

Western Lake Erie Basin Water Resources Protection Plan

Ohio, Indiana and Michigan



"The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment."

August 2005



**United States Department of Agriculture
Natural Resources Conservation Service**

An Equal Opportunity Provider and Employer

Executive Summary

Lake Erie is part of the Great Lakes System which contains 20 percent of all the freshwater in the world. Tourism associated with Lake Erie provides more than \$7.4 billion annually in direct sales. Lake Erie seaports generate approximately \$1 billion in revenue annually. Lake Erie sport fishing has been estimated to generate hundreds of millions of dollars annually.

Numerous Federal and State reports have identified Lake Erie as impaired due to excessive loadings of sediment and nutrients. Long-term water quality monitoring has identified the Maumee River as being the largest single contributor of nonpoint source pollution to the Lake. The Lake Erie Protection Plan establishes a goal to reduce sediment loading into the lake by 67 percent. The Lake Erie LAMP (Lake Wide Area Management Plan) similarly identified nutrient loading and land use practices as adversely affecting the future state of the lake. Each year dredging of Toledo Harbor requires removal of approximately 850,000 cubic yards of sediment at an average annual cost of \$2.2 million.

Reports and modeling done in the basin by U.S. Geological Survey, USDA Agricultural Research Service, Heidelberg College, and NRCS have identified the erosion control practices of conservation tillage and conservation buffers as effective in reducing both soil erosion and sediment transport from the watershed. Nutrient management, manure management plans, wetland restorations, and controlled drainage have been shown to effectively reduce nutrient transport from the watershed to the lake. Current USDA Farm Bill programs are a proven means of facilitating installation of these practices by farmers.

NRCS has developed a plan to use *Rapid Resource Assessments, Area Wide Planning, and acceleration of USDA Farm Bill programs* to address the resource concerns for the Western Basin of Lake Erie, and the contributing watersheds including the Maumee, the Portage, and the Ottawa Rivers as well as other smaller direct discharge streams between Toledo and Sandusky Bay. The project area encompasses 4.2 million acres in the Maumee River watershed and another 714,000 acres in the Ottawa River, Portage River, and the Lake Erie direct tributaries combined, for a total project area of 4,914,000 acres.

Rapid Resource Assessments in each of the eight different 8-digit hydrologic units in the project area will be combined into a basin wide plan. This data will be used through an Adaptive Management approach to fine tune and guide the acceleration of the USDA Farm Bill programs.

The plan estimates the acres of filter strips, riparian buffers, grassed waterways, conservation tillage and nutrient management as well as the number of Comprehensive Nutrient Management Plans (manure management), waste storage structures, and pasture systems that will be needed to address resource concerns.

This 10-year plan for accelerating the participation in USDA Farm Bill programs will involve financial assistance to farmers in the form of cost sharing and practice payments, and technical assistance to assist farmers in planning and applying these practices.

Progress will be measured by a combination of means, including the NRCS Progress Reporting System (PRS), annual tracking of land use/cover changes, conservation tillage transects, and water quality monitoring data.

TABLE OF CONTENTS

INTRODUCTION -----	1
SETTING AND BACKGROUND-----	3
RESOURCE MANAGEMENT ISSUES IN THE WATERSHED -----	8
EXISTING WATERSHED INFORMATION AND STRATEGIC DOCUMENTS -----	17
A BASIN WIDE PROJECT TO ADDRESS THE RESOURCE MANAGEMENT ISSUES -----	19
BASIN WIDE PLANNING AND IMPLEMENTATION -----	20
BUILDING AND MAINTAINING COOPERATIVE CONSERVATION -----	22
SUMMARY -----	24

FIGURES

Figure 1. Western Lake Erie Basin-----	3
Figure 2. Population of the Maumee Basin -----	4
Figure 3. Land Use in the Maumee Basin-----	5
Figure 4. Average Annual Rainfall -----	6
Figure 5. Maumee Basin Gross Soil Erosion -----	7
Figure 6. Maumee Basin Ground Water Yields -----	11

TABLES

Table 1. Market Value of Agricultural Products Sold-----	8
Table 2. Farm Bill Program Contracts and Dollars by County-----	15
Table 3. Conservation Buffers installed in Ohio Portion of the Maumee Basin-----	16
Table 4. Conservation Practice Needs by USDA Program Area -----	21

WESTERN LAKE ERIE BASIN WATER RESOURCES PROTECTION WORK PLAN

INTRODUCTION

Lake Erie is part of the Great Lakes System which contains 20 percent of all the freshwater on the face of the earth. Tourism associated with Lake Erie provides more than \$7.4 billion annually in direct sales expenditures according to the Ohio Department of Development. Lake Erie seaports generate approximately \$1 billion revenue annually. Lake Erie sport fishing has been estimated to generate hundreds of millions of dollars in revenue annually. Lake Erie provides water supply to 3127 water treatment plants, which in 1996 withdrew an average of 437 million gallons/day (Ohio Lake Erie Commission, 1998 and 2000).

The Maumee Watershed is a highly productive and intensively farmed agricultural region of Indiana, Michigan, and Ohio. Its agricultural production is extremely important to the State's economy. Due to the high percentage of cultivated crops, the watershed is also the largest contributor of suspended sediments to Lake Erie and soil loss and soil erosion are among the most important economic and water-resource issues in the Lake Erie Basin (Myers, et. al, 2000). The Maumee River discharges more tons of suspended sediment per year than any other tributary to the Great Lakes (Baker, 1993). A portion of this sediment is trapped in Maumee Bay, necessitating annual dredging to keep the Port of Toledo open. Dredging costs on the average are more than \$2.2 million annually, in addition to the environmental costs of dredging and disposing of the dredged sediment.

Of the 14 potential beneficial use impairments listed in the Great Lakes Water Quality Agreement, only 3 are not impaired in Lake Erie. Land use practices and nutrient loading are the primary human activities affecting the future state of the Lake Erie ecosystem (Lake Erie LAMP, 2000).

In the year 2000, the Ohio Lake Erie Commission adopted the Lake Erie Restoration and Protection Plan, which established a goal of reducing sediment delivered to the lake by 67 percent.

Although vastly improved from the 1960s, Lake Erie beaches are still under a "No Swimming" advisory approximately 20 percent of the summer due to bacterial contamination (Lake Erie Restoration and Protection Plan, 2000).

Goal and Objectives

The goal of this project is to protect and preserve the water resources of the Western Lake Erie Basin. By initiating a cooperative watershed planning process with concurrent plan implementation, both short- and long-term water conservation needs in the basin can be met.

The objectives of this effort include:

- Reduction of soil erosion and sediment delivery to Lake Erie
- Reduction of dredging costs in the Toledo Harbor
- Safeguarding drinking supplies in the basin
- Minimization of water flow spikes which result in flooding
- Protection of fish and wildlife habitat both in tributaries and in Lake Erie
- Restoration of wetlands and riparian forests

The adoption of the following conservation practices by farmers in the watershed will be necessary to meet the objectives:

- Conservation tillage
- Wetland restoration and enhancement
- Nutrient and manure management systems
- Cropland conversion
- Controlled drainage
- Buffer/filter strips

Numerous Farm Bill programs as well as other Federal, State, local and nonprofit programs are available to assist basin landowners to adopt these conservation practices.

SETTING AND BACKGROUND

General Description of Watersheds

The Western Lake Erie Basin is biologically the most productive of any region in the Great Lakes (Figure 1). The Western Basin receives significant drainage from the Ohio tributaries of the Maumee, Portage, and Ottawa Rivers and from the Raisin River and Detroit River in Michigan. There are also several smaller streams which provide direct discharge into the Western Basin. For the purpose of this plan, the project area will include all the drainage entering the Western Basin of Lake Erie from the Ohio State line east to (but not including) the Sandusky River Watershed (Maumee Basin and cross-hatched area of Figure 1). Since the Maumee River covers much of this area and typifies all of the project area, it is used for the purpose of illustrating the existing condition and resource treatment concerns. The treatment needs and budget developed for this project include all the land area draining from or through Ohio into the Western Basin.

