Rapid Watershed Assessment - Data Profile
Lower Maumee Watershed

Rapid watershed assessments provide initial estimates of where conservation investments will best address the concerns of landowners, conservation districts, and other community organizations and stakeholders. These assessments help landowners and local leaders set priorities and determine the best actions to achieve their goals.

This assessment for the Lower Maumee Watershed was completed by NRCS with inpu from our conservation partners and other local entities.

"The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer."

Table of Contents

Introduction 1
Physical Information 4
Physical Description 4
Land Use and Land Cover 6
Information and Trends 6
A View of the Watershed 8
Water Resources Information 9
Riparian Zone Protected and Unprotected 12
Water Quality Assessment Data 14
Drinking Water Source Protection Area 19
Soil Resource Information 20
Soil Resources 20
Land Capability System 21
Prime Farmland Classification 23
Hydric Soil Distribution 24
Soil Loss 25
Analysis of Soil Erosion Potential Within the Watershed 27
Toledo Harbor Dredging 28
Flood Plain Soils 29
Flooding and Water Drainage in the Lower Maumee Watershed 30
Air Resources Information 32
Wind Erosion 32
Plant and Animal Resources 33
Livestock Resources Information 33
Wildlife and Endangered Species 35
Conservation Systems and Practice Application Data 38
Watershed Projects and Planning Information 42
Summary and Observations of Watershed Resource Concerns 44
Next Steps 45
Needed Conservation Practices 45
Applicable USDA Farm Bill Programs 45
References and Citations 46

Tables and Figures

Table 1 - Counties Located in the Lower Maumee 2
Table 2 - 2000 Census Data Summary 2
Table 3 - Watershed Slope 5
Table 4 - Cropland and Crop Types in the Watershed 7
Table 5 - Stream Miles By Order 11
Table 6 - Riparian Zone Protected and Unprotected 12
Table 7 - Use Attainment Data 14
Table 8 - Causes and Sources of Impairments 15
Table 9 - Beneficial Use Impairments in 2005 16
Table 10 - Major Water Bodies in the Watershed 18
Table 11 - Land Capability Subclasses 21
Table 12 - Estimated 1997 Gross Soil Loss from Cultivated Cropland by Land Capability Subclass 26
Table 13 - Flood Prone Soils Data 29
Table 14 - Lower Maumee Flood Discharges 31
Table 15 - Air Resource Concerns Table 32
Table 16 - Livestock Operations Data 33
Table 17 - Estimated Livestock Animal Units, Manure and Nutrient Production 34
Table 18 - Habitat Reference Information 36
Table 19 - Rare or Endangered Species Information 37
Table 20 - NRCS Conservation Progress Performance Measures 38
Table 21 - Agricultural Census Data and Economic Information 41
Table 22 - Local Watershed Related Organizations Identified in the Watershed 42
Table 23 - List of Relevant Published Watershed Plans, Studies, Reports 43

Figure 1 - Watershed Map 1
Figure 2 - Lower Maumee Watershed Map 3
Figure 3 - 10-Meter Digital Elevation Model 5
Figure 4 - Land Use Map 6
Figure 5 - Broad Land Use - 1982 - 1997 7
Figure 6 - Average Annual Precipitation 9
Figure 7 - Water Withdrawal in the Lower Maumee Watershed 10
Figure 8 - Stream Orders for the Lower Maumee Watershed 11
Figure 9 - Riparian Zone Analysis Map 13
Figure 10 - Primary Soil Management Concern within 120 feet of Streams 13
Figure 11 - Drinking Water Source Protection Area 19
Figure 12 - Land Capability Subclasses 22
Figure 13 - Prime Farmland 23
Figure 14 - Hydric Soil 24
Figure 15 - 1997 Annual Gross Soil Loss on Cropland by Land Capability Subclass 25
Figure 16 - Soil Erosion Potential (R x K x LS) 27
Figure 17 - 1997 Cultivated Cropland Soil Erosion Rates as a Multiple of “T” 28
Figure 18 - Flood Prone Soils 29
Figure 19 - Soils Subject to Severe Wind Erosion 32
Figure 20 - Oak Openings Boundary 36
Figure 21 - Conservation Tillage Trends 39
Figure 22 - Conservation Tillage - Corn and Beans 40
Figure 23 - Conservation Tillage - Corn, Soybeans, and Wheat 40

Introduction

The Lower Maumee Watershed is located in Lucas, Fulton, Henry, Wood, Defiance, Putnam, and Hancock Counties in northwest Ohio. The watershed is delineated by the United States Geological Survey as an 8-digit hydrologic unit number 04100009. The 692,421-acre (1082 square mile) watershed of the Lower Maumee River drains into the western basin of Lake Erie at Maumee Bay. Over 66.7 percent of the watershed is cropland and over 88.1 percent of the watershed has a 2 percent slope or less. The largest city in the watershed is Toledo. The total population in the Lower Maumee Watershed is estimated at 278,003 (2000 census).

