, the Upper Great Miami River contributed approximately 38 percent of total nitrogen and 33 percent of the total phosphorus loads found in the Lower Great Miami River. The three upstream subwatersheds provided 74 percent of the total nitrogen load and 66 percent of the total phosphorus load calculated for the Lower Great Miami River.

Therefore, it can be concluded that the remaining pollutant loads enter the Lower Great Miami River between the confluence of the Stillwater, Upper Great Miami, and Mad Rivers and the location of the automated sampler on the Lower Great Miami River in Fairfield. Figures 7 and 8 illustrate how much of the calculated total nitrogen and total phosphorus loads in the Great Miami River at Fairfield, Ohio are entering from the upstream subwatersheds.

Figure 7 – 2008 Total Nitrogen Load in the Great Miami River at Fairfield, Ohio.

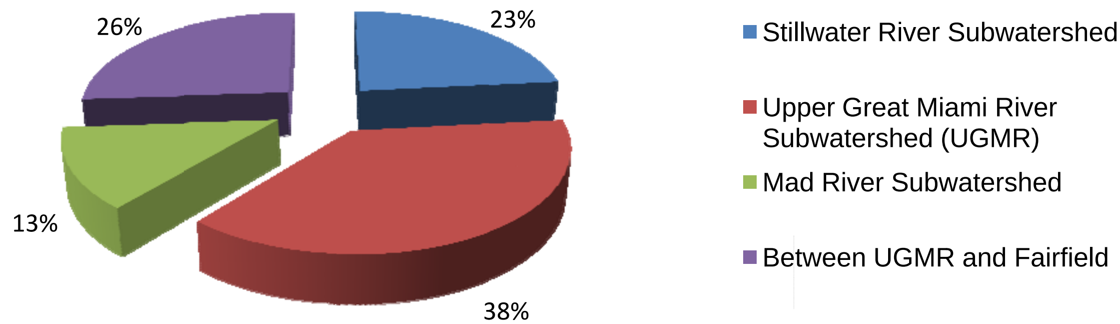
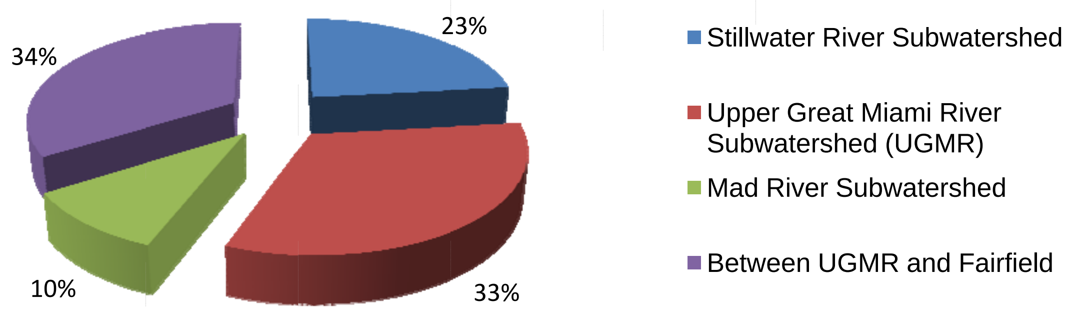


Figure 8 – 2008 Total Phosphorus Load in the Great Miami River at Fairfield, Ohio.



II. Program Development

A. Market Feasibility Analysis

At the request of the Water Conservation Subdistrict (WCS) of The Miami Conservancy District, in 2004 a preliminary market feasibility analysis was conducted by Kieser & Associates, a consultant specializing in ecosystem trading programs. The analysis assessed the opportunity for a trading program to succeed in the Great Miami River Watershed in Ohio. The analysis answered two critical questions.

1) Is there an adequate supply of agricultural nonpoint source reductions of phosphorus and nitrogen to meet wastewater treatment plant demand?

2) Are the cost differentials between wastewater treatment plant upgrades and trading sufficient to support a trading program?

The market feasibility analysis addressed these questions by:

- Conducting a nonpoint source loading analysis to assess agriculture credit supply in each of four major subwatersheds of the Great Miami River Watershed; Upper and Lower Great Miami, Mad, and Stillwater Rivers.
- Comparing the costs of incremental point source load reductions via traditional controls to the costs of comparable load reductions by agricultural nonpoint sources.
- Analyzing cost savings and load reductions potentially achieved through a proposed point source/nonpoint source trading program.

The market feasibility analysis indicated that point to nonpoint source trading offers significant cost savings (between 314 and 384.7 million dollars) over traditional command and control approaches. Traditional approaches include mandatory treatment plant upgrades which are estimated to cost more than 422.5 million dollars for treatment plants in the Great Miami River Watershed.

The analysis found there to be a significant demand for phosphorus and nitrogen credits. The demand for these credits comes from wastewater treatment plants that need to comply with future effluent standards. The analysis also found an ample supply of nutrient credits available from agriculture to meet most of the demand (with some limited exceptions).

B. Stakeholder Involvement

During the design phase, more than 100 meetings were held with stakeholders in the Great Miami River Watershed. The Water Conservation Subdistrict (WCS) solicited input from county soil and water conservation district (SWCD) boards, joint boards, wastewater treatment plant operators, and community-based watershed organizations throughout the Great Miami River Watershed. Once a basic program was designed, input was also solicited from the Ohio Department of Natural Resources (Ohio DNR), the Ohio EPA, the U.S. EPA Headquarters and Region V, the Ohio River Valley Water Sanitation Commission (ORSANCO), the Ohio

Environmental Council (OEC), the Ohio Farm Bureau Federation and the United States Department of Agriculture's Natural Resources Conservation Service (NRCS).

The Trading Program is implemented in a cooperative effort with the WCS, local wastewater treatment plants, the Ohio EPA, the SWCDs, agricultural producers, the Ohio DNR, the Ohio Farm Bureau Federation, and ORSANCO.