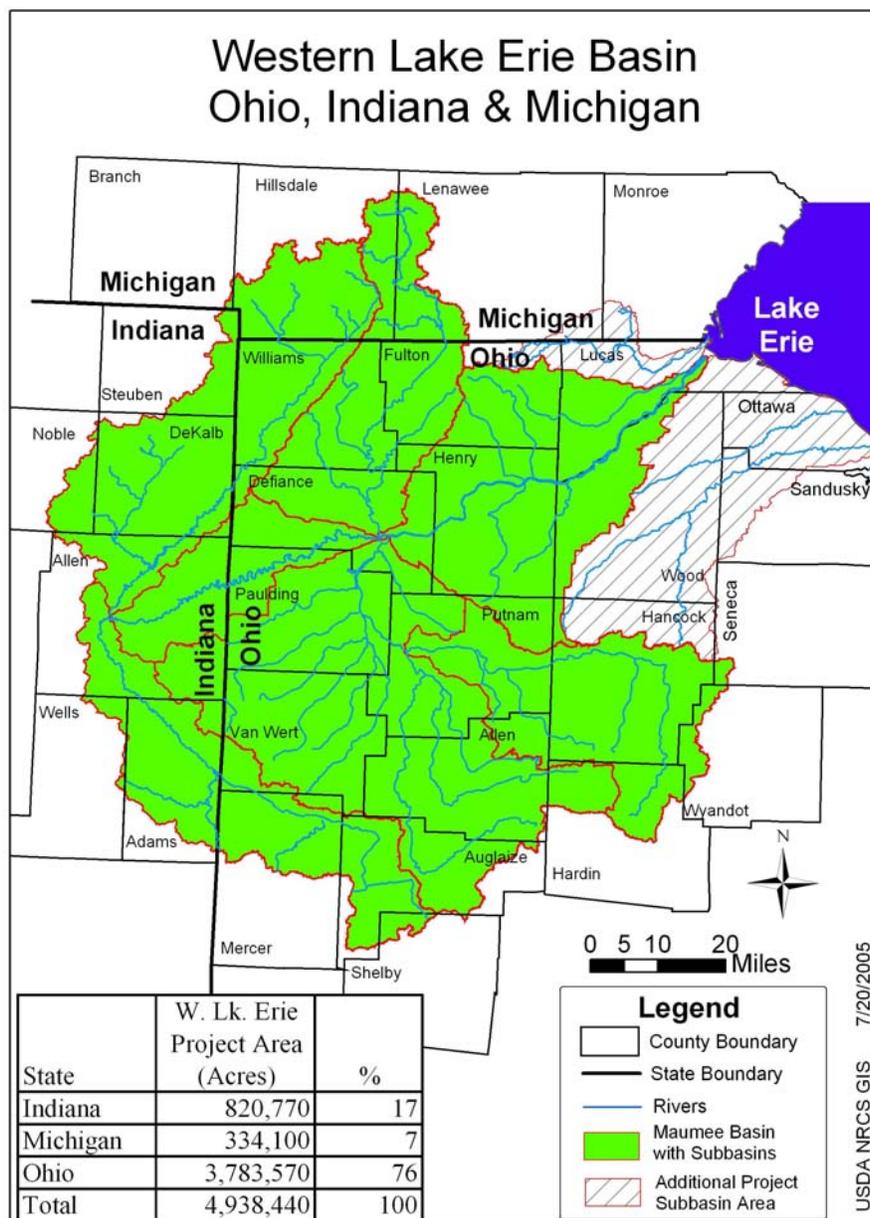


Figure 1 – Western Lake Erie Basin

Located in Indiana, Michigan, and Ohio, the Western Lake Erie Basin covers over 4.9 million acres. Three urban areas are located in the basin - Toledo adjacent to Maumee Bay in Lake Erie, Fort Wayne at the western boundary of the watershed in Indiana, and Lima near the southern boundary of the watershed in Ohio. Many smaller towns and cities are scattered throughout the watershed. The population of the basin area is over 1.2 million people (Figure 2).

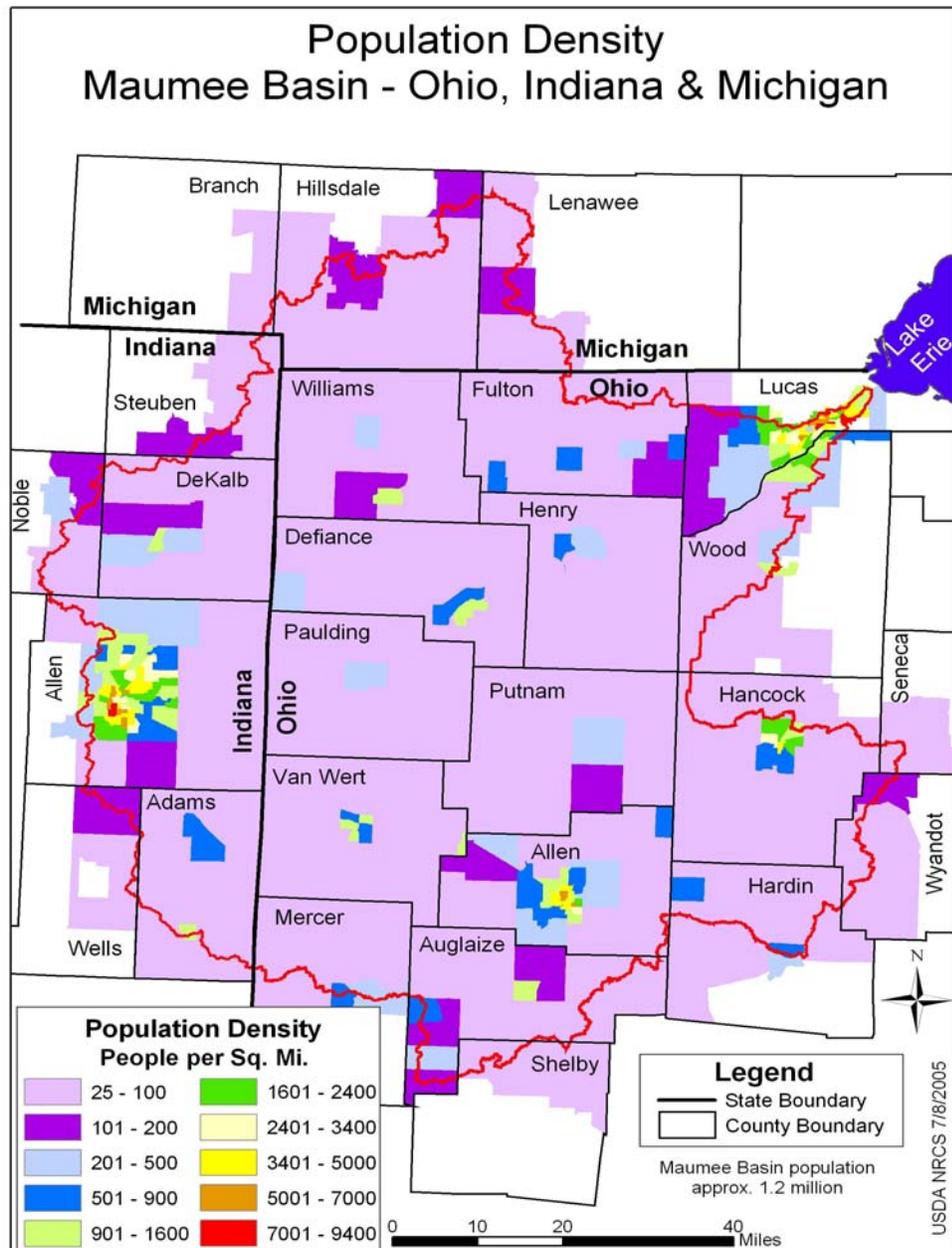


Figure 2 – Population of the Maumee Basin

Land Use

Agriculture is the predominant land use with 2,990,400 acres (71 percent) of the basin area in cropland (Figure 3). There are 14,820 farms with an average of 230 acres per farm. Urban development and roads represent 10 percent of the area. Forested land comprises 8 percent of the watershed (1997 National Resources Inventory (NRI) revised 2000).