Figure 1 - Watershed Map

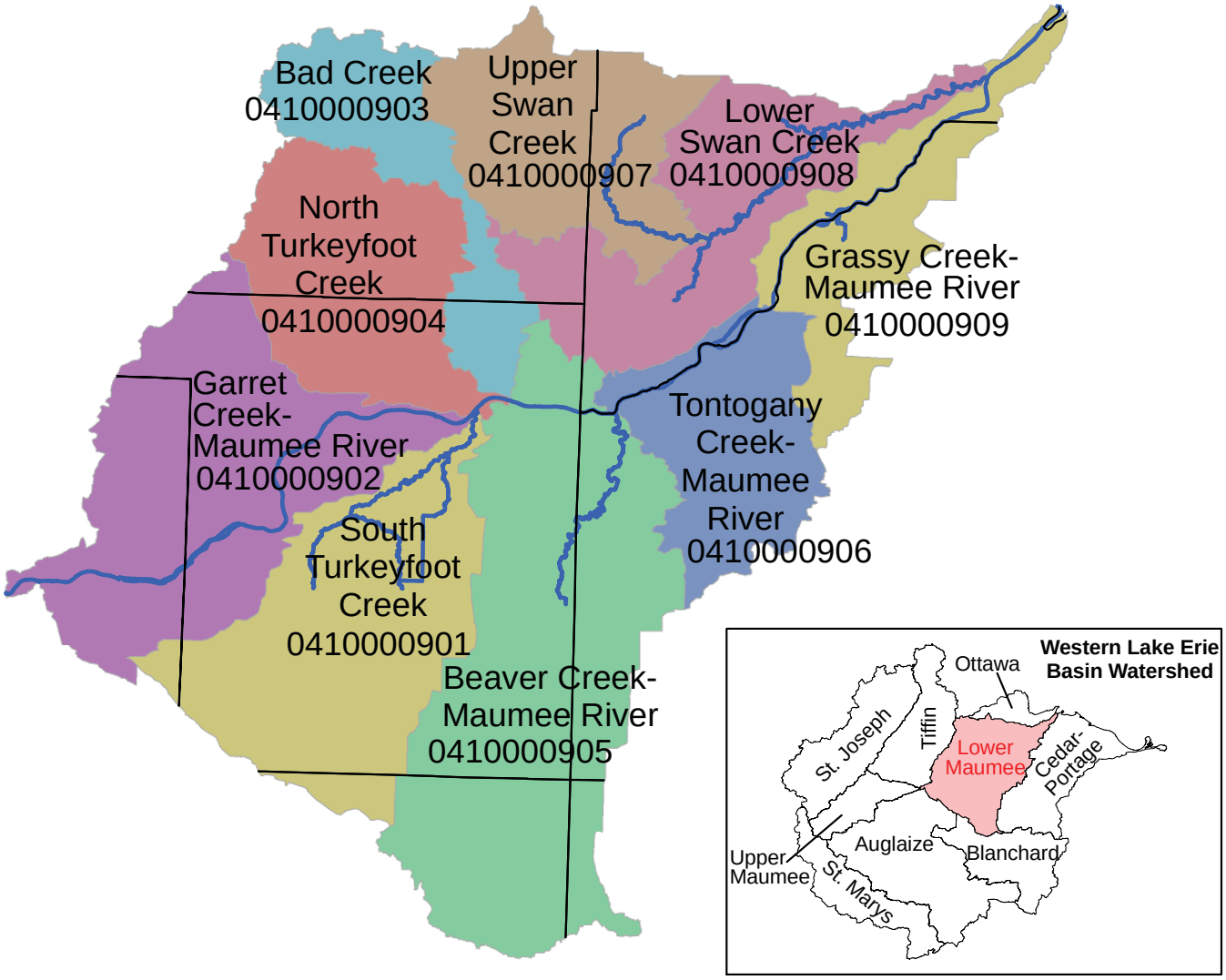


Table 1 - Counties Located In The Lower Maumee

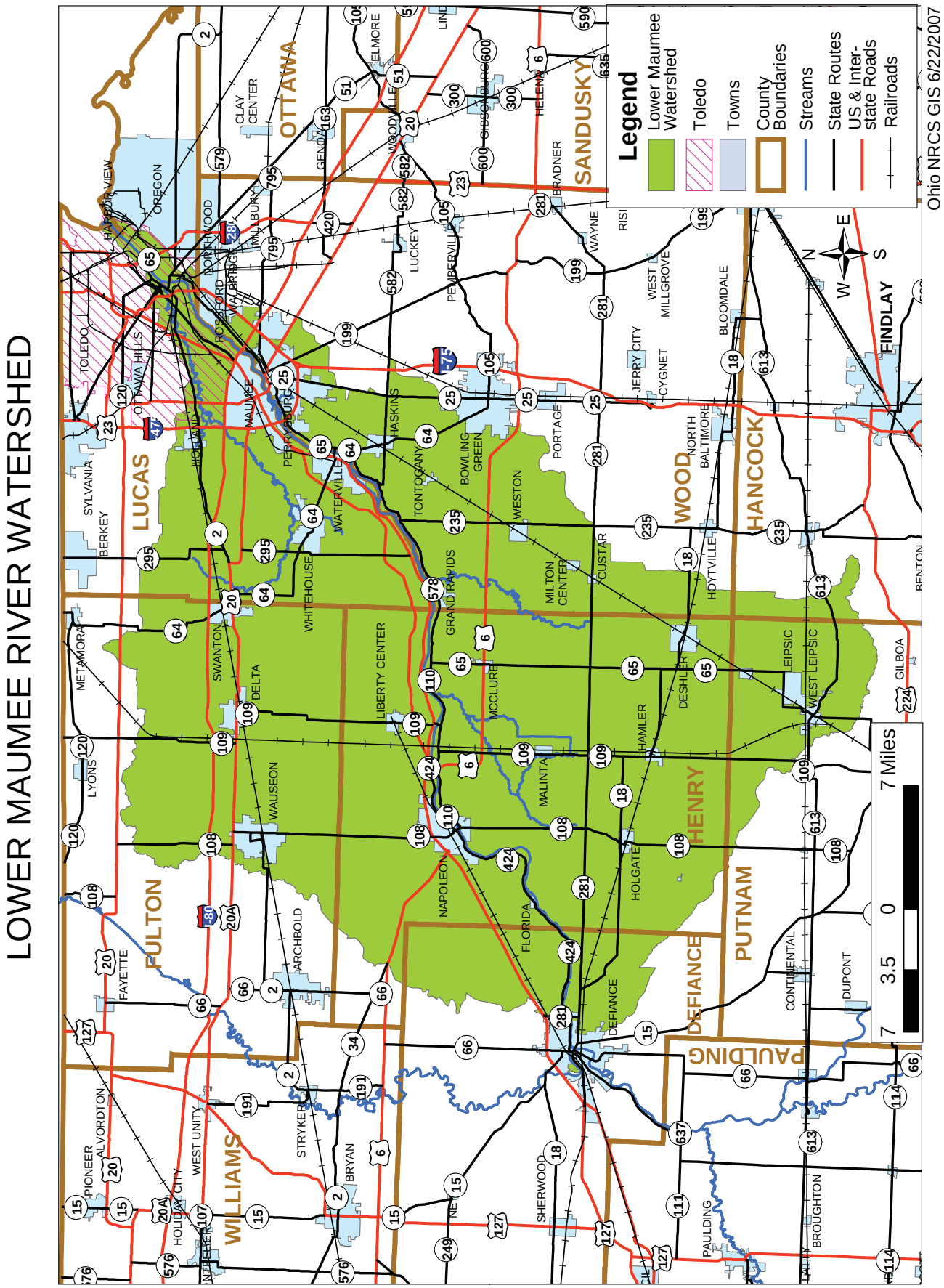
County	Acres	Acres in Watershed	% of Watershed Area	% of County in Watershed
Defiance	265,917	44,537	6.4%	16.7%
Fulton	259,938	117,945	17.0%	45.4%
Hancock	341,639	7,551	1.1%	2.2%
Henry	269,400	255,678	36.9%	94.9%
Lucas	223,551	107,039	15.5%	47.9%
Putnam	310,026	42,013	6.1%	13.6%
Wood	398,068	117,658	17.0%	29.6%
Totals		692,421	100.0%	

Table 2 - 2000 Census Data Summary for the Lower Maumee Watershed

Summary	Number
Total Population	278,003
Total Households	108,295
Total Families	72,969
Total Housing Units	115,813
Average Household Size	2.52
Average Family Size	3.08
Median Household Income	$41,607
Average Household Income	$53,058
Per Capita Income	$20,926
Population by Race	**Number**
Total	278,003
Population Reporting One Race	272,927
White	241,505
Black or African American	21,049
American Indian or Alaska Native	740
Asian	2,784
Native Hawaiian or Other Pacific Islander	61
Some Other Race	6,788
Population Reporting Two or More Races	5,076
Total Hispanic Population	15,740

Source: U.S. Census Bureau, Census 2000 Summary File 1 and 3 through ESRI Business Analyst Online, http://bao.esri.com/esribis

Figure 2 - Lower Maumee Watershed Map



Physical Information

Physical Description

The Lower Maumee River Watershed extends across the Major Land Resource Area (MLRA) 99; the Erie-Huron Lake Plain of the Lake States Fruit, Truck Crop, and Dairy Region. The MLRA 99 typically is nearly level glacial lake plain with a few scattered ridges of sandy soils that represent past shorelines and moraines. Local relief typically varies less than 10 feet, except for the beach ridges and low moraines that can rise almost 30 feet above the landscape level.

The part of this watershed within MLRA 99 typically is a nearly level glacial lake plain with a few scattered ridges of sandy soils that represent past shorelines and moraines. Local relief typically varies by less than 10 feet, except for the beach ridges and low moraines that can rise almost 30 feet above the general level of the landscape

The entire land area of the Lower Maumee Watershed was surveyed using the Public Land Survey System (PLSS) and, consequently, cropland, pastureland, and forested areas typically are rectangular in shape. Agriculture typically consists of cash grain farming of corn, soybeans, and wheat production with some livestock production.

Bedrock geology consists of the Sunbury and Bedford Shales, Antrim Shale, Ten Mile Creek Dolomite and Silica Formation, Dundee Limestone, Detroit River Group, and Salina Group Dolomite. Limestone quarries are scattered about in the watershed. Some karst features (e.g., sinkholes) exist in the eastern part of the watershed.

The following cities and villages are situated entirely or partially in the Lower Maumee Watershed: Toledo, Rossford, Maumee, Whitehouse, Perrysburg, Delta, Wauseon, Swanton, Waterville, Grand Rapids, Holland, Neapolis, Haskins, Tontogony, Weston, McClure, Custar, Deshler, Leipsic, Hamler, Napoleon, Holgate, Malinta, Jewell, Okolona, Defiance, New Bavaria, and Belmore.

Prior to historical settlement, wetlands were common as part of the 'Black Swamp' south of the Maumee River. Based on soil survey information, wetlands made up about 65 percent of the watershed. Due to the clearing of swamp forest and the subsequent drainage of the land, most of the wetlands have been artificially drained. Wooded wetlands currently constitute about 4 percent of the watershed and an additional 0.5 percent of nonforested wetlands are present in the watershed.