The Trading Program also utilizes a Project Advisory Group that includes representation from water quality credit buyers and sellers as well as state and local agencies. They make recommendations on specific projects and provide input on Trading Program strategies, structures, and systems. They also have extensive knowledge of, and promote, conservation practices in the agricultural community. Representatives of the Ohio EPA participate as ex-officio members. The Project Advisory Group has representatives from:

1. Wastewater Treatment Plants
2. Agricultural Producers
3. Water Environment Federation/Ohio Water Environment Association
4. Ohio Farm Bureau Federation
5. County Soil and Water Conservation Districts
6. Ohio Department of Natural Resources
7. United States Department of Agriculture
8. Community-Based Watershed Organizations

III. Program Description

The Trading Program facilitates the trade of water quality credits. Credits are generated from the voluntary installation of best management practices which prevent pounds of phosphorus (TP) and pounds of nitrogen (TN) from discharging into the Great Miami River Watershed's rivers and streams. Water quality credits can only originate from a voluntarily-installed best management practice which results in nutrient reductions. This means that the activities cannot be otherwise required by local, state, or federal law or contract.

As of January 2009, there are no final pollutant-specific caps, wasteload allocations or load allocations for TP or TN in the Great Miami River Watershed. Ohio EPA staff has indicated that in-stream criteria for both TP and TN will be proposed in 2009.

Eligible buyers are public and private entities that:

(1) Hold an NPDES permit that provides for their participation in the Trading Program, and
(2) Participate in funding the administrative and analytical costs to implement the Trading Program.

A. Quantification of load reductions

The Region 5 load reduction spreadsheet model and an Ohio DNR load reduction spreadsheet model are utilized to quantify the load reductions that result from implementing the individual BMPs. The spreadsheet model is subject to ongoing revision by ODNR staff in consultation with

Ohio EPA staff. The model may be expanded to include new BMPs when adequate data is available. The load reduction spreadsheet model is maintained by the Ohio Department of Natural Resources and can be found at the Division of Soil and Water's Pollution Abatement program website.
www.ohiodnr.com/soilandwater/programs/agpollutionabate/default/tabid/8856/Default.aspx

BMPs that are not included in the load reduction spreadsheet model must be calculated using a generally-accepted engineering method deemed acceptable by the director of the Ohio EPA. Types of BMPs that were funded by the Trading Program from 2006-2008 include:

1. Apply conservation crop rotation
2. Install field filter strips
3. Convert to no-till or conservation tillage
4. Conversion to hayland, alfalfa, and/or grass seeding
5. Pasture seeding and prescribed grazing
6. Plant cover crop
7. Establish sod
8. Manage milking parlor water
9. Management cowlot runoff
10. Conduct grid sampling with variable rate fertilizer application
11. Install animal waste pond
12. Increase manure storage
13. Stabilize ditch or stream bank
14. Install grassed waterway
15. Build roof over concrete feedlot
16. Install grade stabilization structure

B. Justification for Trading Ratios

A trading ratio is the number of pounds of nutrients that must be reduced by a best management practice in relation to the number of pounds of nutrients that are necessary to meet the compliance requirements of a wastewater treatment plant. Trading ratios are assigned based on the status of the eligible buyer and the attainment status of the water at the eligible buyer's discharge point.

The Trading Program utilizes trading ratios to:

(1) Incentivize voluntary early participation of the wastewater treatment plants in the Trading Program.
(2) Promote additional nutrient reductions by participating wastewater treatment plants whose point sources discharge into surface water that is non-attaining.

Eligible Buyer Status

Eligible buyers that participate in the Trading Program before they receive an NPDES permit, which has specific requirements for nutrient reduction, are called Investors. Investors voluntarily participate in the program early. This early participation earned them the right to trade at more favorable ratios for all subsequent permits where credits are applied to achieve compliance.

Investors may accumulate this trading ratio benefit up to 100% of the permit-required reductions of TP and TN. If the eligible buyer accumulates less than 100% of their required annual reduction, the fraction of the annual discharge reduction not met by the early participation is subject to a higher trading ratio.

In 2006, seven local jurisdictions operating seven wastewater treatment plants founded the Founding Investors Group and provide funds to the Trading Program. The Group includes the cities of Dayton, Englewood, Union, Butler County, and Tri-Cities Wastewater Authority which is a partnership of the cities of Vandalia, Huber Heights, and Tipp City.

Eligible buyers that choose to participate once they have a requirement to reduce nutrients are called Contributors. They are not eligible for these reduced ratios.

Trading ratios are also dependent on the water quality attainment status at the eligible buyer's discharge point. An eligible buyer that discharges to partial or non-attaining water must acquire credits at a higher ratio than an eligible buyer who discharges to fully attaining waters. The water quality attainment status is determined based on Ohio EPA's Designated Aquatic Life Uses.

Table 5 illustrates the trading ratios based on the eligible buyer's category and the water quality at the buyer's discharge point.

Table 5. Trading Ratios

Eligible Buyer Status	Credits required to offset a one pound effluent reduction by a buyer who discharges to Fully Attaining Waters	Credits Required to Offset a One Pound Effluent Reduction by a Buyer Discharging to Partial or Non-Attaining Waters
Investor	1	2
Contributor	2	3

For example, a wastewater treatment plant, prior to any regulatory obligation to reduce TP or TN from their effluent, provides funds to the Trading Program. They are then qualified for Investor status. The funds are used to install a project that reduces the discharge of TP by 1,000 pounds per year. The project must be installed upstream of the treatment plant's discharge point and meet other eligibility criteria. The wastewater treatment plant then later receives a new permit with requirements to reduce TP by 1,000 pound/year. Because they are qualified as an Investor, and if they discharge into fully-attaining water, they only need to insure the reduction of 1000 pounds of TP. If they discharge into partial or non-attaining water, they will have to insure the upstream reduction of 2000 pounds of TP for the 1000 pounds required in their permit. A

Contributor, depending on the attainment status at their discharge point, would have to pay for 2000 or 3000 pounds of reductions upstream to meet their permit requirements.

If a wastewater treatment plant continuously participates in the Trading Program they may apply the trading ratio they are eligible for to all subsequent permit terms.

C. Baseline Justification

The Trading Program is designed to augment existing local, state and federal conservation incentives to result in an increase in BMPs and water quality improvement. For purposes of the Trading Program, the baseline is the set of pre-existing BMPs that are installed in the Great Miami River Watershed. Any BMP that is implemented in accordance with a contract or agreement executed prior to the Trading Program's first funding round deadline of March 2006 is considered part of the baseline and is not eligible to generate credits.
The pollutant reductions achieved by BMPs that are part of the baseline may be used to achieve voluntary TMDL load allocations. BMPs that are funded by the Trading Program funds may assist eligible buyers in meeting their permitted wasteload allocation targets. This approach creates a logical nexus between federal and state funding needed to implement the load reductions required and recommend by approved TMDLs.

i. Why the Trading Program does not fund pre-existing BMPs

During the first round of funding, the Trading Program allowed existing BMPs to receive funds in exchange for the credits and the assurance that the BMP would continue. The justification for this included:

1. No contract or agreement was in place to assure the continuation of the voluntary BMPs. An agreement with the Trading Program would promote its continued reduction of nutrients.
2. If applications were not accepted from for existing BMPs it could be viewed as punishment for the producers that were doing a good job.
3. There was precedent set by other conservation initiatives that fund existing conditions (e.g. conservation easements).