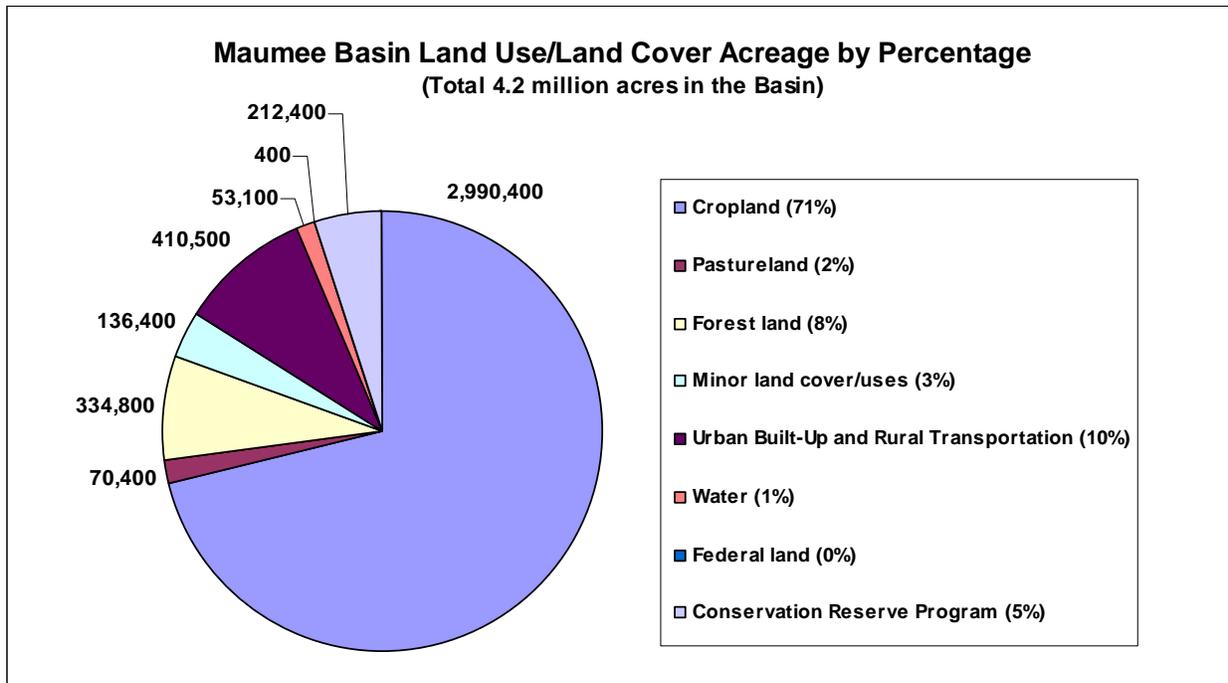


Figure 3 – Land use in the Maumee Basin

Soils

Soils are mostly moderately poorly drained to very poorly drained. Accordingly, over 90 percent of the agricultural land is drained by surface ditches and subsurface drains. With the added drainage, soils that are naturally poorly drained become better drained and highly productive. Parent material of the soils is glacial till from the several glaciers that traveled across the basin. The center portion of the basin is very flat lake plain surrounded by the slightly more sloping glacial till plains.

Precipitation

The region has abundant rainfall which is normally well distributed throughout the growing season. Average annual precipitation varies from 33 inches to 37 inches, depending on location in the watershed (Figure 4).

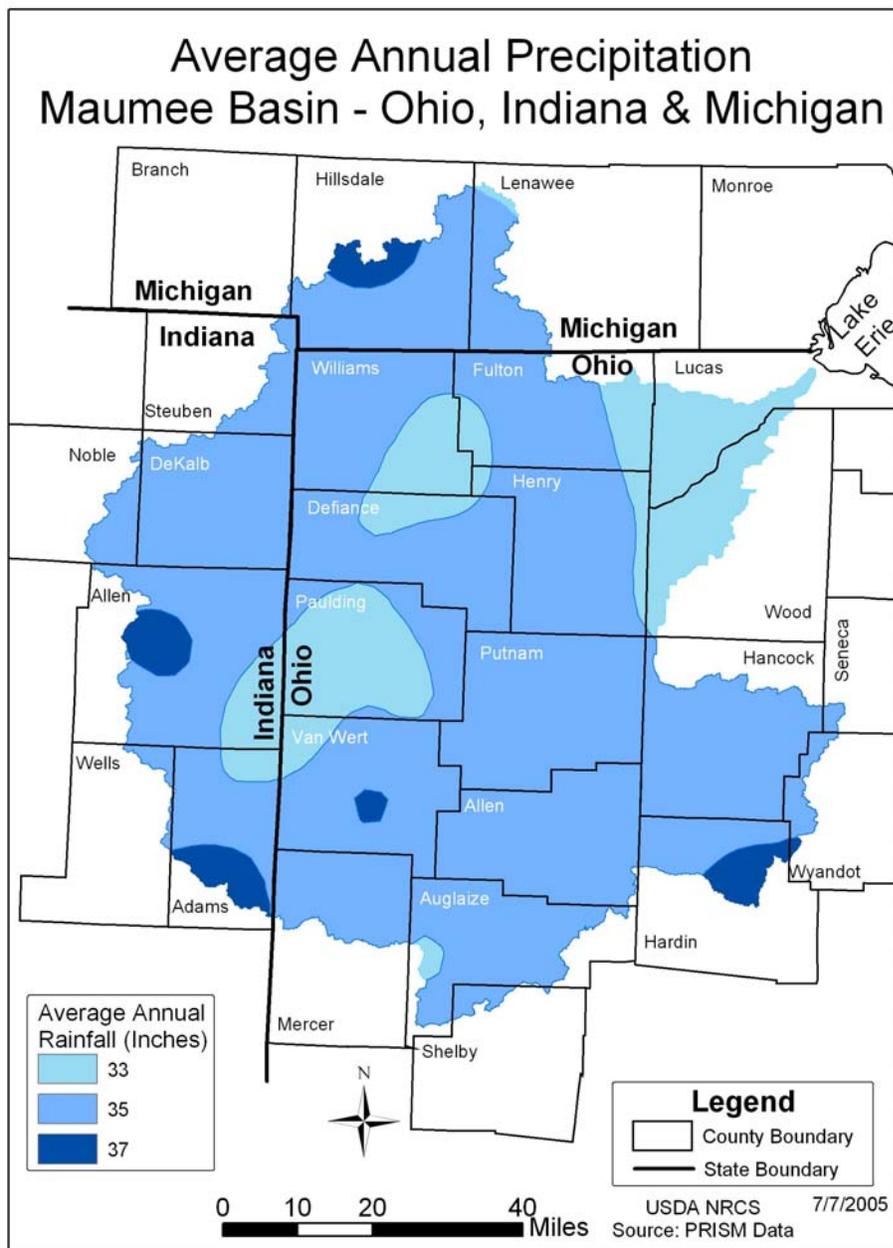


Figure 4 – Average Annual Rainfall

Soil Erosion

The 1997 NRI (revised 2000) data shows that 4,958,700 tons of soil per year were eroding away in the Maumee Basin (Figure 5). In 1997 dollars, the cost of this soil erosion is estimated to be \$33,790,185. Conversely, 4,800,600 tons of soil have been retained on the land representing a savings of \$31,979,475 to land owners and millions to municipal water treatment plants.

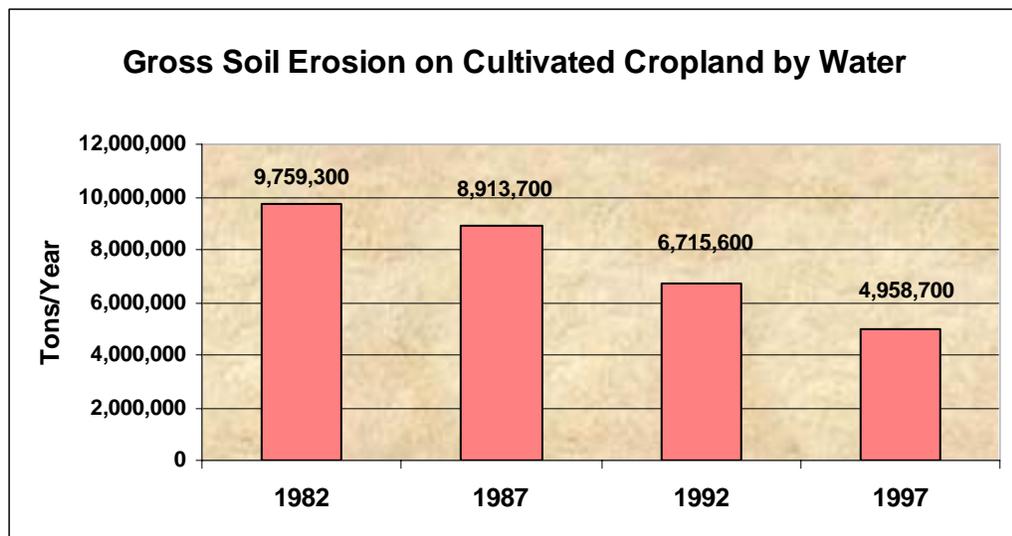


Figure 5 – Maumee Basin Gross Soil Erosion

NRCS has a proven track record in conservation planning and implementation of Farm Bill programs to successfully address soil erosion. Since 1982, soil erosion in the Maumee Basin has been reduced nearly 50 percent on cultivated cropland.