Figure 3 - 10-Meter Digital Elevation Model for the Lower Maumee Watershed

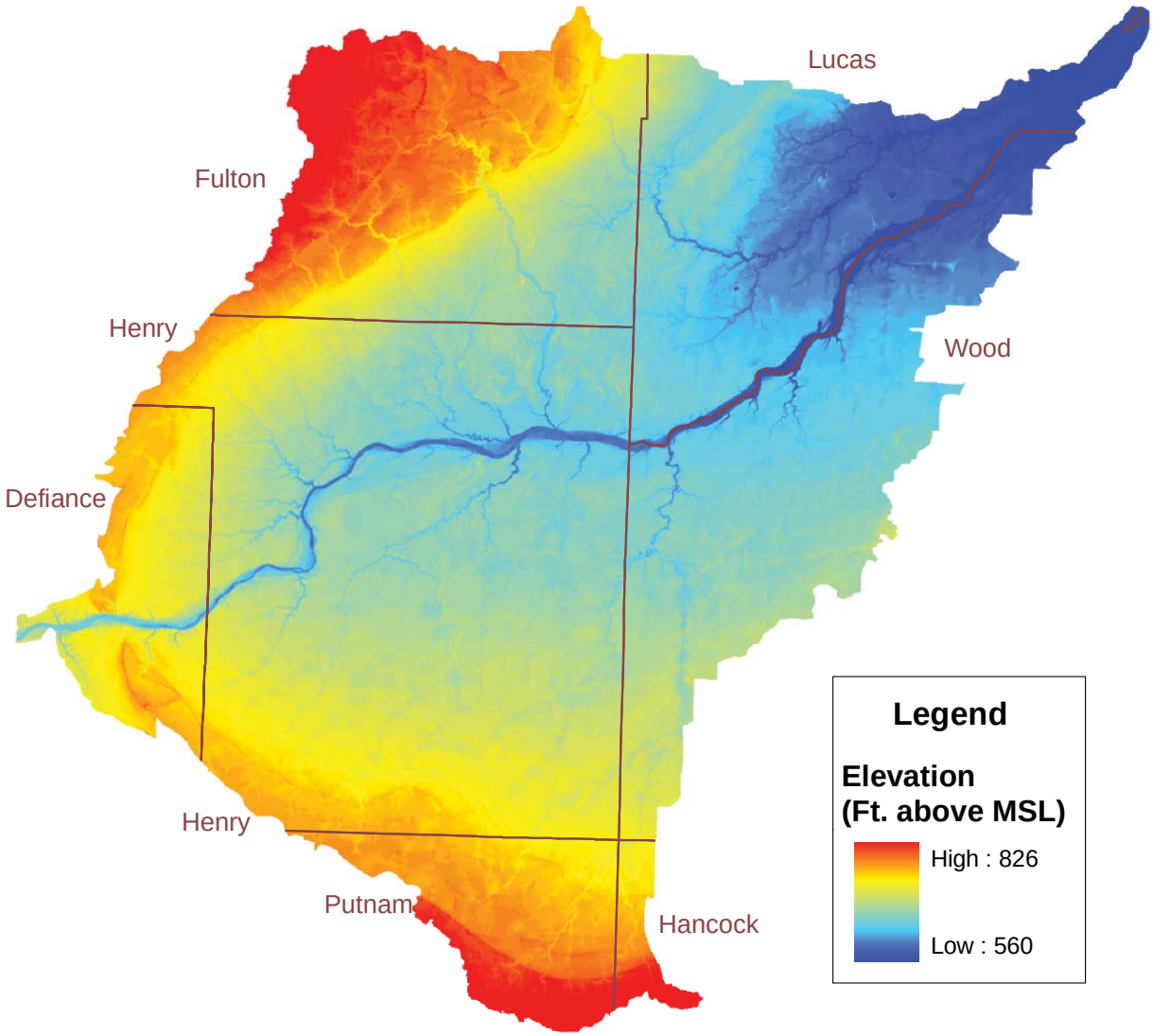


Table 3 - Watershed Slope

Class	Area (Sq.Mi.)	Percent of Watershed
0-1%	835.4	77.2
>1-2%	118.0	10.9
>2-4%	69.5	6.4
>4-6%	28.2	2.6
>6-8%	13.3	1.2
>8-10%	6.6	0.6
>10%	10.9	1.0
Total =	1081.9	100.0

Land Use and Land Cover

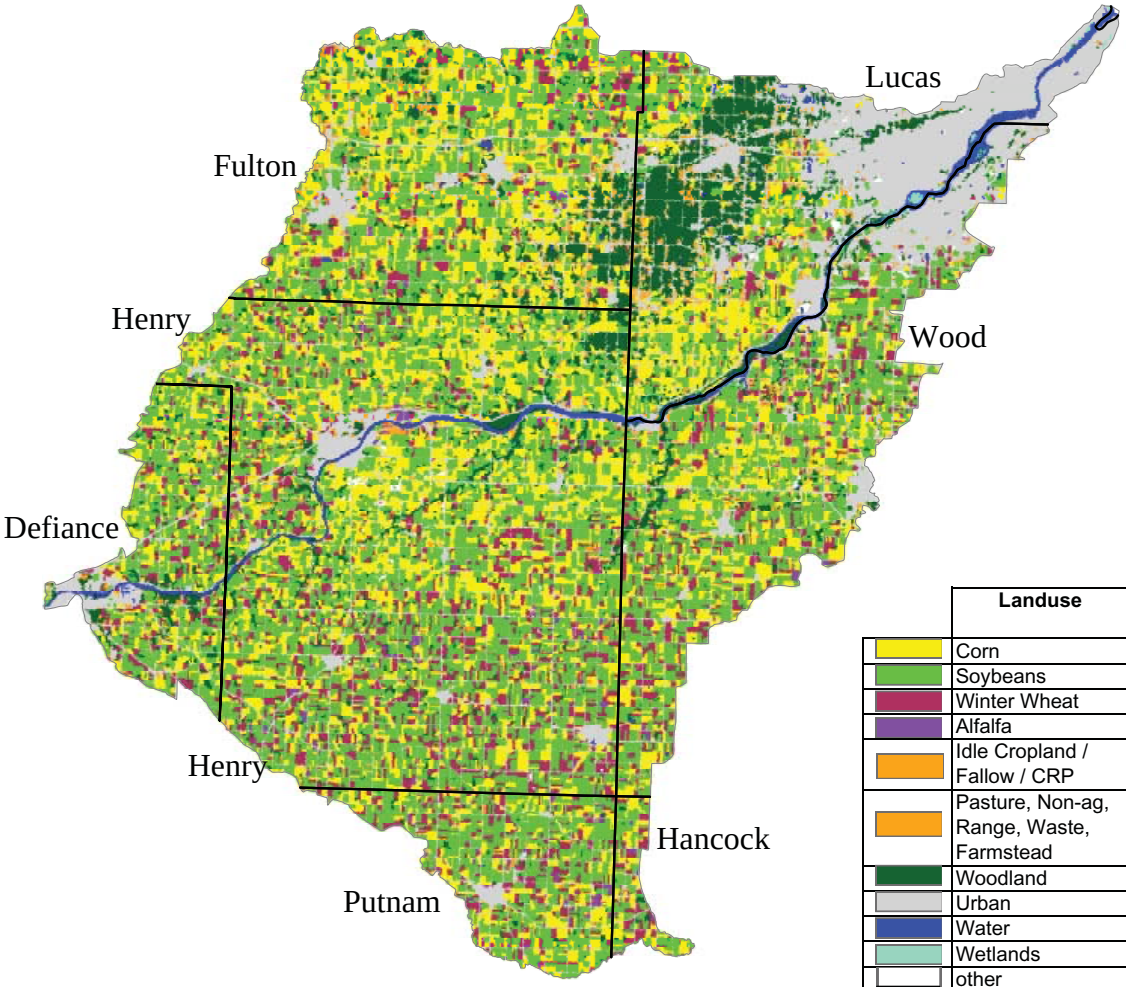
Information and Trends

In 1994, there were about: a) 416,543 acres of agricultural land; b) 27,964 acres of forest; c) 658 acres of shrub/scrub woods; d) 3,892 acres of urban land; e) 3,258 acres of wetlands in open fields; and f) 108 acres of barren land. (Source: ODNR-Division of Real Estate and Land Management land cover inventory of Ohio)

According to the USDA-NRCS National Resources Inventory (NRI), from 1982 to 1997, there was an increase of about 25,400 acres of urban/built-up land, representing about 3.7 percent of the Lower Maumee Watershed with a slight corresponding decline in pastureland, cropland, and forestland acreage.

In 1997, according to the NRI, the watershed was 67 percent cropland, 1 percent pastureland, 6 percent forestland, 1.5 percent minor cover/uses, 12 percent rural transportation, 1 percent water, less than 1 percent Conservation Reserve Program (CRP), and about 6 percent urban/built-up land.

Figure 4 - Land Use Map



	Landuse	Watershed Area (Acres)	Watershed Area (%)
	Corn	162,230	23.4%
	Soybeans	220,890	31.9%
	Winter Wheat	73,680	10.6%
	Alfalfa	5,020	0.7%
	Idle Cropland / Fallow / CRP	1,950	0.3%
	Pasture, Non-ag, Range, Waste, Farmstead	25,010	3.6%
	Woodland	60,550	8.7%
	Urban	130,600	18.9%
	Water	9,740	1.4%
	Wetlands	570	0.1%
	other	2,180	0.3%
	Totals =	692,420	100.0%