During the first funding round this justification was met with criticisms including:

1. Trading Program funds should promote the installation of new practices, not pay for existing practices.
2. There would be no incremental water quality improvement by paying for existing BMPs.
3. Agricultural producers are unlikely to revert to fewer conservation practices once they have them installed.

Because of this criticism, the Trading Program no longer funds BMPs that existed before the first funding round.

D. Schedule for Conducting Ambient Water Quality Monitoring

The collection of water quality data that supports the Trading Program began in 2006. One automated sampler is installed in each of the four major subwatersheds. The data is collected on a rotating schedule (see table 6). The samplers collect continuous samples for a minimum of two years. The data is analyzed along with flow and precipitation data.

Table 6. Rotating Subwatershed Monitoring Schedule

Subwatershed	Calendar Years Monitored
Stillwater River	2009, 2010, 2013, 2014, 2017, 2018
Upper Great Miami River	2009, 2010, 2013, 2014, 2017, 2018
Lower Great Miami River	2011, 2012, 2015, 2016, 2019, 2020
Mad River	2011, 2012, 2015, 2016, 2019, 2020

E. Backup Credit Supply (Insurance Pool)

The Trading program includes an Insurance Pool of credits to be used as a backup supply of credits for eligible buyers. The Insurance Pool is used to insure that an eligible buyer is not at an enforcement risk due to the possible failure of an agriculture management practice that is generating credits used for compliance purposes.

A portion of the credits in the Insurance Pool come from the extra credits from the higher trading ratios assigned to Contributor-status buyers. For Contributors who discharge to fully attaining water, one of every two credits is directed to the Insurance Pool. For Contributors who discharge to partial or non-attaining water, one of every three credits is directed to the Insurance Pool. In addition, credits generated from other projects may be specifically designated for the Insurance Pool.

Specific guidelines for operating the Insurance Pool will be developed in consultation with the Ohio EPA and the Ohio DNR once Ohio's nutrient criteria is established. The guidelines will anticipate the following:

- Credits may be withdrawn from the Insurance Pool, if necessary, to replace credits that are lost due to a failed management practice. The SWCD staff that is responsible for oversight of the agriculture management practice will make the determination that a practice has failed.
- Credits may be sold to generate funds to cover Trading Program costs.
- 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.

F. Trading Program Implementation

A trade occurs when an eligible credit buyer uses water quality credits to comply with their NPDES permit. A credit is equal to a pound of nitrogen or a pound of phosphorus that is prevented from discharging into a stream or river.

Credits may be generated anywhere within the Great Miami River Watershed in Ohio. Eligible buyers may only use water quality credits that are generated upstream from their point of discharge for compliance purposes. This assures there is a benefit to water quality at the buyer's point of discharge and to all stream reaches between the buyer's discharge and the project that is generating the water quality credits. This approach also prevents 'hot spots'.

i. Step 1 – Request for Proposals Issued

The Water Conservation Subdistrict (WCS) of The Miami Conservancy District issues a request for proposals (RFP) to announce that funds are available. Eligible soil and water conservation district (SWCD) offices then work with agricultural producers to identify projects that meet the criteria specified in the RFP. The criteria include that the project must be located in the eligible area of the Great Miami River Watershed, reduce nutrient runoff, and quantified using the load reduction spreadsheet.

ii. Step 2 – Applicants Submit Proposals

The completed project applications are submitted by a deadline to the WCS by the SWCDs. Eligible applications must demonstrate the applicant's commitment to implement the project and meet ongoing inspection and reporting requirements.

iii. Step 3 – Proposal Review and Selection

To select the project applications for funding, the WCS reviews them for accuracy and completeness. Then, the Ohio Department of Natural Resources' Division of Soil and Water Conservation (Ohio DNR) reviews and verifies the modeling used in quantifying the nutrient load reductions. Ohio DNR staff may also inspect the proposed project sites to validate proper application of the model. Project applications that are improperly completed, or contain modeling that cannot be verified, may not be considered for funding.

To make the final selection, the WCS facilitates a project application review and selection process with the Project Advisory Group who then recommends projects for funding. The primary criteria that is used to rank the projects is the cost per pound of nutrient reduction. This is a selection process sometimes referred to as a reverse auction.

iv. Step 4 – Applicants Notified of Projects Selected

The WCS then notifies all successful SWCD applicants of the results of the selection process.

v. Step 5 – Project Funds Released

As broker of the Trading Program, the WCS enters into a contract, called the Project Agreement, with the SWCD for each project to be implemented. The SWCD agrees to accept the funds and pay the agricultural producer, inspect the project to ensure its installation and maintenance, and keep accurate and complete records of the project.

vi. Step 6 – SWCD Contracted to Manage the Projects

The SWCD enters into a project agreement, called the Project Scope of Services, with the agricultural producer who is responsible for the installation, operation and maintenance of the management practice(s). The agricultural producer agrees to allow regular inspections by the SWCD. Once the agreements are signed and submitted, the WCS and a representative from the Founding Investors Group requests that the Trading Program Project Fund (managed by the City of Dayton Finance Department) issue a payment to the SWCD. The funds are then transferred to the SWCD who makes payments to the agricultural producers implementing the project.

When a project is installed, the SWCD verifies that it is completed according to the Project Scope of Services and sends the WCS a signed Notice of Installation form. The SWCD then conducts annual inspections and submits an annual report to the WCS verifying the status of the agricultural management practices.