Even though much of the watershed is at or below Tolerable Soil Loss (“T”), a soil erosion problem still exists from a water quality perspective. The soils in the watershed have a high clay content and once in suspension are easily transported a long way. The clay soils, along with the efficient drainage systems in the watershed and the large acreage of cultivated cropland, all combine to deliver a large sediment load to the mouth of the Maumee River. Thus, the Maumee delivers the largest loads of sediment and nutrients to Lake Erie. The Maumee also delivers the largest discharge of any tributary in Lake Erie.

NRCS technical and financial assistance have been identified in numerous reports dating from 1963 as being the treatments needed to address sedimentation and its consequences impairing Maumee Basin streams and ultimately Lake Erie.

Port of Toledo

The Port of Toledo, located at the mouth of the Maumee River, is one of nine major ports on Lake Erie. Approximately 1512 million tons of cargo, including ore, coal, grain, fertilizer, petroleum, and steel, are shipped through the port each year. Annual dredging of the port is needed to keep the ship channel open and requires dredging of an average of 850,000 cubic yards of sediment at an average cost of at least \$2.2 million per year.

In addition to being costly, disposal of the dredge material presents many environmental challenges. Currently, most of the dredge material is disposed of by being dumped in the open lake. The more toxic material is placed in a confined disposal facility, which each year reduces the capacity to dispose of future dredged material in this facility. Construction of new confined disposal facilities is expensive and environmentally challenging and controversial.

The Toledo Harbor interagency team is searching for solutions to the dredging problem and has adopted source reduction as one means to reduce the magnitude of the problem. A goal has been established to reduce sediment contributed to the harbor from agricultural sources by 15 percent over 1993 reference conditions.

Lake Erie Recreation

Tourism sales in Ohio's seven Lake Erie counties amount to more than \$7.4 billion annually. The economic impact of the Lake Erie sport fishing industry is estimated at hundreds of millions of dollars annually. Tourism and sport fishing are directly related to water quality and the health of the lake.

Agriculture and Economic Impact of Ag Production

According to the National Agricultural Statistics Service's 2002 Census of Agriculture, the annual market value of agricultural products sold from the Maumee Basin exceeded \$1 billion dollars (Table 1). Corn and soybeans are the dominate crops grown, with lesser amounts of wheat, hay, and oats. Livestock operations include dairy cows, beef cows, hogs, and chickens. The basin is approximately one-sixth the size of Ohio, but produces agricultural products equal to about 24 percent of Ohio's total (\$4.26 billion¹).

State	Area of Maumee Basin	Market Value of Products Sold
Indiana	19%	\$190,953,729
Michigan	7%	\$61,946,126
Ohio	74%	\$756,750,517
Total Maumee		\$1,009,650,372

Table 1 - Market Value of Agricultural Products Sold

RESOURCE MANAGEMENT ISSUES IN THE WATERSHED

Water Quality Issues

Lake Erie Water Quality

The 2004 State of the Lake Report stated that "Lake Erie has improved considerably from the 1970s when mats of floating algae and problems with odor and poor aesthetics were all too common. However, problems with pollution continue to this day. Point sources are largely under control, but nonpoint sources continue to be significant."

"For the most part, point sources of pollution have been greatly decreased in the Lake Erie watershed and rate **Excellent** (Lake Erie Quality Index). Watershed sources of pollution particularly from agriculture, streambank erosion, and construction site runoff continue to be the primary cause of degradation to Lake Erie, rating **Poor** (Lake Erie Quality Index)."

With the passage of the Clean Water Act, the Great Lakes Water Quality Agreement, and other efforts, water quality in the lake improved tremendously. However, in recent years, there has been a decreasing trend in the health of the lake. Once again, we are seeing blue-green algae blooms, increased attached

¹ 2002 Census of Agriculture, National Agricultural Statistics Service, USDA, <http://www.nass.usda.gov/census/>. County data were prorated by percent area in the Maumee Basin.

algae (*Cladophora*) growth along the shoreline, and an increase in the area of low to no dissolved oxygen (anoxia) at the bottom of the central basin. In addition, in recent years, *Microcystis*, a potentially deadly form of algae, has appeared in western Lake Erie almost every summer since 1995. *Microcystis* was found near Toledo recently in particles large enough to be seen by the human eye. Research is underway to determine why the lake is changing and the role that nonpoint pollution may play in the return of the algal blooms.

Instream Water Quality

The Ohio Environmental Protection Agency Total Maximum Daily Load (TMDL) Priority List indicates impairment in all of the eight 8-digit subwatersheds in the study area. Siltation, flow and habitat alteration, organic enrichment/low dissolved oxygen, metals, and turbidity are identified as the pollutant causes. One Western Lake Erie Basin TMDL report has been completed on the Upper Auglaize subwatershed. TMDL reports will be completed on all the impaired Western Lake Erie Basin subwatersheds by 2014.

Dredging

Soil that is eroded from farm fields ends up as sediment deposited in drainage ditches, streams, rivers and Lake Erie. In many instances, the sediment needs to be removed on regular intervals to maintain drainage capacity. The most significant of these instances is the Toledo Harbor. The U.S. Army Corps of Engineers must dredge yearly to maintain the shipping channel in the harbor and the lake. On the average, 850,000 cubic yards of sediment must be dredged annually, at a yearly cost of \$2.2 million or more. In addition to the cost, dredging disturbs contaminated sediments and the dredged material must be disposed of, creating environmental concerns and difficulties. Space for additional confined disposal facilities is scarce and existing facilities are filling up. An interagency team has labored for many years to find solutions to the dredging and disposal problem, and reduction of source loads has been identified as one part of the overall solution. Widespread adoption of Farm Bill conservation practices has the potential to reduce the amount of sediment entering the harbor for the Maumee Watershed.

A dredging concern which is not as noticeable, but is much more prevalent, is the widespread need to periodically reconstruct thousands of miles of drainage ditches in the watershed to maintain drainage capacity. As sediment accumulates in the bottom of the drainage ditches, the depth of the ditches decreases and eventually tile outlets are restricted or covered and cease to function. Reconstruction of these ditches is expensive and environmentally disruptive. A reduction in soil erosion would lengthen the time between ditch cleanouts and lessen environmental impacts.

Drainage Needs and Concerns

What was known as the Black Swamp covered a considerable portion of the Maumee River Basin in northwest Ohio and northeastern Indiana. This area was inhospitable for farming (or living) despite having rich soils due to the swampy conditions. Efforts to change the land into an area that was farmable were slow and difficult. By 1900², almost a century after Ohio became a state; most of the swamp had been drained and made a rich and productive farmland. The open ditches and subsurface drainage that enabled the transformation remain essential keys to the agricultural production of the area.

² Black Swamp Conservancy, http://www.blackswamp.org/swamp%20history/swamp_history.html

The estimated market value of agricultural products sold in 2002 in the Maumee Basin was over a billion dollars³.

Maintaining the open ditches for both capacity and depth (for subsurface drain outlets) remains of continuing importance to the agricultural producers in the Maumee Basin. Likewise, maintaining the subsurface drainage systems is a priority for maximizing the productive capacity of the land. Although often considered environmentally unfriendly due to the disappearance of wetlands, subsurface drainage has more benefits than higher production. Reducing the wetness of the upper soil horizons allows for greater infiltration during rainfalls and, thereby, reduces surface runoff and the corresponding erosion⁴.