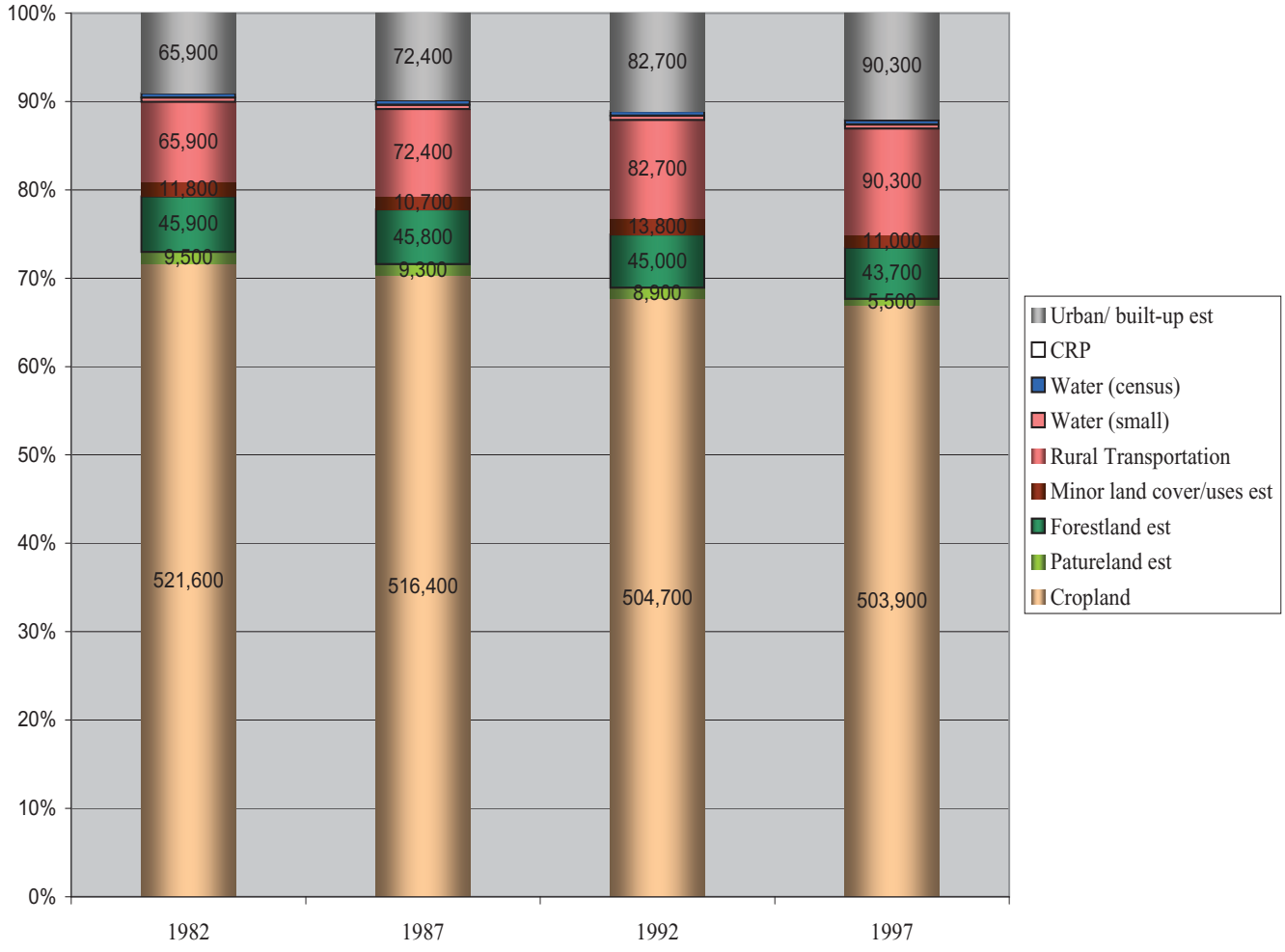
2006 Land cover data from USDA NASS

Table 4 - Cropland and Crop Types in the Watershed

	Cropland	Corn	Bean	Wheat	Alfalfa
Watershed (Ac.)	462,320	162,230	220,890	73,680	5,020
% of Cropland		35.1%	47.8%	15.9%	1.1%

Source: 2006 Land use / Land cover from NASS

Figure 5 - Broad Land Use
1982 - 1997



A View of the Watershed

Restored Wetland in the Lower Maumee Watershed

Old Miami - Erie Canal lock at Grand Rapids, Ohio

Mouth of the Maumee River at the Port of Toledo

Dredging in Lake Erie

Hancock County Windbreak

Clean Lake Erie at Maumee Bay

Figure 6 - Average Annual Precipitation

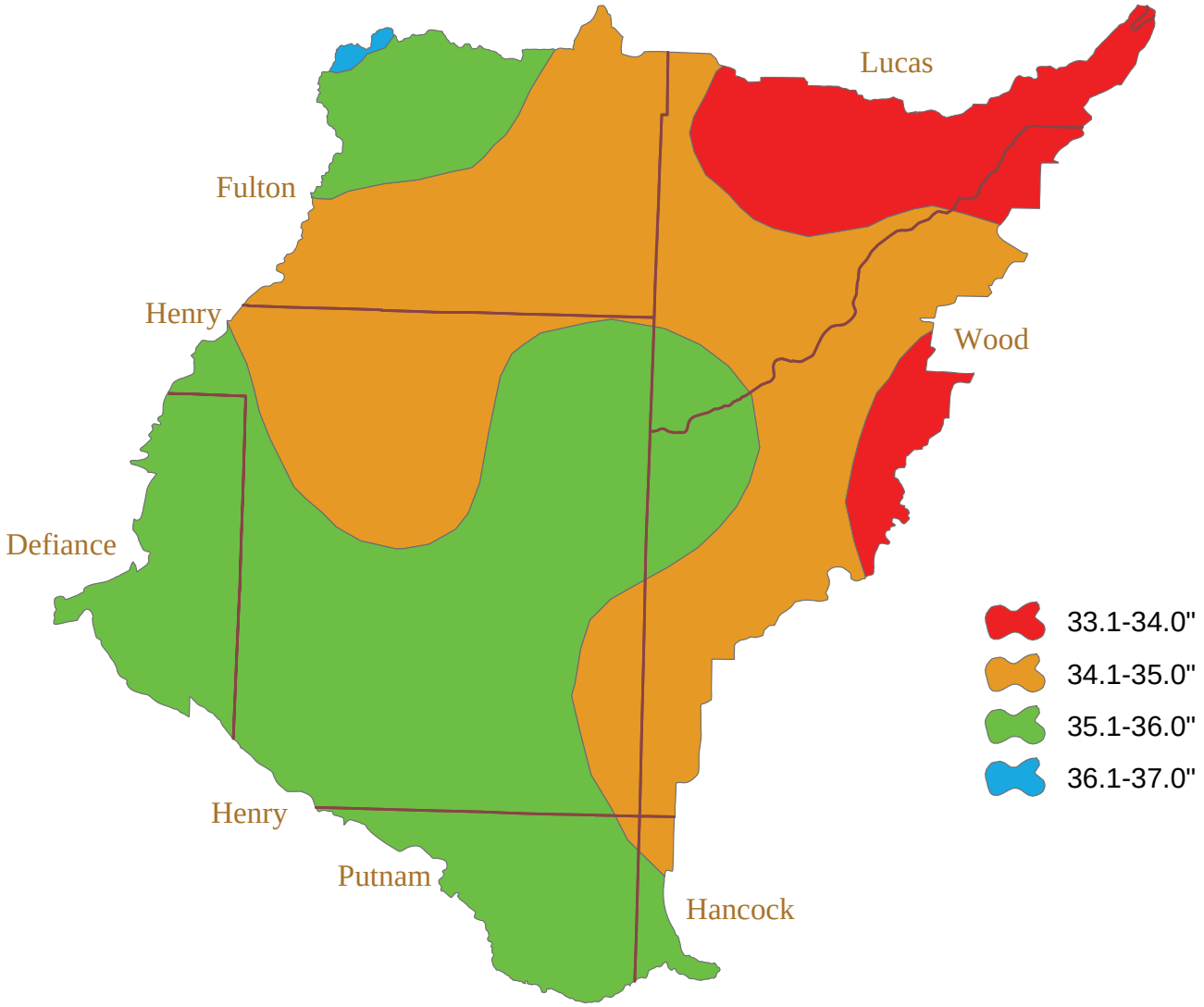
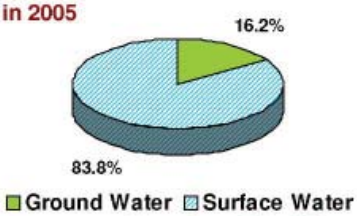


Figure 7 - Water Withdrawal in the Lower Maumee Watershed

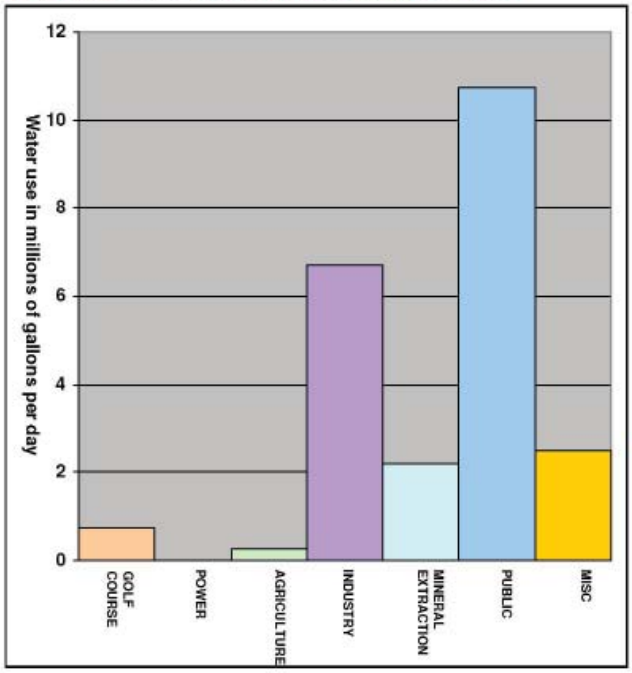
Water Withdrawal in the Lower Maumee Basin