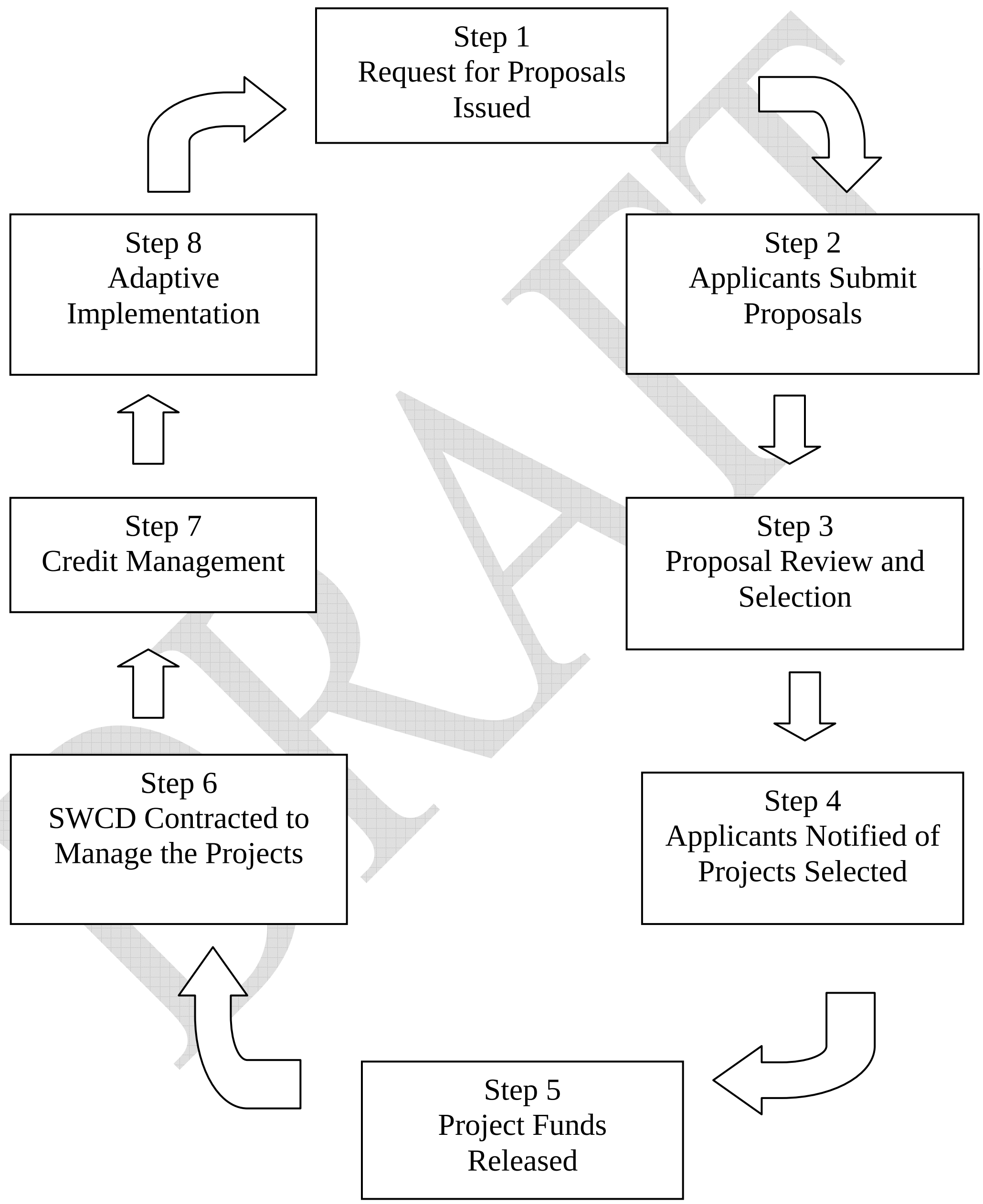
vii. Step 7 – Credit Management

The WCS tracks and validates the ongoing generation of the credits by maintaining an updated inventory of all agricultural management practices and their inspection records. The WCS allocates the credits to participating eligible credit buyers.

viii. Step 8 – Adaptive Implementation

Adaptive implementation of the Trading Program occurs when recommendations for improvements result in changes in processes and procedures for the subsequent funding round. Modifications that have been made to the Trading Program since the first round include changes to the funding criteria, the timing of RFPs, language in the agreements, and funding procedures.

Figure 8. Trading Program Implementation Process



Appendix 4
Dayton Daily News Article Regarding Stillwater TMDL Study

Dayton Daily News

Stillwater River cleaner than reported

By Ben Sutherly

Staff Writer

Sunday, April 27, 2008

DAYTON — The Ohio Environmental Protection Agency likely overstated pollution in the Stillwater River in a study five years ago, agency officials said last week.

The agency is revising its pollution estimates for the watershed northwest of Dayton after the Miami Conservancy District publicly questioned them, saying water-quality data collected through one of its programs show the river is far less polluted by phosphorus than once thought.

It's the first time the Ohio EPA is revising one of its Total Maximum Daily Load reports — a comprehensive study that identifies sources of pollution within a watershed.

Such studies can play a role in determining how much money municipalities spend to upgrade their sewage treatment plants. The cost of those upgrades often are paid for through rate increases to residents and businesses.

"We're pleased they're undertaking this," said Douglas "Dusty" Hall, the Conservancy's program development manager. "I do expect there will be much better agreement between our numbers and their numbers."

The Conservancy estimated 167,753 kilograms of phosphorus was discharged between April 2005 and April 2006 in the watershed drained by the Stillwater River. Comparable amounts of phosphorus were discharged the next year.

That's far lower than the EPA's baseline estimate of 669,579 kilograms.

Dale White, the EPA water quality modeler who calculated the original Stillwater pollution estimates, said the amount of phosphorus in the Stillwater River is still too high, even if the EPA's revised estimates turn out to be in the same range as the Miami Conservancy District's findings. The EPA's target for the watershed is now 75,069 kilograms per year, he said.

White said the original miscalculations resulted from inaccurate modeling. The same mistake was not made in other TMDL studies around the state, he said.

Too much phosphorus can harm aquatic wildlife by depleting oxygen in the water. The nutrient is discharged by sewage treatment plants, farms and failing septic systems.

White expects the EPA will have a new pollution estimate this fall. It's too soon to say how much staff time will be invested in the revisions.

If the Stillwater's pollution estimates change significantly, more public input will be sought for a new report.

"It's fair to say it warrants another look," White said.

Those with questions about the revisions and their impact may call the EPA's Erika Wiggins at (614) 644-2160.