Flooding Issues

Heavy rainfall events can cause significant flooding in the watershed as was seen in the storm that hit western Ohio (including Mercer, Van Wert, Auglaize, and Shelby Counties) over the July 4th weekend in 2003. The heaviest rainfall was in southern Van Wert and northern Mercer Counties where 9 to 15 inches of rain fell within a few days.

Many natural channels carry only the annual or 2-year event within bank. Larger events make use of the floodplain to store and convey water downstream. Encroachment of the floodplain is a main cause of the flood damages that occur. By keeping high value development such as homes and businesses out of the floodplain, flood damages can be largely prevented. Local community, township, and county regulations and the National Flood Insurance Program are designed to prevent flood prone development from being built in harm's way.

Where communities have already built in or near the floodplain, various remedial actions include channel modification, relocation, flood proofing, and establishment of wetland areas along the stream corridor that serve as natural flood storage areas. Flood retarding reservoirs are not an option due to the mostly flat terrain in the Maumee Basin.

Water Supply - Drinking Water Quality and Quantity

Communities in the basin rely on both surface and ground water for water supply. From USGS data for 1990 it is estimated that 55 percent of the population is supplied from surface water and 45 percent from ground water⁵. Ground water is used where it is available in sufficient quantities and quality. Where it is not available or where surface supplies are more cost effective, surface waters are used. Some communities use a combination of the two sources. The Maumee Watershed receives an average of 31-37 inches of precipitation per year.

Ground Water Quality and Quantity

Parts of the Maumee Watershed have abundant, good quality groundwater compared to much of Ohio. According to the Ohio Department of Natural Resources Division of Water, well yields in portions of the watershed are between 25 to 500 gallons per minute (Figure 6). In other areas of the watershed,

³ 2002 Census of Agriculture, National Agricultural Statistics Service, USDA, <http://www.nass.usda.gov/census/>. County data were prorated by percent area in the Maumee Basin.

⁴ Upper Auglaize Watershed AGNPS Modeling Project Final Report, pg. 54, http://www.oh.nrcs.usda.gov/programs/agnps/up_auglaize_ws_agnps_final_report.html

⁵ USGS water use data (1990), <http://water.usgs.gov/watuse/wudownload.html>

ground water yields are limited to less than 5 gallons per minute or ground water has a high sulfur content. In these areas, residents typically rely on surface water supplies.

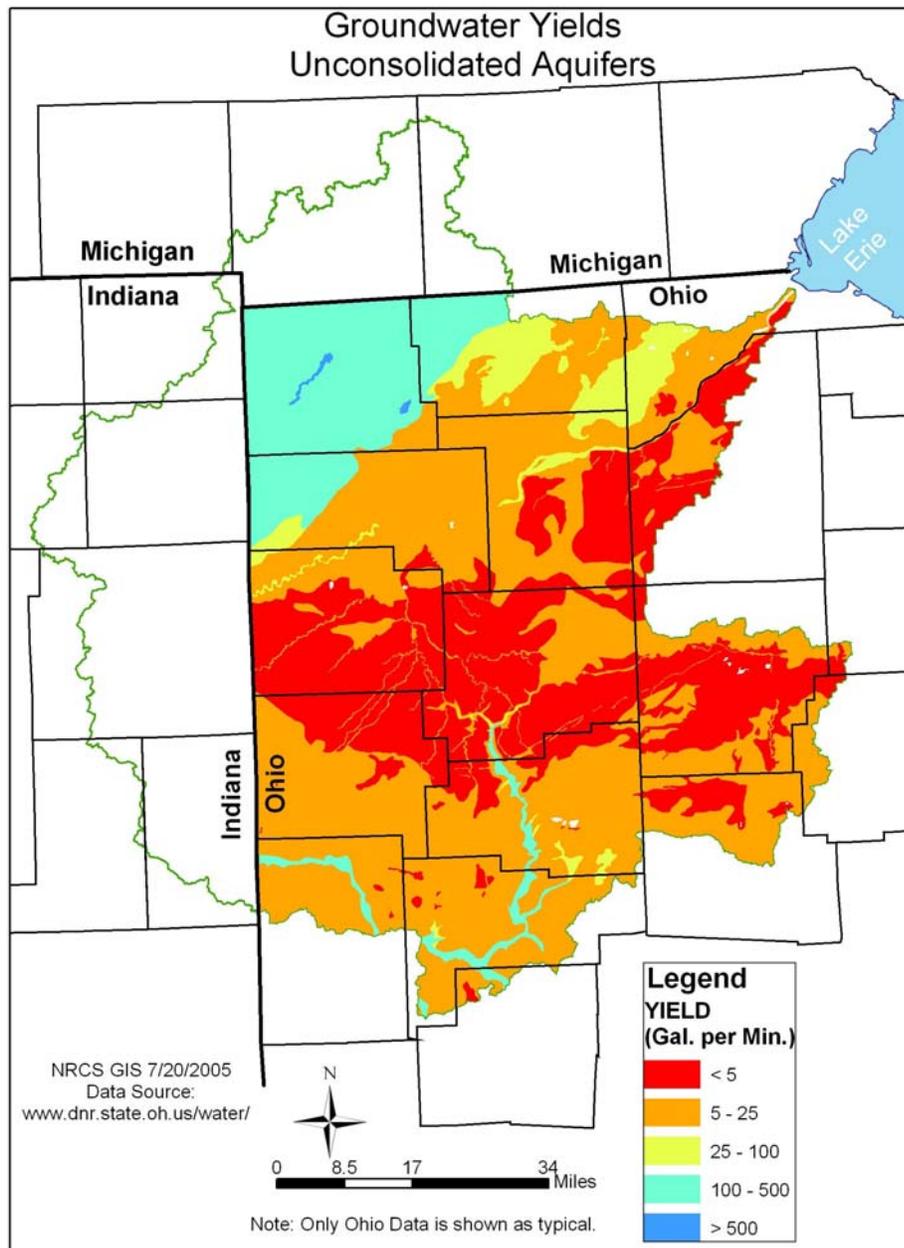


Figure 6 - Map of Maumee Basin Well Yields

Heidelberg College's Water Quality Lab has sampled tens of thousands of private wells in the Midwest. They report that most wells are free of more than trace levels of contamination either by nitrate or pesticides, with some local exceptions. Northwest Ohio counties are among the least frequently contaminated wells in the State. (Baker et al, 1989).

Surface Water Quality and Quantity

Surface water is abundant in the basin due to the proximity to Lake Erie and to the major streams that bisect the watershed, including the Auglaize, St. Mary's, Blanchard, Tiffin, St. Joseph, and Maumee

Rivers. While there is ample water available from precipitation, it is not well distributed throughout the year. As a result, storage is needed to provide a water supply during periods of low flow or during summer droughts which have a 20 percent probability of occurring any given year.

The flat topography of the watershed does not provide natural sites for water supply reservoirs. Thus, “upground” storage reservoirs are commonly constructed. The high value of northwest Ohio farm land and the need to dike all the way around the reservoirs result in high construction costs. In addition, these reservoirs take land out of production.

In contrast to the good quality ground water, surface water is generally of lesser quality and requires more treatment. Widely used pesticides are routinely detected in surface waters in northwest Ohio, though they generally do not exceed health advisory levels on an annual average basis (Richards, et al., 1995).

Nitrate Alerts

Similarly, nitrate concentrations in northwest Ohio rivers often exceed the Maximum Contaminant Level of 10 mg/L. Typically, communities using these rivers for public water supplies have alternative sources, such as wells that can be used to mix with the river water to bring the concentration into the safe range. However, it is not unusual for boil water advisories to be issued in the spring of the year. For example, data from the Water Quality Lab show that concentrations in the Maumee River at Waterville exceeded 10 mg/L on 145 of the 1602 days (9 percent) sampled between January 1, 2000, and December 31, 2004 (R. Peter Richards, personal communication) and concentrations exceeded 5 mg/L on 732 days (46 percent). Higher concentrations in surface water reflect the capture of field drainage by tiles and its return to surface water, as well as the age (hundreds to thousands of years) of water tapped by many wells.