Total fresh-water withdrawal and source of water in 2005

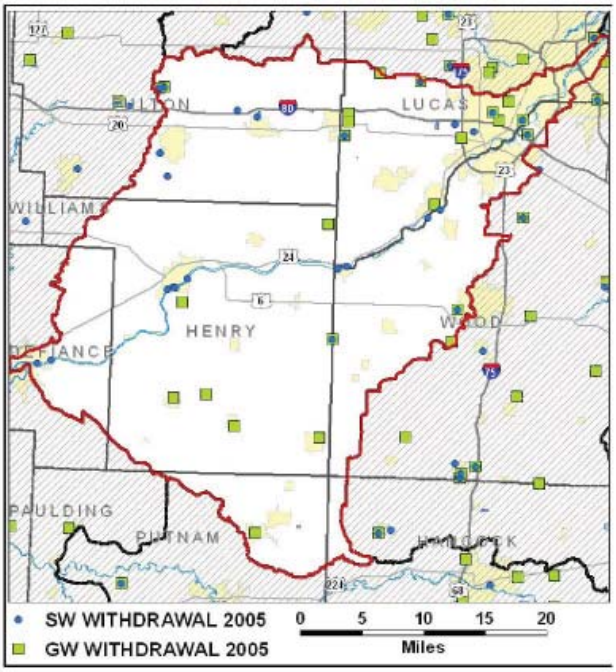
Source	Water use, in million gallons per day	Percent of total use
Surface Water	19.41	83.8%
Ground Water	3.74	16.2%
Total	23.15	100.0%



Total fresh-water withdrawal by category in 2005



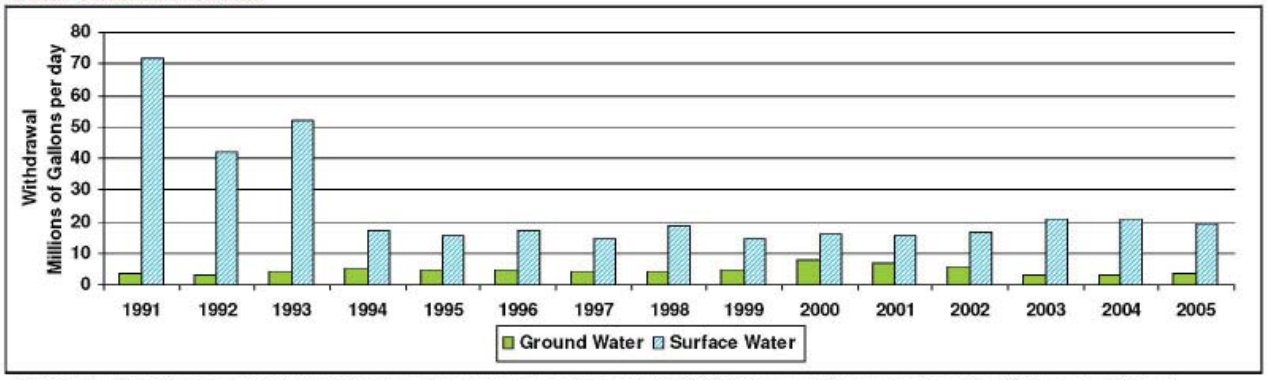
Location of facilities withdrawing water in 2005



Total fresh-water withdrawal by category in 2005 in millions of gallons per day

	Golf Course	Power	Agriculture	Industry	Mineral Extraction	Public	Misc	Total
Surface Water	0.45	0.00	0.05	6.70	0.00	9.71	2.50	19.41
Ground Water	0.31	0.00	0.22	0.00	2.19	1.02	0.00	3.74
Total	0.76	0.00	0.27	6.70	2.19	10.74	2.50	23.15
Percent Total	3.3%	0.0%	1.2%	28.9%	9.4%	46.4%	10.8%	100.0%

Water withdrawal trends



Provided by Ohio Department of Natural Resources (http://www.dnr.state.oh.us/tabid/4035/Default.aspx) in cooperation with U.S. Geological Survey (http://oh.water.usgs.gov/) and Natural Resources Conservation Service (www.oh.nrcs.usda.gov/). Indiana data provided by Indiana DNR (http://www.in.gov/dnr/water/water_availability/SWWF/index.html). See (www.dnr.state.oh.us/tabid/18805/Default.aspx) for explanation of data.

Figure 8 - Stream Orders for the Lower Maumee Watershed

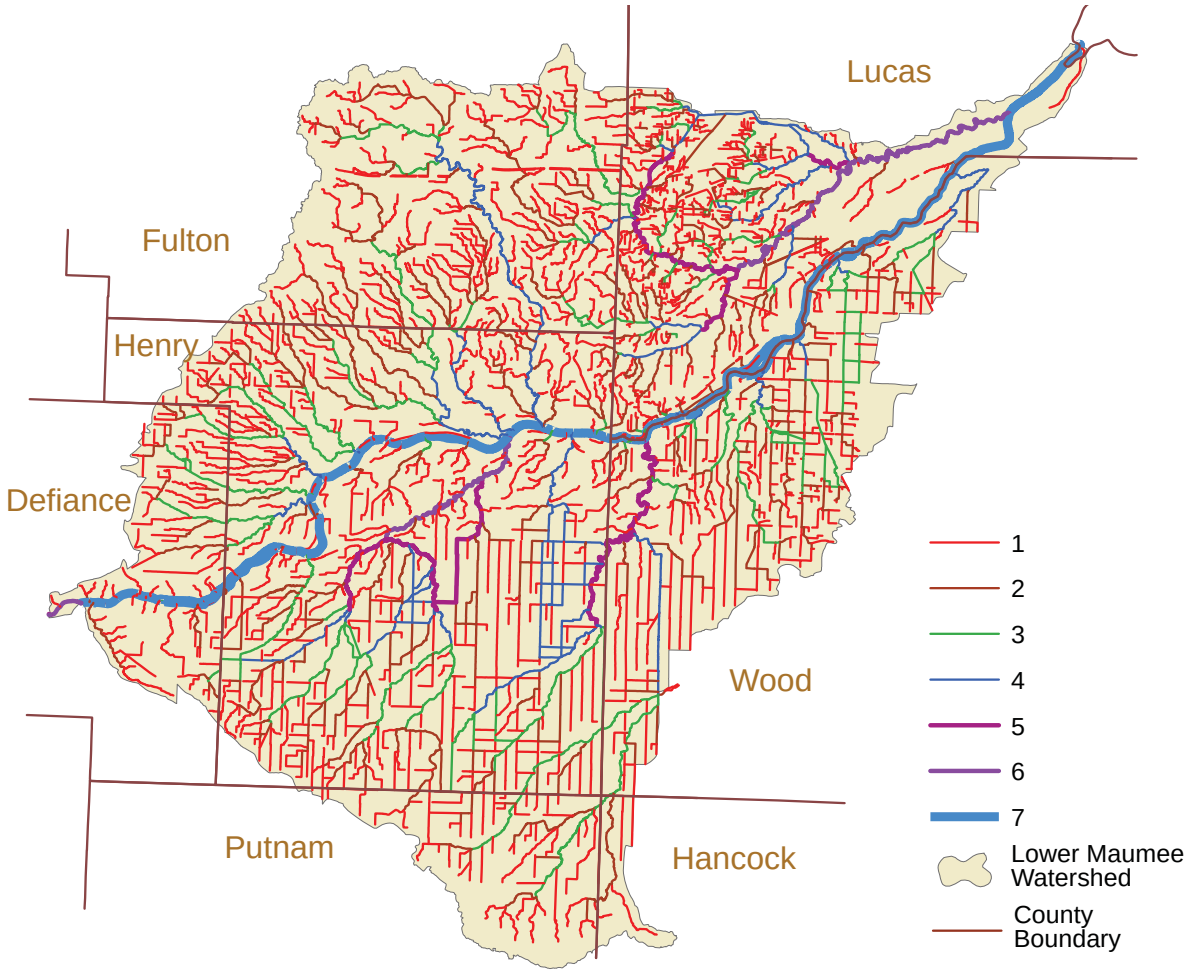


Table 5 - Stream Miles By Order

	Acres of Standing Water (Lakes/ Ponds)	Total Miles of Streams	Total Miles 1st Order Streams	Total Miles 2nd Order Streams	Total Miles 3rd Order Streams	Total Miles 4th Order Streams	Total Miles 5th Order Streams	Total Miles 6th Order Streams	Total Miles 7th Order Streams
Total Lower Maumee Watershed	1181.4[1]	2460.0	1321.9	506.4	286.5	177.1	57.4	36.1	74.6
Defiance Co. Portion	92.2	144.1	94.6	24.5	12.7	N/A	0.1	1.8	10.4
Fulton Co. Portion	203.4	370.1	238.6	76.6	36.5	18.5	N/A	N/A	N/A
Hancock Co. Portion	2.2	19.8	12.5	6.6	0.7	N/A	N/A	N/A	N/A
Henry Co. Portion	145.2	940.4	476.5	183.5	120.7	96.5	25.1	10.3	27.6
Lucas Co. Portion	507.6	459.3	214.7	101.2	34.0	39.1	20.3	24.0	26.2
Putnam Co. Portion	35.0	105.7	75.5	19.5	10.7	N/A	N/A	N/A	N/A
Wood Co. Portion	195.9	420.7	209.5	94.6	71.3	23.0	11.9	N/A	10.4

[1] 0.05 Acres and larger, and does not include Lake Erie backwater in the Maumee River.