Appendix 5
Agreement with Ohio Department of Natural Resources
For the Implementation of Agricultural Drainage Management Studies

Proposal for Evaluating Drainage Water Management (Controlled Drainage) and Wood Chip Bio-Reactor Treatment Systems within the Great Miami River Watershed Water Quality Credit Trading Program

Project Duration: October 2008 to December 2010

Project Manager: Rob Hamilton
Ohio Department of Natural Resources (ODNR)
Division of Soil and Water conservation (DSWC)
2045 Morse Road, Building B-3, Columbus, Ohio 43229
(614) 562-0738
rob.hamilton@dnr.state.oh.us

Project Collaborators:

- Shelby Soil and Water Conservation District (SWCD)
- Ohio State University Extension (OSUE)
- Department of Food, Agricultural, and Biological Engineering (OSU)
- USDA Agricultural Research Service (ARS)
- USDA Natural Resource Conservation Service (NRCS)
- The Miami Conservancy District (MCD)
- Agri-Drain Corporation

Project Objectives:

1. Evaluate the effectiveness of Drainage Water Management (controlled drainage) systems for reducing Nitrate and Phosphorus loadings in the Great Miami Watershed.
2. Compare free flowing subsurface drainage, Drainage Water Management and alternative subsurface drainage designs and treatment systems on Glacial formed soils in West Central Ohio.
3. Demonstrate the use of Drainage Water Management and alternative subsurface drainage designs and treatment systems on agricultural land.
4. Advance the current Pollution Load Reduction Model used in the Great Miami Watershed Water Quality Trading Program by adding load reduction calculations for Drainage Water Management.
5. Provide pollutant load reduction information that can be used in other trading programs in Ohio and across the Mid-west.
6. Improve water quality in the Great Miami River watershed and sub-watersheds.

Summary of Work Performed:

Installation and evaluation of drainage water management practices in the Great Miami Watershed.

Total Project Cost: $64,331

Background:

Agricultural subsurface (tile) drainage is an essential water management practice on many highly productive soils in West Central Ohio and the Great Miami River Watershed. However, nitrate and other nutrients carried in subsurface drainage waters can lead to local water quality problems and contribute to hypoxia in the Gulf of Mexico. Strategies are needed to reduce the nutrient loads while maintaining adequate drainage for crop production. There are a variety of management practices that can help reduce nutrient loads on tile-drained soils (growing cover crops, fine-tuning fertilizer application rates and timing, etc.). This project will specifically focus on the use of two management practices for reducing nutrient loadings: 1) Drainage Water Management which includes modifying subsurface drainage system design and operations; and 2) woodchip bio-filters or bio-reactors which includes modifying the drainage system to allow drainage water to flow through and be treated through an underground trench filled with wood chips.

Drainage Water Management (Controlled Drainage) Overview

Drainage Water Management is the practice of using a water control structure in a subsurface drainage main, submain, or lateral drain to artificially management the drainage outlet elevation. The water table must rise above the managed outlet elevation for drainage to occur. The outlet depth, as determined by managing the flash boards in the water control structure, is:

- Raised after harvest to limit drainage outflow and reduce the delivery of nutrients to ditches and streams during the off-season. (Figure 1)
- Lowered in early spring and again in the fall so the drain can flow freely before field operations such as planting or harvest. (Figure 2)
- Raised again after planting and spring field operations to create a potential to store water for crop use in midsummer. (Figure 3)

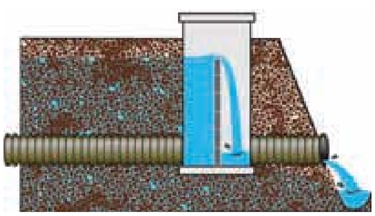


Figure 1.

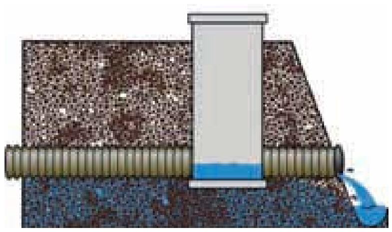


Figure 2.

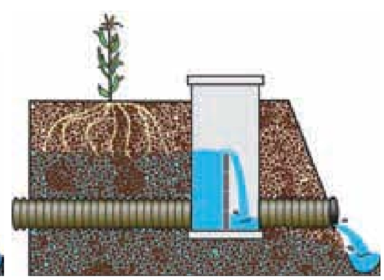


Figure 3.

Woodchip Bioreactor Overview

Woodchip bio-reactors can be used to remove nitrate from large volumes of drainage water depending on system size and retention time. Treatment with this practice involves diverting drainage water into a trench filled with woodchips (Figure 4). Nitrate is removed from the drainage water by denitrification, in which nitrate is converted to nitrous oxide and nitrogen gas.

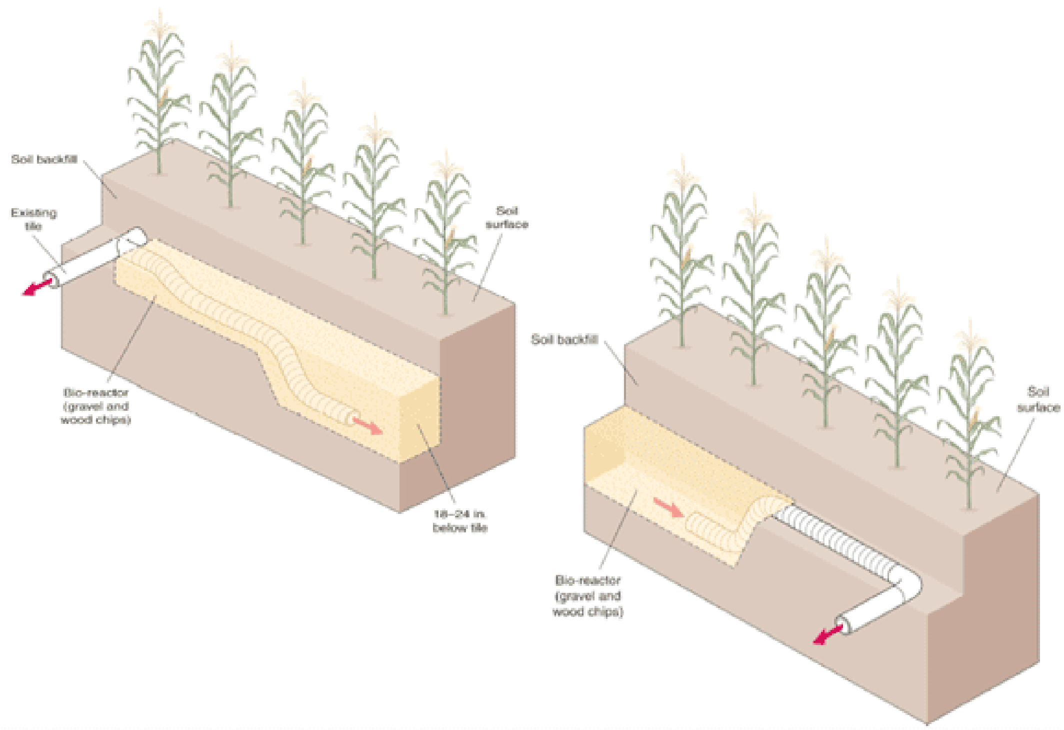


Figure 4. Example Bio-reactor System (from Richard Cooke, Univ. of Il)