Loss of Wetlands

Prior to settlement, over half of the Maumee River watershed was wetland. Much of the watershed was part of the Great Black Swamp, a large maple-ash-oak wet forest that stretched from Toledo to Fort Wayne. Outside of this lake plain area, numerous smaller wetlands were found in depressions in the till plain. Beginning with large-scale drainage projects in the mid 1800s the wetlands have been converted through draining and filling. Currently, less than 5 percent of the watershed is wetland and many of the remaining wetlands are degraded. Although much of this wetland acreage has been converted to productive farmland, there has been a tremendous loss of wetland functions such as nutrient or sediment storage and cycling, storm water conveyance or storage, and fish and wildlife habitat.

Wildlife Habitat

Much of the remaining wildlife habitat in the watershed tends to be fragmented and of moderate to poor quality. Species dependent on large or connected patches of good habitat are rare, while species adapted to lower quality habitat with abundant edge are more common. Unique plant communities, such as the Oak Openings and wet prairies (and their associated animal communities), have been reduced to small remnants. Even where larger blocks of better habitat occur, the intensity of adjacent land use affect wildlife use. Expanding on areas of better habitat would address this issue somewhat.

Aquatic habitat in streams has been seriously degraded by sedimentation, organic enrichment and lack of riparian cover. Fish, mussel, and aquatic invertebrate communities have been significantly depleted in many of the watershed's streams and recovery will be unlikely unless improvement is made in streamside and in-channel conditions. A few federally-listed species are found in the watershed; range expansion will require protection of existing habitat and creation of new, suitable habitat.

Forestry Issues – Windbreaks, Riparian Buffers, and Agro-Forestry Issues

There is a significant need in the watershed for forestry practices and restoration of some forest functions. Currently, the watershed is only 8 percent forested. Clearing and conversion of land for agricultural production has removed a large share of the original forest which covered the watershed in pre-settlement times. In some areas, entire sections of land are devoid of trees. The removal has resulted in greater volumes of runoff, reduced times of concentration, and increased peak flows of runoff. The removal of riparian forests has resulted in a loss of habitat, increased stream temperatures, and reduced capacity for flood water storage in the floodplains. The removal of woody fencerows has increased soil erosion due to wind and increased problems with blowing snow in the winter.

While the high value of the land for agricultural production assures that it is not feasible, practical, or desirable to reforest large areas of the watershed, there are tremendous opportunities to use buffer practices to reforest strategic areas. Reforestation of strategic areas, such as riparian forest buffers, and windbreaks, can provide huge benefits without removing a lot of land from agricultural production. Widespread adoption of these practices in the watershed would reduce soil erosion, slow runoff, reduce flooding and improve habitat. USDA Farm Bill programs can provide a very effective vehicle for increasing the installation of these practices in the watershed.

Grazing Lands Conservation

Grazing livestock and equine operations are an important part of the agriculture economy and environment. Forages can provide most of the nutrition for forage consuming livestock and horses. The equine industry is growing in Ohio and in the Maumee River Basin, especially in the rural-urban interface. There is also a growing demand for forages due to the increase in dairy cattle within the Maumee River Basin. The 1997 NRI reported 70,400 acres of existing pasture and 174,400 acres of whole field CRP. Improving the management of these acres will promote the ecological and economic stability of the grassland resource by improving the soil, water quality, air quality and the plant community.

Converting other highly erodible and marginal cropland to forage based agriculture can reduce erosion, improve soil and water quality, and increase grassland wildlife habitat. NRCS technical assistance and financial programs for private grasslands can enhance these natural resources. Implementing grassland conservation practices will improve and sustain the soil, water, plant, air, and wildlife resource conditions.

Emerging Technologies

Several emerging conservation technologies offer new ways to achieve environmental improvement in the watershed. Two of the more promising technologies include controlled drainage and wetland restorations.

Controlled Drainage

Controlled drainage is the process by which tile drainage systems are managed to close off tile flows during parts of the year when the drainage is not needed. Most systems in the watershed were installed with gravity flows which make them operational year around. However, the drainage is only needed during the parts of the year when the crop is under production. Pilot projects are underway to demonstrate that these systems can be managed or closed off part of the year. This prevents export of nutrients, pesticides, and/or sediment out of these systems during this time frame. In addition, some systems are being designed to allow blocking of the tile for subsurface irrigation purposes. With these systems, small reservoirs may be installed to recirculate the tile water. Demonstration projects currently are underway by the Maumee Valley Resource Conservation and Development Council. With additional research and successful field scale demonstrations, the opportunity exists to develop a new method of conservation treatment which can take water quality improvements to a higher level of achievement.

Wetland Restoration

Wetland restoration and creation is a relatively new tool in the conservation treatment arsenal. The addition of restored or created wetlands at strategic locations in the drainage network slows the rate of runoff during storm events and provides opportunities to filter runoff and trap sediment, nutrients, and pesticides. This can result in improved water quality and reduced delivery to downstream receiving waters. In the past, farmers were quick to drain wetlands. With the advent of financial incentives for wetlands under the Farm Bill programs (including WRP, Continuous CRP and CREP), farmers are viewing these practices in a new light. Acceleration of Farm Bill implementation offers the opportunity to reduce sediment delivery from the watershed, improve water quality, and restore or create habitat.

Water Withdrawals and Diversions and the Great Lakes Compact

The Great Lakes hold 20 percent of the earth's and 90 percent of the U.S. freshwater. Millions of gallons are pumped out annually, but only 1 percent is replenished each year by rainfall. Elsewhere in the world, diversions have already depleted major bodies of water or groundwater aquifers. In 1999, a company considered hauling water in tankers to drought ridden Asian communities. This event precipitated a major effort to protect Great Lakes water from diversions.

Governors of the Great Lakes States and Premiers of the Canadian Provinces responded with the Annex 2001 Amendment which updated the regional water management system and sought to conserve and improve the Great Lakes. On June 30, 2005, they released the second draft of the Great Lakes Basin Sustainable Water Resources Agreement for public comment. Provisions of this agreement will protect the waters of the Great Lakes, prevent diversions, and require water conservation measures. This compact is on track to be adopted later this year and will make great strides in protecting the waters of the Great Lakes Region.

Recent Conservation Accomplishments

Since the authorization of the Farm Security and Rural Investment Act of 2002 (Farm Bill), 9352 contracts worth \$18,335,193 have been developed in the Ohio portion of the Western Lake Erie Basin (Table 2). Financial assistance for conservation practices has been obligated through the Wildlife Habitat Incentives Program (WHIP), the Environmental Quality Incentives Program (EQIP), the Wetlands Reserve Program (WRP), the Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP), the Conservation Security Program (CSP), and the Grassland Reserve Program (GRP).

Ohio County	Farm Bill Program Contracts	Farm Bill Program Dollars
Allen	664	\$1,085,362.24
Auglaize	716	\$1,594,190.21
Defiance	1416	\$2,133,550.60
Fulton	591	\$1,989,875.84
Hancock	343	\$422,946.27
Hardin	178	\$936,019.09
Henry	885	\$420,296.78
Lucas	42	\$315,615.00
Mercer	287	\$939,688.16
Ottawa	228	\$577,423.23
Paulding	549	\$1,362,085.15
Putnam	697	\$1,001,707.09
Sandusky	555	\$532,621.27
Seneca	17	\$22,098.10
Shelby	49	\$88,275.19
Van Wert	443	\$1,293,014.29
Williams	1063	\$3,230,948.64
Wood	556	\$291,558.45
Wyandot	73	\$97,917.45
TOTAL	9352	\$18,335,193.05

Table 2 - Farm Bill Program Contracts and Dollars by County

While much has been accomplished through these conservation programs, the unfunded backlog of applications indicates that more can be done to achieve the basin's conservation goals on private land. In Ohio there are 165 EQIP applications (\$2 million) and 25 WRP (\$1.2 million) applications waiting for funds.

Demand for Lake Erie CREP has been strong but acreage enrollment is dependent upon matching state funds. Revision of the Lake Erie CREP is being considered to enable 25,000 acres to be included in the program.

Table 3 shows that a very significant number of new conservation buffer practices have recently been installed in Ohio portion of the watershed. Much of the impetus for these buffers was the result of promotional efforts by the Lake Erie Buffer Team. The NRCS-led Lake Erie Buffer Team was an interagency group of 22 partners from governmental and private organizations that developed and carried out a multi-facet program to market conservation buffers. Their efforts resulted in a doubling of the rate of installation of buffers that were installed using Farm Bill and other programs within the watershed.