Riparian Zone Protected and Unprotected

Available Common Land Unit (CLU) data was used to get an estimate of the amount of cropland riparian area that is protected by Conservation Reserve Program (CRP) buffer practices. Additionally, the total amount of protected riparian area was estimated by adding naturally protective land uses (e.g., woods, wetlands, farmsteads, and urban) to cropland from the CLU layer that was protected by CRP practices. (Note: This buffer is half as wide as the buffer used for soil management concern on the next page.)

Table 6 - Title Riparian Zone Protected and Unprotected

Of Acres within 60 ft. stream buffer both sides (120 ft. total):	
% Total Cropland Acres in Riparian Zone Protected By CRP	11.2%
% Total Cropland Acres In Riparian Zone Unprotected	88.8%
% of Total Acres In Riparian Zone That Are Protected	56.8%
% of Total Acres in Riparian Zone That Need Protection	43.2%

Note: 60 ft. buffer was measured from the edge of stream where the National Hydrology Dataset (NHD) showed a stream width and from the centerline of stream where it did not show a stream width.

Figure 9 - Riparian Zone Analysis Map

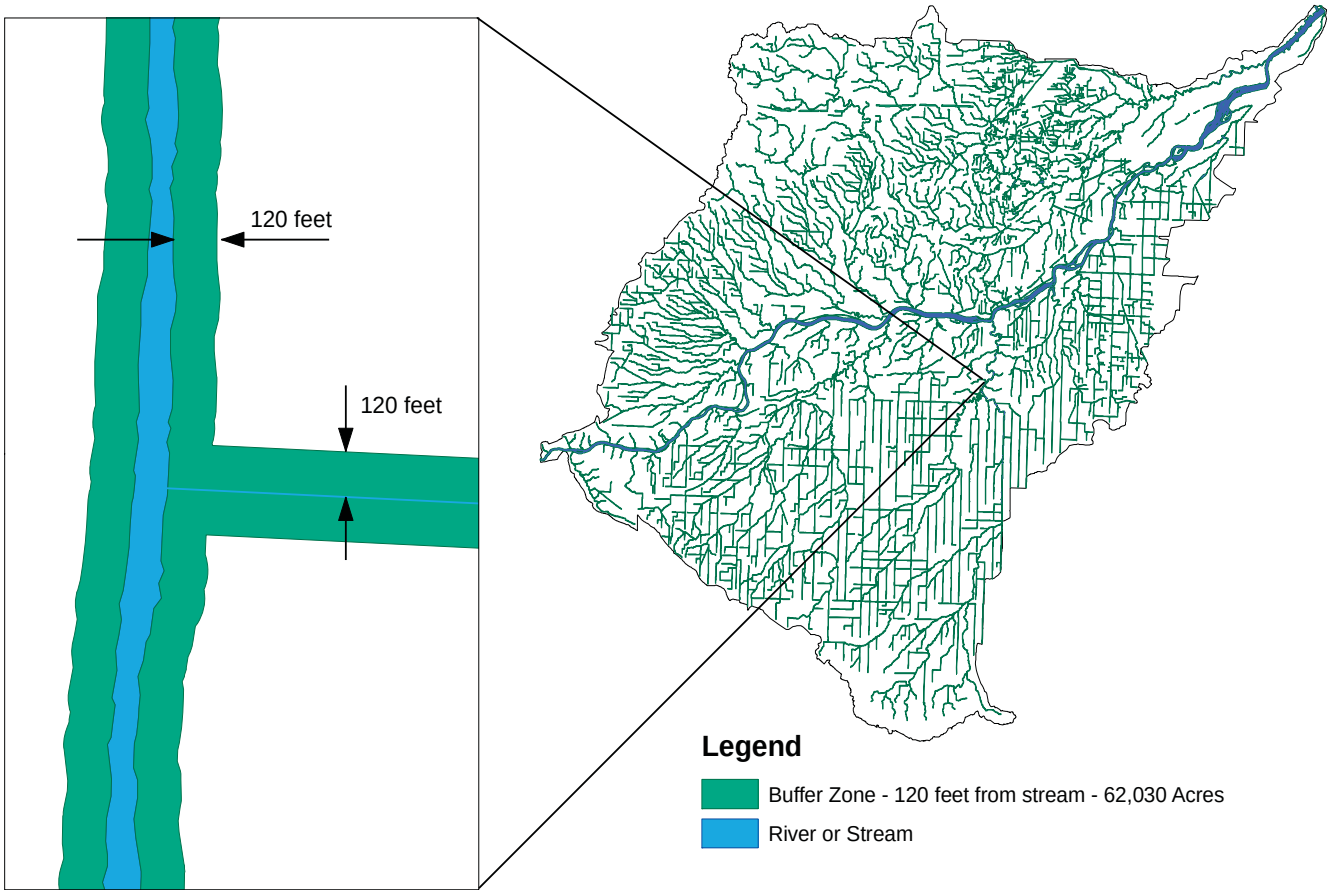
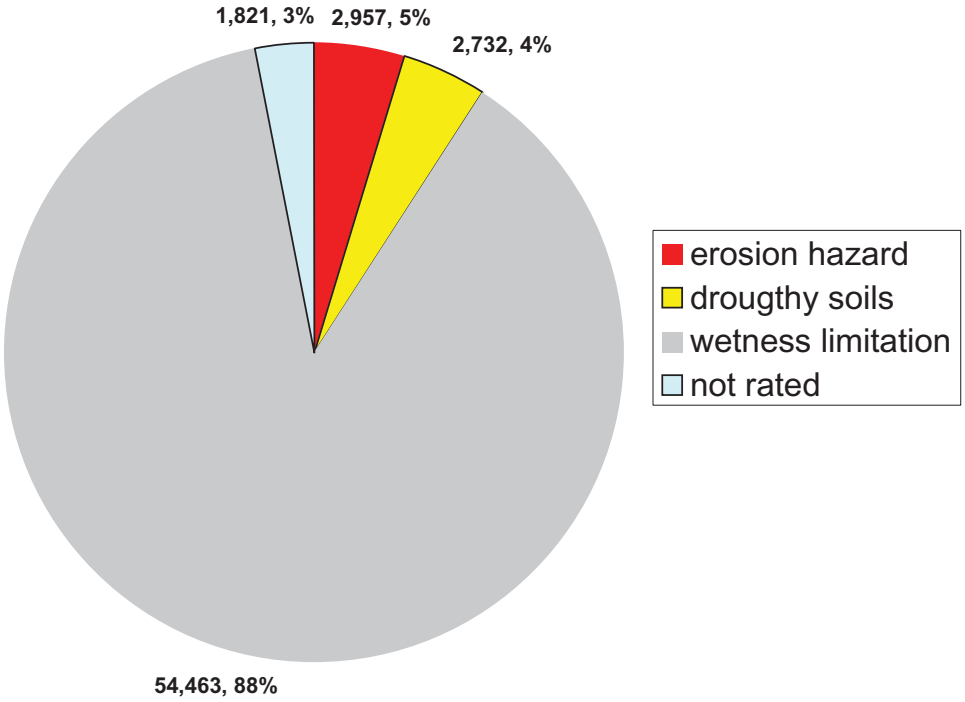


Figure 10 - Primary Soil Management Concern within 120 feet of Streams (Acres and Percentage)



Water Quality Assessment Data

The Lower Maumee Watershed, in its totality, is only beginning to be evaluated through the EPA's TMDL process. TMDLs identify and evaluate water quality problems in impaired water bodies and propose solutions to bring those waters into attainment. The TMDL reports address water quality problems that were identified previously in water quality studies of the watershed. Water quality sampling in the Maumee River and its tributaries was initiated in 2006 to determine if a TMDL study is needed.