Project Proposal and Description:

Through this project ODNR-DSWC, Shelby SWCD and project collaborators will evaluate the effectiveness of Drainage Water Management systems and bio-reactors for reducing Nitrate and Phosphorus loadings in the Great Miami Watershed. This evaluation will take place on four individual farms located in Shelby County, Ohio and also part of the Great Miami Watershed. The four farms cooperating in this study have been identified and the landowners have agreed to either modify existing or install any new practices necessary as part of this project. Furthermore, each landowner has expressed their willingness and cooperation in monitoring and evaluating the effectiveness of these practices.

This study will compare the quality of free flowing subsurface drainage with the outflow from Drainage Water Management (controlled drainage) systems, and with wood chip bio-reactors, on glacial formed soils in West Central Ohio. At each of the four project sites the free flowing subsurface drainage and Drainage Water Management systems will be monitored as in a paired-field comparison. A structure will be installed in the subsurface drainage system at each site to measure the quantity (flow) and the quality of water from free flowing tile systems. Another structure will be installed at each site where the outlet elevation will be managed at different levels during the growing and non-growing seasons (see management description above under Drainage Water Management). The primary objective of this study will be to measure the drainage water volume, nitrate and other nutrient concentrations from free flowing drainage, Drainage Water Management outflows, and outflows from the bio-reactor system. Only one of the four project sites will be designed with the wood chip bio-reactor treatment system. Data collected from this site will be collected the same way as other sites with Drainage Water Management systems. The wood chip bio-reactor will be evaluated against the other sites to determine any additional benefits from this treatment system.

Materials and Methods

This project will begin during October 2008, or later as soon as the project is approved. A minimum of two 10" water control structures will need to be installed at each site. The height of the water control structures installed will be between 6-8 feet depending on actual subsurface drain depth. To measure and quantify flow, a weir will placed within each structure along with a pressure transducer. This system will also include a solar panel for power, a data logger, and a voltage-regulating device at each structure. Estimated cost for this equipment for each structure is $1,500.

To evaluate possible water quality benefits from the different systems and management practices, in field measurements will be taken from free flowing and managed systems. A spectrophotometer will be used to measure concentrations of nitrate and soluble phosphorus. Samples will be collected from each structure. Sampling frequency will depend upon whether or not adequate flow is available. We estimate that water quality information will be collected 12 to 26 times a year per structure. The Shelby SWCD will collect water quality information. Additional laboratory analysis may be done as funding allows. Each system will be evaluated for a minimum of two years.

Pollution Load Reductions for Drainage Water Management Practices

ODNR-DSWC has the responsibility of maintaining the pollution load reduction spreadsheet for the Great Miami River Watershed Water Quality Credit Trading Program. This spreadsheet is used to calculate the amount of nutrient reduction a specific conservation practice will generate. The current spreadsheet does not include any load reduction calculations for Drainage Water Management practices. This project is designed to monitor and measure the effectiveness of Drainage Water Management practices in the Great Miami Watershed. This project, if approved, will allow ODNR-DSWC to make improvements to the spreadsheet and include load reductions for Drainage Water Management practices. Having the ability to calculate pollution load reductions for these practices will make these practices eligible for funding in the water quality-trading program. Furthermore, by collecting information, monitoring, and documenting the effectiveness of these practices, and sharing project results across the state through the USDA and other state and local conservation agencies and organizations, the public will be benefited. Trading programs in the Midwest and other states that have subsurface drainage will also benefit from the work completed through this project.

Budget Proposal for Evaluating Drainage Water Management and Treatment Systems

Item	Unit Cost	Total Cost
10” In-line water control structure, labor for installation, and additional pipe and connections needed for 8 structures	**$3,750**	**$30,000**
Installation and materials for one bioreactor system	**$3,031**	**$3,031**
Water monitoring equipment- weir, pressure transducer, data logger, voltage regulator, spectrophotometer, reagent, additional sampling 8 structures	**$1,950**	**$15,600**
SWCD technical assistance monitoring, design, and installation.	**$40**	**$7,850**
DSWC technical assistance design, installation, annual summary report, modification of load reduction spreadsheet.	**$40**	**$7,850**
	Total	$64,331

Appendix 6
Magazine Articles

Corn & Soybean Digest

Get Paid To Hold Onto Those Nutrients

Apr 1, 2008 12:00 PM, BY SUSAN WINSOR

Dairyman Jeff Beavins is getting paid to build a structure that stores six months' manure. Most of the $130,000 cost will be paid for by water quality credits from local wastewater treatment plants. The Miami (OH) Conservancy District is the intermediary exchange.

The manure containment will divert his farm's nitrogen (N) and phosphorus (P) runoff from the Great Miami (OH) River watershed. Paying Beavins to avert contaminants from the river, in the form of water quality credits, is more cost-effective than upgrading wastewater treatment plants, say environmental scientists.

Beavins and 35 other farmers are participating in an experimental project that is a sign of things to come. Managed by The Miami Conservancy District, the pilot water quality credit program has approved $586,000 for 36 Ohio farmers and their soil and water conservation districts (SWCDs) to implement conservation plans reducing fertilizer and manure runoff.

In one year, Beavins' manure containment structure will prevent 3,536 lbs. of N and P from entering the watershed. In 20 years, that amounts to 70,720 lbs. This makes Beavins' $107,000 payment a win-win for all sides. The downstream wastewater treatment plant avoids costly upgrades for removing N and P that Beavins keeps out of the watershed.

He and other participating growers have worked with their local SWCD technical staff to submit competitive bids. SWCDs aggregate those water credits into a contract between the SWCD and the Miami Conservancy District and verify the on-farm practices. To measure the effectiveness of the program, automated water samplers collect river water every eight hours at four watershed locations.