Maumee Basin (Ohio only) Conservation Buffer Accomplishments in Acres					
Fiscal Year 1997 thru Fiscal Year 2003					
Fiscal Year	Continuous CRP	CREP	319 Program	WRP	Total Acres
1997	1524	0	0	1245	2769
1998	3222	0	0	569	3791
1999	1167	0	0	95	1262
2000	799	424	0	295	1518
2001	1210	4945	567	227	6949
2002	1033	3141	0	118	4292
2003	657	3395	0	312	4364
Total	9612	11,905	567	2861	24,945

Table 3 - Conservation Buffers Installed in Ohio Portion of the Maumee Basin

EXISTING WATERSHED INFORMATION AND STRATEGIC DOCUMENTS

The status and trends of Lake Erie water quality are well documented via long-term monitoring and published research. Heidelberg College has monitored sediment, nutrient, and pesticide loadings into the lake via daily (or more frequent) sampling since 1979. The sampling program includes a station near the mouth of the Maumee River at Waterville. U.S. Geological Survey carried out a National Water Quality Assessment Program (NAWQA) in the Lake Erie and Lake St. Clair Basins. U.S. EPA, Ohio EPA, and the Ohio DNR have done extensive water quality sampling and monitoring.

Current status of Lake Erie water quality is best summarized in these studies and reports:

1. The Lake Erie Restoration and Protection Plan, Ohio Lake Erie Commission, 2000.
2. The Lake Erie Restoration and Protection Plan, Second Progress Report, Ohio Lake Erie Commission, 2004.
3. The Lake Erie LAMP (Lake Wide Area Management Plan), 2000.
4. Status and Trends in Suspended Sediment Discharges, Soil Erosion and Conservation Tillage in the Maumee River Basin, U.S. Geological Survey, 2000.
5. Lake Erie Agricultural Systems for Environmental Quality Study (LEASEQ), Heidelberg College and Ohio Agricultural Research and Development Center, Baker, Calhoun, et al., 1997.
6. Upper Auglaize Watershed Agricultural Non-Point Source (AGNPS) Modeling Project Final Report, Bingner et al., 2005.

Collectively, this body of work documents that while progress has been made in restoring and improving Lake Erie, much remains yet to be done. The Lake Erie Restoration and Protection Plan Reports that:

- Over 90 percent of Lake Erie marshlands have been filled or converted to some other use.
- Of the 12 major tributaries, 4 were rated only “fair” by the Qualitative Habitat Evaluation Index and 6 rated “poor.”
- Over 1.1 million tons of sediment is transported every year down the four largest tributaries (including the Maumee). This is over twice the desired load calculated as needed to reduce detrimental impacts.
- Lake Erie near shore areas cannot support healthy biological communities across the shoreline. Of 21 areas assessed by the index of Biotic Integrity, 14 rated only “fair” and 5 rated “poor.”

The Lake Erie LAMP, a lake wide management plan developed by 20 Federal and State government agencies, identified “nutrient loading and land use practices as the primary human activities affecting the future state of the lake. Land use practices affect habitat, influence hydrology and sediment runoff, and contribute to loadings of contaminants.”

The Lake Erie Restoration and Protection plan establishes the following goals and actions for Lake Erie:

- Reduce sediment loading coming from the Lake Erie Watershed into the lake by 67 percent.
- Eliminate sources of disease causing microorganisms into Lake Erie so that no beach is ever under an advisory.
- Increase from 52 percent to 80 percent the percentage of agricultural acreage under conservation tillage in the Lake Erie Watershed.

- Establish conservation buffers on 80 percent of the Lake Erie Watershed ditches, streams, and tributaries.
- Reforest riparian corridors and marginal acreage in the Lake Erie Watershed.
- Expand wetlands within the Lake Erie Watershed.
- Protect critical fish spawning areas within the Lake Erie Watershed.

Beyond the Lake Erie Restoration Plan, the Great Lakes Regional Collaboration, a partnership of Federal, State, and local governments, as well as other stakeholders, has also identified a strategy to protect the entire Great Lakes. That draft plan also identifies nonpoint sources as contributing significantly to the problems of the Great Lakes and identifies buffer practices, cropland soil management, manure management plans, wetland restorations, and hydrology improvements as vital to addressing problems of the Great Lakes.

In addition to defining current water quality status and establishing goals, these collective bodies of work also identify effective and needed treatment alternatives. Together, the USGS Sediment Discharge Report, the LESEAQ report and the AGNPS Modeling project results document and quantify the effectiveness of conservation tillage in reducing erosion and sediment delivery, as well as reducing the volume of runoff. The LESEAQ report substantiates the beneficial effect of this practice at the watershed level over time.

The Lake Erie Protection Plan, the Great Lakes Regional Collaboration, and the AGNPS Modeling Project identify buffers, including filter strips, riparian forest buffers, windbreaks, and wetland restorations, as well as nutrient management, as important practices to meet Maumee Watershed and Lake Erie protection and restoration goals.

All of these critically important practices can be applied to the watershed in increased amounts to help achieve goals of the Lake Erie Restoration Plan via acceleration of the rate of adoption of USDA Farm Bill programs within the watershed.

The pertinent programs that will be used to accomplish the conservation treatment needs include:

- Environmental Quality Incentives Program (EQIP)
- Wildlife Habitat Incentives Program (WHIP)
- Conservation Reserve Program and Conservation Reserve Enhancement Program (CRP and CREP)
- Wetlands Reserve Program (WRP)
- Grazing Lands Conservation Initiative (GLCI)
- Conservation Security Program (CSP)

Conservation practices that will be implemented using the above tools within this accelerated planning and land treatment program will include:

Conservation Tillage/No-till
Nutrient Management
Grass Filter Strips
Animal Waste Utilization
Riparian Forest Buffers
Windbreaks

Tree Plantings
Drainage Water Management/Controlled Drainage
Wetland Restorations and Enhancements
Grazing Land Management
Waste Storage Structures
Critical Area Plantings

A BASIN WIDE PROJECT APPROACH TO ADDRESS THE RESOURCE MANAGEMENT ISSUES

The Western Lake Erie Basin Water Resources Protection Project will use a planning and implementation approach to address the basin's and lake's resource management concerns. The planning phase of the project will include both a Rapid Resource Assessment and an Area Wide Watershed Planning Component. The implementation phase will involve using the planning information to accelerate land treatment. Both phases will be implemented concurrently.

Rapid Resource Assessments and Area Wide Watershed Planning Component

The Rapid Resource Assessment will be step one of this component. A rapid assessment will identify current resource conditions on private lands, recommend resource management systems to solve identified problems, and estimate (quantitative and/or qualitative) on-farm effects. Water Resource Planning staffs for NRCS in Ohio, with field office staff assistance, will complete the rapid assessments on an 8-digit hydrologic unit basis. There are eight 8-digit subbasins in the Maumee Watershed and other regions of the project area. All eight rapid resource assessments for the entire basin will be completed by September 1, 2007.

Step two of this component will be the assembling of the rapid resource assessment on a basin wide scale. Cumulative effects analysis will evaluate the effects of the compiled data on the basin as a whole. This analysis will involve other environmental studies, peer reviews, and collaboration among other interested parties such as government agencies, organizations, individuals, and groups within the basin.

Concurrent Land Treatment Implementation Component

The Maumee Watershed and Lake Erie is one of the most studied areas in the Midwest. Ample research and planning exists to document the problem and identify overall the types of practices needed to reduce the problems. The time for action is now and there is no need to wait for further studies before beginning to accelerate implementation of proven conservation practices in the current Farm Bill programs. Thus, this plan will start an accelerated land treatment implementation program concurrently with the start of the Rapid Resource Assessment phase.

The assembled Rapid Resource Assessments and other area wide planning information will then be used to provide technical assistance for the implementation component using an Adaptive Management Process. The adaptive management strategy will utilize the compiled rapid assessment data to ensure that the implementation phase is using the best applied science available. The implementation will be evaluated and adjusted throughout the project using the area wide planning information to efficiently and effectively target resources and assistance.

The implementation phase will consist of on-farm planning and implementation and include one-on-one landowner technical assistance by certified NRCS planners to develop individual farm and ranch conservation plans and to obtain financial assistance to apply conservation systems.