Ohio EPA has been active with local organizations to actively evaluate the watershed and gather water quality data. The Maumee RAP, now housed under Partners for Clean Streams, has been active since the late 1980s in collecting watershed data and composed the Watershed Restoration Plan for the Maumee River Area of Concern. The Maumee Area of Concern covers most of the eastern portion of the Lower Maumee Watershed. The study found the majority of the streams in the watershed are impaired and do not meet water quality standards, the large river assessment units rate much better than the smaller streams, and that the reasons for non-attainment are typically non-point source pollution, siltation, and stream alteration.

The following tables, taken from the Maumee AOC Watershed Restoration Plan (January 2006), summarize the watershed use attainment data collected in the Maumee River Area of Concern.

Table 7 - Use Attainment Data

Assessment Unit Description			**Watershed Size (sq. mi.)**
Maumee River Mainstem (Indiana border to Lake Erie)			**6,586**
Aquatic Life Use Assessment			
Sampling Year(s) 1992, 1993, 1996, 1997	AU Total Length (miles):		107.87
	AU Monitored Miles		94.35
Aquatic Life Use(s): WWH (Warmwater Habitat)	# Sites Sampled:		51
	# Miles Full Attainment:		44.00
Impairment? Yes	# Miles Partial Attainment:		13.15
	# Miles Non-Attainment:		37.20
	% Attainment (Monitored Miles)		
	Full	Partial	Non
Large River AU Attainment Status:	46.7%	13.9%	39.4%
High Magnitude Causes:	High Magnitude Sources:		
Flow Alteration	Nonirrigated Crop Production		
Other Habitat Alterations	Channelization - Agriculture		
Turbidity	Combined Sewer Overflow		
Nutrients	Major Municipal Point Source		
Unionized Ammonia			
Siltation			
Total Toxics			

Table 8 - Causes and Sources of Impairments

Segment	Miles Assessed & Aquatic Life Use Designation#	Causes of Impairment*	Sources of Impairment*	Comments
Maumee River (Waterville to Swan Creek)	15.46 (RM 5.22-20.68) WWH	Other habitat alterations-H Siltation-H Pesticides-M Priority organics-M Metals-M Nutrients-M Total toxics-M	CSOs-H Agriculture-M Other urban runoff-M Hydromodification-M	305(b)-1996: Data in this table 305(b)-2000: No data, just these comments - River flows down the BG escarpment in this reach; wide shallow limestone base w/ aquatic community influenced downstream by Lake Erie and upstream by ag drainage; water is turbid year round, Lucas Co WWTP is a source of ammonia
Maumee River (Swan Creek to Lake Erie)	15.46 (RM 0-5.22) WWH	Total toxics-H Pesticides-M Priority organics-M Metals-M Nutrients-M Siltation-M	Major municipal pointsource-H CSOs-H Agriculture-H Other urban runoff-M Removal of riparian vegetation-M Streambank modification/ destabilization-M Drainage/filling of wetlands-M Spills-M	305(b)-1996: Data in this table
Duck Creek	3.56 (RM 0-3.56) WWH	Other habitat alterations-H Pesticides-M Priority organics-M Metals-M Siltation-M Salinity /TDS / chlorides-M Flow alteration-M Oil and grease-M	Other urban runoff-M Sludge-S Channelization-H Removal of riparian vegetation-M Streambank modification/ Destabilization-H Spills-M Contaminated sediments-M	305(b)-1996: Data in this table
Grassy Creek	5.5 (RM 0-5.5) WWH	Other habitat alterations-H Pesticides-M Metals-M Nutrients-M Priority organics-M Siltation-M Organic enrichment /DO-S	Habitat Modifications o/than Hydromod.-H Land development/ Suburbanization-M Other urban runoff-M Onsite wastewater systems (septic tanks)-S	305(b)-2000: PCBs and pesticides were found in fish tissue samples probably from urban runoff and spills; generally a good stream; could improve if urban problems remedied; descent riparian was present in many places.

* Magnitude of that cause or source of impairment: H=high, M=moderate, S=slight, T=identifies a threat

\# Aquatic Life Use Designation: WWH=Warm Water Habitat, MWH=Modified Warm Water Habitat, LRW=Limited Resource Water

Table 8 describes the location in the watershed where individual impairments to the Warmwater Habitat were identified. The river's impairments could be divided between upstream agricultural sources and downstream urban concerns based on data collected and locations within the watershed.

Their beneficial use impairments to Maumee and the Grassy Creek and Duck tributaries are included in Table 9.

Table 9 - Beneficial Use Impairments in 2005

Beneficial Use Impairments (BUI)	Maumee River	Grassy Creek	Duck Creek	Reasons/Data Source
BUI 1: Restriction on fish and wildlife consumption	Impaired	Not Impaired	Impaired	Duck: If health dept. LE-wide notices apply to creeks—no creek specific advisory Maumee River: Mouth to Waterville – Do not eat channel catfish (2005 fishing season advisory18). Statewide – No more than one fish per week due to mercury19. 2005 Ohio Snapping Turtle Consumption Advisory (mercury20). Grassy Creek: Ohio EPA DSW website does not list any impairments for the creek.
BUI 2: Tainting of fish and wildlife flavor	Unknown	Not Impaired	Unknown	Duck: If health dept. LE-wide notices apply to creeks—no creek specific advisory Maumee River: Mouth to Waterville – Do not eat channel catfish (2005 fishing season advisory18). Statewide – No more than one fish per week due to mercury19. 2005 Ohio Snapping Turtle Consumption Advisory (mercury20). Grassy Creek: Ohio EPA DSW website does not list any impairments for the creek.
BUI 3: Degradation on fish and wildlife populations	Impaired	Impaired	Impaired	Maumee River: In most cases, for ICI, Miwb, and IBI the Maumee River scores below the designated criteria. (See data table in Volume 1) Grassy Creek: 1993 data for RMs 2.9 (6.919 and 7.462) and 4.9 (5.548) fall below criteria. No ICI scores. 1993 data for RMs 2.9 is conflicting (38 & 26) and 4.9 (20) is below criteria. No data or determination of degradation of wildlife populations; Unknown Duck: OEPA 305b reports; data from Dennis Minshke
BUI 4: Fish tumors or other deformities	Impaired	Impaired	Impaired	Duck: OEPA DELT data - fish sampling in 1986, 1993, 1997 Maumee River: Data from 1986, 1993, 1996, 1997, and 1998 indicate that there are DELTS from RM 0.6 to RM 19.8. Grassy Creek: Data from 1993 are for Ms 2.9 and 4.9. Eroded fins and lesions recorded at RM 2.9.
BUI 5: Bird or animal deformities or reproductive problems	Unknown	Not Impaired	Not Impaired	This BUI was not indicated for the Maumee AOC for its RAP designation.

Table 9 - Beneficial Use Impairments in 2005 (cont.)

Beneficial Use Impairments (BUI)	Maumee River	Grassy Creek	Duck Creek	Reasons/Data Source
BUI 6: Degradation of benthos	Impaired	Impaired	Impaired	Maumee : Average 1986 ICI score for RMs 0.8 - 15: 0. Average 1997 ICI score for RMs 17.9 to 18.3: 26. Average 1998 ICI score for RMs 1.6 & 2.6: 0. Grassy: No data available. BPJ assumes impaired Duck: OEPA 305b report data.
BUI 7: Restriction on dredging activities	Impaired	Not Applicable	Not Applicable	Maumee River: commercially navigable waterbody with dredging activities is the Maumee River. Grassy & Duck Creek: No navigational dredging occurs on Grassy Creek.
BUI 8: Eutrophication or undesirable algae	Unknown	Unknown	Unknown	Maumee & Grassy: Status of this BUI is unknown. No data available on dissolved oxygen or nuisance growths of algae. Duck: Occasionally; not toxic algae.
BUI 9: Restrictions on drinking water consumption, or taste and odor	Not Applicable	Not Applicable	Not Applicable	Grassy & Duck: Does not apply - no known drinking water supplies.
BUI 10: Beach closings	Impaired	Impaired	Not Impaired	Maumee River: Local fishing spots along the river. Because work is scheduled on CSOs, BPJ would be to indicate impairment. ODH only has information on Lake Erie.21 Grassy Creek: No information available on use of this creek. Duck: Review e.coli data; work w/ Health Dept.
BUI 11: Degradation of aesthetics	Impaired	Impaired	Impaired	Maumee & Grassy: Public health nuisances associated with raw or poorly treated sewage can be a problem in these streams due to number, density of units (homes), age, poor maintenance, and no monitoring of septic systems. Duck: Clean Your Streams day events, surveys of watershed during WIRP project and tours; past reports of sheens to OEPA and Coast Guard.
BUI 12: Added cost to agriculture and industry	Unknown	Unknown	Not Impaired	Duck: No known ag or industrial users present.
BUI 13: Degradation of phytoplankton and zooplankton populations	Not Applicable	Not Applicable	Not Applicable	Ohio EPA has determined that this BUI does not apply to these waters.
BUI 14: Loss of fish and wildlife habitat	Impaired	Impaired	Impaired	Ohio EPA QHEI scoring in 1986, 1993, 1997 and 1998 indicate that Maumee is impaired. Ohio EPA 1993 QHEI scoring indicate that Grassy Creek is slightly below the desired score.