Together, these Ohio farmers' plans will cut P and N loads in local waterways by about 215 tons over the next 20 years. Reductions are used to comply with a stream or river's total maximum daily load (TMDL). A TMDL identifies the amount of a particular pollutant (N, P or sediment) that a particular stream, lake or river can handle without violating state water quality standards.

This Great Miami River Water-shed Water Quality Credit Program could save an estimated $385 million in costly technology upgrades over 20 years, if all wastewater treatment plants in the watershed participated, says a Kieser & Associates 2004 report (see www.envtn.org/docs/Great_Miami_Trading_Analysis.pdf).

This voluntary, collaborative local approach is more cost-efficient than adding a new bureaucracy or upgrading treatment plants, says Dusty Hall, program development manager for the Miami Conservancy District. “The idea is to leverage existing local Soil and Water Conservation Districts and their relationships with producers,” he says.

Water quality credit trading is favored by USDA-NRCS, which funded a portion of this three-year, $2.17-million program.

TO APPRECIATE THE effectiveness of this approach, consider the following: Farmers in the Great Miami River watershed bid from 33¢ to $1.90/lb. of N and P reduced. That compares to $422.5 million to install P-and N-removal technology at 314 watershed wastewater treatment plants over the next 20 years, says Miami Conservancy District Program Development Specialist Sarah Hippensteel. Buying credits for agricultural best management practices (BMPs) would cost $37.8 million over the same period, she estimates, for a savings of $384.7 million.

This watershed is ideally suited for water quality credit trading. It has agricultural uses upstream from both the Great Miami River and from participating municipal wastewater treatment plants. About 80% of the land use is agricultural, with a good supply of both farms and large wastewater treatment plants, to create market liquidity, Hall adds.

Winning water quality credit bids in Beavins' Darke County SWCD have ranged from $1.20 to $1.80/lb. of N and P reduced.

“I work with producers who may receive from $10,000 to $90,000 for their manure reductions,” says Tim Brunswick, Darke County (OH) SWCD. He helped Beavins design the 50 × 135-ft. manure storage structure for his conservation plan.

Although Beavins is a dairy producer, growers can qualify for water credits from BMPs such as no-till, conversion to pasture, adding cover crops or filter strips, grass waterways, grid soil sampling, variable-rate fertilizer application, conservation crop rotations and others.

Unlike the voluntary Great Miami (OH) River water quality credit program, Chesapeake Bay's water-shed falls under a federal cap of N and P. Full-scale implementation of water quality credit trading there could save $1 billion in wastewater treatment costs, according to a 2004 EPA report.

Eighty percent of existing N and P contributions there come from agriculture, says Peter Hughes, Red Barn Trading Co., Lancaster, PA.

He sold the first nutrient credit there last November to help meet these federal obligations for Chesapeake Bay water quality.

RED BARN (AGRONOMIC) Consulting uses its agricultural client base to identify farm improvements that generate credits, and then pools credits for buyers. Red Barn holds the majority of Pennsylvania Department of Environmental Protection-certified credits and has applications for more than 100,000 more credits pending.

Red Barn Consulting also helps farms submit proposals for cost-sharing on future N- and P-reducing practices.

“For example,” Hughes says, “a grower might propose credits for 100 acres of no-till with a cover crop. Or, a poultry producer might earn credits of $10/lb. to sell poultry manure outside of the watershed. The practice is certified by the Department of Environmental Protection, and the credits will be sold on an open market.

“Because the regulations don't begin until 2010, we do not yet have an exchange for trading these credits,” Hughes says. “At this point we have a reverse-Economics 101, with a lot of supply but low demand.”

This type of market-based approach to environmental quality is on the rise. An EPA survey of water quality credit trading programs tallied 21 water quality trading programs in various stages of development. A 2004 Dartmouth College study found 40 credit trading programs in 17 states.

“What we see today is the tip of the iceberg in terms of the environmental benefits of trading programs and cost savings that can be achieved,” Hall says of water quality trading programs. “The EPA has strongly encouraged states to adapt stream criteria similar to what Ohio is doing.

“The best approach to trading programs is a locally based common-sense approach with voluntary partners at the table,” he says.

Editor's note: *To learn more see:* www.epa.gov/owow/watershed/trading/tradingmap.html
www.pca.state.mn.us/water/wqtrading/index.html

Public Works Online
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Trading Away Pollution

Wastewater managers in southwest Ohio use water quality trading to reduce nutrient levels in local waterways.

Source: PUBLIC WORKS MAGAZINE
Publication date: July 1, 2008

By Jay Landers

When the Clean Water Act was enacted 35 years ago, wastewater treatment plants and other “point” sources were considered the nation's biggest polluters, and billions of dollars were spent on new facilities or major upgrades.

While this gave the nation more advanced treatment plants discharging much less pollution into waterways, many rivers and streams remain impaired. Now the culprits are often runoff from farms, urban areas, and other “nonpoint” sources. Unfortunately, because of its diffuse nature, such pollution is difficult to regulate and costly to curtail.

There's a possible solution, however: the emerging practice of water quality trading, which addresses nonpoint pollution while helping point-source dischargers meet their regulatory goals. Since the EPA released its Water Quality Trading Policy in 2003, seven states have established a framework for water quality trading programs, and at least three more are developing one.

One of the most recent examples of this watershed-based approach to managing water quality is the Great Miami River Watershed Water Quality Trading Program, which was begun as a pilot project in 2006 by the Miami Conservancy District in Dayton, a special district established by the state to provide flood protection and improve water quality along the Great Miami River in southwestern Ohio.

The Great Miami River and its tributaries will benefit from the water quality improvements realized through the Miami Conservancy District's watershed-based trading program. Here, a kayaker enjoys the river outside Dayton, Ohio. Photo: Dusty Hall

A Mutually Satisfying Fit

Almost 85% of the land in the river's watershed is agricultural, and the region includes several treatment plants: ideal conditions for establishing a successful program.

Water quality trading is most likely to work when the cost to remove pollutants from one source of pollution is considerably less than the cost to remove an equivalent amount of pollutants from another source of pollution.

A financial analysis indicated the potential savings of such a program—including $40 million to upgrade and operate Dayton's plant to meet tougher discharge standards—would offset potential transaction costs. So the district reached out to the state and federal EPA, the U.S. Department of Agriculture (USDA), other state and local agencies, treatment plant managers, and the Ohio Farm Bureau Federation.