Implementation of conservation systems and practices will require a combination of technical assistance (TA) and financial assistance (FA). TA is used to conduct resource inventories, evaluate inventory data, provide tools and techniques to implement systems and practices, and install many of

the management practices that require minimal financial support. FA provides cost-share and economic incentives to install more costly conservation systems and practices.

BASIN WIDE PLANNING AND IMPLEMENTATION

Assistance will occur in two phases; basin wide planning and on-farm implementation. Basin wide planning will begin immediately. On-farm implementation phase will be carried out from August 2006 through August 2015.

Rapid Resource Planning and Basinwide Planning Strategy

A strategy and staffing needs were developed for the Rapid Resource Assessment phase. Rapid Resource Assessments will be prepared for each of the eight 8-digit sub-watersheds during the two year period at the start of the project. A rapid resource assessment team has been assembled by NRCS and includes agronomy, soils, hydrology, economic, and water quality expertise. This team will be working with local stakeholders, partner agencies, and field offices in the watershed to evaluate resource conditions and complete the assessments.

On-Farm Implementation Strategy

Conservation practice treatment needs were developed by practice and by USDA Farm Bill programs for the 10 years of the project period. Table 4 outlines conservation practice needs by USDA program area.

Major Conservation Practice Needs Over the Next 10 Years			
CONSERVATION NEED		GOAL	PROGRAM
Conservation Acres Planned			
	CTA Planning	1,500,000 acres	
Management Practices			
	Conservation Tillage	500,000 acres	EQIP
	Cover Crops	100,000 acres	EQIP
Buffers			
	Filter Strips	35,000 acres	CRP/CREP
	Riparian Buffers	10,000 acres	CRP/CREP
	Grassed Waterways	5,000 acres	CRP/CREP
	Windbreaks	1,500 acres	CRP/CREP
Nutrient Management			
	CNMPs	1,000 no.	EQIP
	Fertilizer Containment System	5000 no.	EQIP
	Precision Farming	200,000 acres	EQIP
Wetland Restoration			
	WRP Easements	5,000 acres	WRP
	CRP 15 year Rentals	15,000 acres	CRP/CREP
	Warm Season Grass	10,000 acres	CRP
	Shallow Wetland Dev	10,000 acres	CRP
Waste Management Systems			
	Liquid or Pond Systems	1,000 no.	EQIP
	Upground Dry	500 no.	EQIP
	Composting (animal)	200 no.	EQIP
Cropland Conversion			
	Pasture Systems	150 systems	EQIP/GRP
	Habitat Development	3000 acres	WHIP
Drainage Water Control Structures			
	Drainage Water Control	20,000 no.	EQIP

Table 4 - Conservation Practice Needs by USDA Program Area

Measuring Progress

Progress of this project will be measured using a variety of data sources, means of measurements, and participating organizations. The following will be used:

1. NRCS progress reporting system.
2. Tracking annual changes in land cover/land use and crop rotations by the University of Toledo.
3. An annual county tillage transect by Soil and Water Conservation Districts.
4. Heidelberg College Water Quality Lab's ongoing Lake Erie Tributary Monitoring program.

The NRCS progress reporting system will be used to track the installation of conservation practices and conservation systems as well as acreage contracted under the various Farm Bill programs. This information will provide data as to progress towards meeting conservation practice goals.

The University of Toledo will be under contract to annually track land use/land cover changes as well as track the various crop rotations and acreages. The university will use a procedure developed during the Upper Auglaize Watershed modeling project. This procedure combines remotely sensed Landsat satellite data with ground truth information to develop field by field multiyear crop rotations as well as field by field land cover maps. The procedure developed can provide this information at greater than 90 percent accuracy. Since erosion and runoff is directly linked to land cover, this information will measure whether the watershed is trending to a more erosive or less erosive condition. This information will provide spatially referenced data needed to utilize AGNPS and/other modeling efforts as part of the rapid resource assessment and planning processes.

Soil and Water Conservation Districts will be contracted with to provide annual conservation tillage transect surveys for each county in the basin. This field collected data will provide an accurate basis for assessing the change in the use of conservation tillage in the basin.

Heidelberg College's Water Quality Laboratory has a nationally recognized tributary monitoring program in place for the Maumee River and other major Lake Erie tributaries. Daily or more frequent samples are collected at the Waterville gauge station and analyzed for sediment, nutrients, metals, and pesticides. This data will be used to monitor exports from the watershed during the project period. Since year-to-year data is heavily influenced by variations in climate or storm events, Heidelberg will be contracted with to perform statistical analysis for NRCS to account for weather related influences in the data.

BUILDING AND MAINTAINING COOPERATIVE CONSERVATION

This project offers a significant opportunity for cooperative conservation. The Federal, State, and local governmental organizations in the watershed, as well as private conservation organizations, have a history of long and successful cooperative resource management efforts. Soil and Water Conservation Districts (SWCDs) in the basin were among the very first in the nation to work with U.S. EPA in accelerating conservation tillage adoption.

Nearly half of the landowners/operators in the Western Lake Erie Basin do not apply conservation planning practices on their farms. In order to achieve our Protection Plan goals, NRCS must

understand and overcome the reasons why landowners/operators are not participating in USDA's conservation programs. By partnering with Soil and Water Conservation Districts and others we can coordinate efforts to reach producers with opportunities for financial and technical assistance.

Several numerous examples of cooperation are ongoing, including the Northwest Ohio Windbreak Program, which is a very successful interagency partnership that has operated for more than 20 years.

More recently, the Lake Erie Buffer Team involved the voluntary participation of more than 22 agencies and private organizations to successfully administer more than \$225,000 in Lake Erie Protection funds to implement the Lake Erie Buffer Program.

Numerous universities including the University of Toledo, Heidelberg College's Water Quality Lab, The Ohio State University Sea Grant, and Stone Laboratory have a long history of water quality research and expertise in the watershed. NRCS has a history of collaboration with each of these organizations.

Most recently, NRCS lead a team with representatives from the above institutions, including U.S. Geological Survey, the Agricultural Research Service, and the U.S. Army Corps of Engineers to complete an AGNPS Modeling Project on the Upper Auglaize Watershed within the Maumee Basin. The team developed new technology to streamline the use of the model. An outgrowth of this effort has been the establishment of two Conservation Effects Assessment Project (CEAP) projects within the Maumee Basin.

Partners who NRCS would involve in this project include:

Local SWCDs

Farm Service Agency
Agricultural Research Service
U.S. Army Corps of Engineers
U.S. Geological Survey
U.S. EPA
Ohio EPA
Ohio Lake Erie Commission
ODNR Division of Soil and Water Conservation
ODNR Division of Wildlife
ODNR Division of Water
ODNR Division of Geological Survey
ODNR Coastal Zone Management

ODNR Division of Forestry
University of Toledo
The Ohio State University Extension
Heidelberg College, Water Quality Lab
OSU Sea Grant
Stone Laboratory
University of Toledo, Lake Erie Center
Pheasants Forever
Ducks Unlimited
Maumee RAP
Erie Basin RC&D
Conservation Action Project (CAP)

Specific partnership actions that have been identified include contracting with Soil and Water Conservation Districts to perform annual tillage transects. These actions also include contracting with the University of Toledo's GIS and Remote Sensing at the Lake Erie Center to perform satellite imagery/remote sensing interpretations to determine land cover and crop rotations and to contract with the Heidelberg College Water Quality Laboratory to monitor and analyze runoff from the project area. Other partnership activities and products will be identified as the project unfolds.

SUMMARY

Numerous Federal and State reports have identified Lake Erie as impaired due to excessive loadings of sediment and nutrients. Long-term water quality monitoring has identified the Maumee River as being the largest single contributor of nonpoint source pollution to the lake. Reports and modeling done in the basin by U.S. Geological Survey, USDA Agricultural Research Service, Heidelberg College, and NRCS have identified conservation tillage and conservation buffer erosion control practices as effective in reducing both erosion and sediment transport from the watershed.

Ohio NRCS has developed a plan to do a rapid resource assessment for all eight 8-digit subbasins in the Maumee Watershed, as well as the Portage River subbasin and Ottawa River Watershed. Data from the rapid resource assessment will be synthesized into an area wide plan. The planning data will be used to guide a concurrently implemented land treatment program which will include accelerated financial and technical assistance with USDA Farm Bill programs.