Reactions to the idea were generally positive.

“We were identifying common ground between the citizens of our urban areas and the citizens of our rural areas,” says Dusty Hall, the district's manager of program development.

Dayton's key motivation was the prospect of future nutrient limits in its discharge permit. Although it has no regulatory requirements pertaining to total phosphorus and total nitrogen, the city expects to receive such limits within the next few years.

In addition to Dayton, the program includes six other facilities from four jurisdictions: the Tri-Cities North Regional wastewater treatment plant, which serves the towns of Huber Heights, Vandalia, and Tipp City; the city of Englewood's plant; the city of Union's Sewage Treatment Plant; and Butler County's LeSourdsville Regional Water Reclamation Facility, Wade Mill Wastewater Treatment Plant, and Queen Acres Sewage Treatment Plant.

This “founding investor group” provided $1.2 million to finance the program for its first three years. Combined with a $900,000 grant from the USDA's Natural Resources Conservation Service in 2005, the program began on solid financial footing.

BUYING AND SELLING CREDITS

The participating treatment facilities have a combined design capacity of 100 mgd. Each entity's financial contribution to the program and the amount of credits it receives are based on its percentage of the group's overall design capacity.

For example, Dayton, which at 72 mgd is the largest plant participating, pays the most. In return it receives approximately 72% of the program's water quality credits.

The program generates credits by contracting with farmers to implement best management practices (BMPs) that reduce the amount of total phosphorus, total nitrogen, or both, from within the watershed. Using an approach known as a reverse auction, the district requests proposals for projects; and local soil and water conservation districts, working directly with farmers, submit proposals identifying the practices to be used to reduce nutrient loadings.

To quantify anticipated nutrient reductions, participants use the Load Reduction Spreadsheet, a program offered by the Ohio Department of Natural Resources to help farmers calculate reductions associated with certain practices when used on various soils and slopes.

“Right upfront it's known that it's the lowest cost per pound of nutrient reduction that's going to be at the top of the funding pile,” Hall says.

To be considered, a project must be conducted voluntarily. In other words, credits must result from projects not otherwise required by local, state, or federal law, or by an existing contractual agreement. “It has to be a new management practice,” Hall says. “It's above and beyond what other state and federal conservation programs fund.” Projects also must be upstream from the treatment plant that receives the resulting credits.

The district presents a list of the various applications and their associated cost per pound of reductions to a project advisory board, which includes representatives of local, state, and federal agencies with technical expertise in such areas as waste-water treatment, agriculture, and soil and water conservation. The board then decides which projects will be funded.

PROGRESS TO DATE

As of June, the district had completed four rounds of project reviews and selected 50 projects in 10 counties.

Ranging in length from five to 20 years, the projects comprise the following BMPs: conservation tillage, crop rotation, and cover; milk house/cow lot treatment; pasture seeding/prescribed grazing; sod establishment; conversion of row crops to hayland; manure storage; filter strips; and sophisticated analyses of nutrient levels in fields to ensure proper application of fertilizer.

Altogether, the projects are anticipated to reduce discharges of total phosphorus and total nitrogen by almost 650,000 pounds. With a total cost of $925,000, the projects are expected to achieve their nutrient reductions at an overall average cost of approximately $1.43/pound, not including transaction costs.

Projects must be inspected annually by the participating local soil and water conservation district to verify that anticipated nutrient reductions are in fact occurring. In addition, each participating soil and water conservation district monitors water quality at a portion of the projects, and the Miami Conservancy District carries out an extensive monitoring program using four continuous water quality samplers, each of which is located at the base of one of the river's four major subwatersheds. Over the course of 24 hours, each sampler collects three samples, two of which are analyzed in a laboratory to determine their nutrient concentrations.

As promising as the program seems, at least one party has some concerns.

Dayton may not be able to justify long-term participation if its discharge permit is not amended to include nutrient limits, particularly for total phosphorus. In that case, it might be more cost-effective to remove phosphorus using iron salts rather than buying pollution credits.

“To make our program really cost-effective, we need to have both requirements [for total nitrogen and total phosphorus] in our permit,” says Tom Schommer, manager of the city's wastewater treatment division. In fact, the city is conducting another economic analysis to reevaluate whether removing nutrients at the plant would be more cost-effective than trading.

In the meantime, Schommer remains committed to the pilot project. “The program is great because it's going to help control nonpoint source pollution,” he says. “It's a beautiful concept—if we can get it to work out.”

— *Landers is a freelance writer based in Cedar Park, Texas.*

Lessons learned

Three key elements of successful water quality trading programs.

Early attempts to develop water quality trading programs fizzled because of complex and costly administrative requirements. But they also generated valuable information that's smoothing the way for subsequent trading programs, says Mark Kieser, a principal with Kieser and Associates LLC, of Kalamazoo, Mich., and acting chair of the Environmental Trading Network, an information clearinghouse.

The 1980s witnessed the nation's first attempts at trading programs. Because they generated just a few trades—at best—they were very expensive and only a few got off the ground.

During the 1990s, projects in Colorado, Connecticut, Idaho, Michigan, and Wisconsin began moving the concept toward greater acceptance. Although begun locally, the six initiatives attracted the attention of the EPA, which sought ways to spur the development of new trading programs around the country.

One of the key lessons that emerged from the 1990s programs is the need for participants to trust each other. The public must be able to review and comment on proposed trades before they're completed. As a result, many states with trading programs have developed registries or authorities to oversee processes for reviewing and verifying trades.

“There needs to be a lot of transparency,” Kieser says. “These can't be back-door deals.”

To succeed, programs must be administered as simply and clearly as possible to avoid confusion on the part of buyers, sellers, and regulators. Because they sought to address a plethora of concerns and contingencies, some of the early trading rules were overwhelmingly complex. “States have since learned that they need to simplify,” Kieser says.

Similarly, it costs more and takes longer to implement programs on a permit-by-permit basis rather than developing general rules or policies applicable to all trades. “That's why we see many states going to policy, rules, or guidance,” Kieser says, rather than incorporating trading rules and procedures into individual discharge permits for wastewater treatment plants.

Of course, trading programs in general remain in their relative infancy, and participants continue to develop the necessary infrastructure to ensure successful approaches to improving water quality in more cost-effective ways. “With each new trade, we're still learning,” Kieser says.