Table 10 - Major Water Bodies in the Watershed

Name/Location	Acres	Elev(ft.)	Type	Uses
Former Quarries near Holland	87.6	657	Former Quarry	
Albon Lake	52.0	628	Former Quarry	Private Recreation
Wauseon Reservoir Number Two	45.1	756	Up Ground	Municipal Water, Recreation
Delta Reservoir	39.0	728	Up Ground	Municipal Water, Recreation
Williamsburg Lake	25.2	648	Dam on Stream	Private
Yellow Creek Reservoir	23.0	744	Up Ground	
Swanton Reservoir	20.8	670	Up Ground	Municipal Water, Recreation
Lake near Deshler	15.6	713		
Lake near Whitehouse	13.9	632		
Fulton Pond - State Reservation	10.8	703	Dug Out	Public Wildlife Area
Wauseon Reservoir	17.0	752	Up Ground	Municipal Water, Recreation

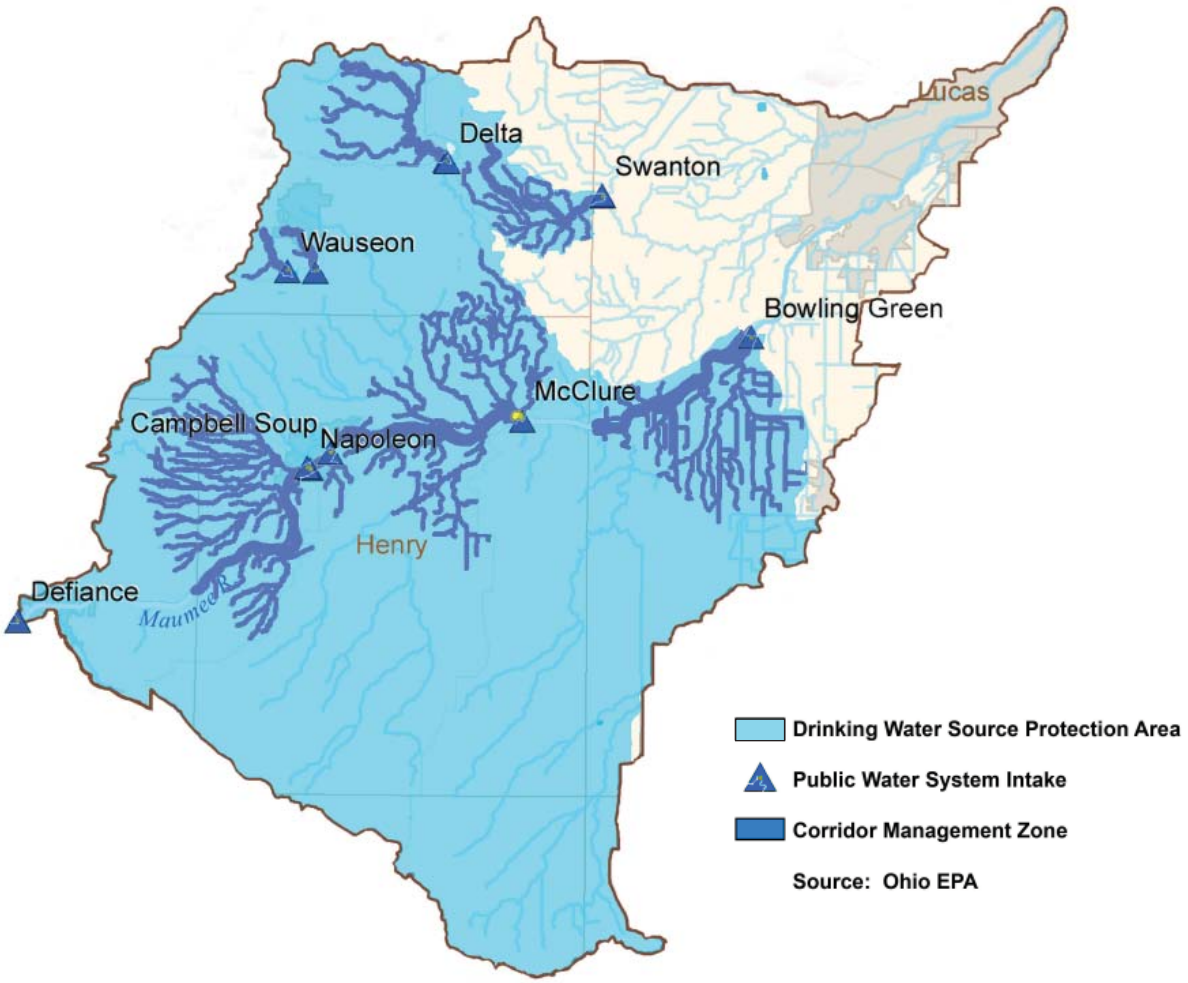
Drinking Water Source Protection Area

The Source Water Assessment and Protection Program in Ohio helps public water suppliers protect drinking water sources, such as streams and underground aquifers, from contamination, in keeping with the Federal Safe Drinking Water Act amendments of 1986 and 1996. These efforts consist of both an assessment (including protection area delineation; identifying the potential contaminant sources in that area; and determining the susceptibility of the aquifer or surface water) and a plan for protection. Possible threats to the surface water source include agricultural runoff (pesticide/fertilizer storage and application, animal feedlots), transportation spills, home construction runoff, oil/gas production activities, unsewered areas, wastewater treatment discharges, landfills, and commercial sources.

The map below shows Drinking Water Source Assessment Areas for Public Water Systems using surface water in the Lower Maumee subbasin. The areas shaded in dark blue are stream corridor management zones which are typically upstream from points of water intake.

Conservation Management Practices such as nutrient management, pest management, conservation buffers and filters, conservation tillage, and animal waste utilization can have a beneficial effect on water quality in the designated source water protection areas.

Figure 11 - Drinking Water Source Protection Area



Soil Resource Information

Soil Resources

The soils of the Lower Maumee Watershed formed in many different kinds of parent materials including glacial till, lacustrine and beach deposits, glacial outwash, recent alluvium, material weathered from bedrock, and organic material.

There are 317 different soil types occurring in the watershed, each with its separate soil management concerns, crop productivity, and capability for different land uses. The soils are dominantly nearly level, very poorly drained and somewhat poorly drained mineral soils formed in deposits of lacustrine material or glacial till, but also include acreages of sandy soils on beach ridges and flats, organic soils in depressional areas, and sloping erosive soils on short side slopes along valleys and narrow bands of end moraines.

Nearly level areas of very poorly drained Hoytville soils comprise about 41 percent of the watershed. Occupying expansive flats on lake-modified glacial till plains in the upper part of the watershed, these soils need artificial drainage for grain crop production. Associated with areas of Hoytville soils are nearly level areas of Nappanee soils comprising about 5 percent of the watershed that also have a wetness limitation due to a high seasonal water table.

Nearly level areas of very poorly drained Mermill soils make up about 6 percent and somewhat poorly drained Haskins soils comprise about 3 percent of the watershed also on lake-modified till plains.

In the northern and central parts of the watershed, the soils typically consist of moderately well drained Ottokee soils, somewhat poorly drained Tedrow soils, and very poorly drained Granby soils on lake plains, deltas, outwash plains, and beach ridges. These soils typically have sandy surface layers and are subject to wind erosion. In addition, Tedrow and Granby soils have a wetness limitation. The watershed consists of about 4 percent Ottokee soils, 4 percent Granby soils, and 2 percent Tedrow soils.

Soil management concerns for most of the soils of the Lower Maumee Watershed include: a) seasonal wetness and the need for artificial drainage on about 599,000 acres of land; b) a hazard of soil erosion by water on about 37,000 acres of land; c) a hazard of soil erosion by wind on about 131,500 acres; d) a hazard of droughtiness due to a restricted root zone on about 68,000 acres; e) and a hazard of soil subsidence on about 470 acres of organic soils.

Land Capability System

Land capability classification shows, in a general way, the suitability and management concerns of soils for most kinds of field crops. In general, the soils here are grouped at two levels, capability class and subclass. Capability classes, the broadest groups, are designated by Roman numerals I through VII indicating progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I: soils having few limitations for use; Class II: soils having moderate limitations;
Class III: soils having severe limitations; Class IV: soils having very severe limitations;
Class V: soils having severe limitations for use other than a hazard of erosion; and Class VI and VII: soils having very severe limitations making them generally unsuitable for cultivation.

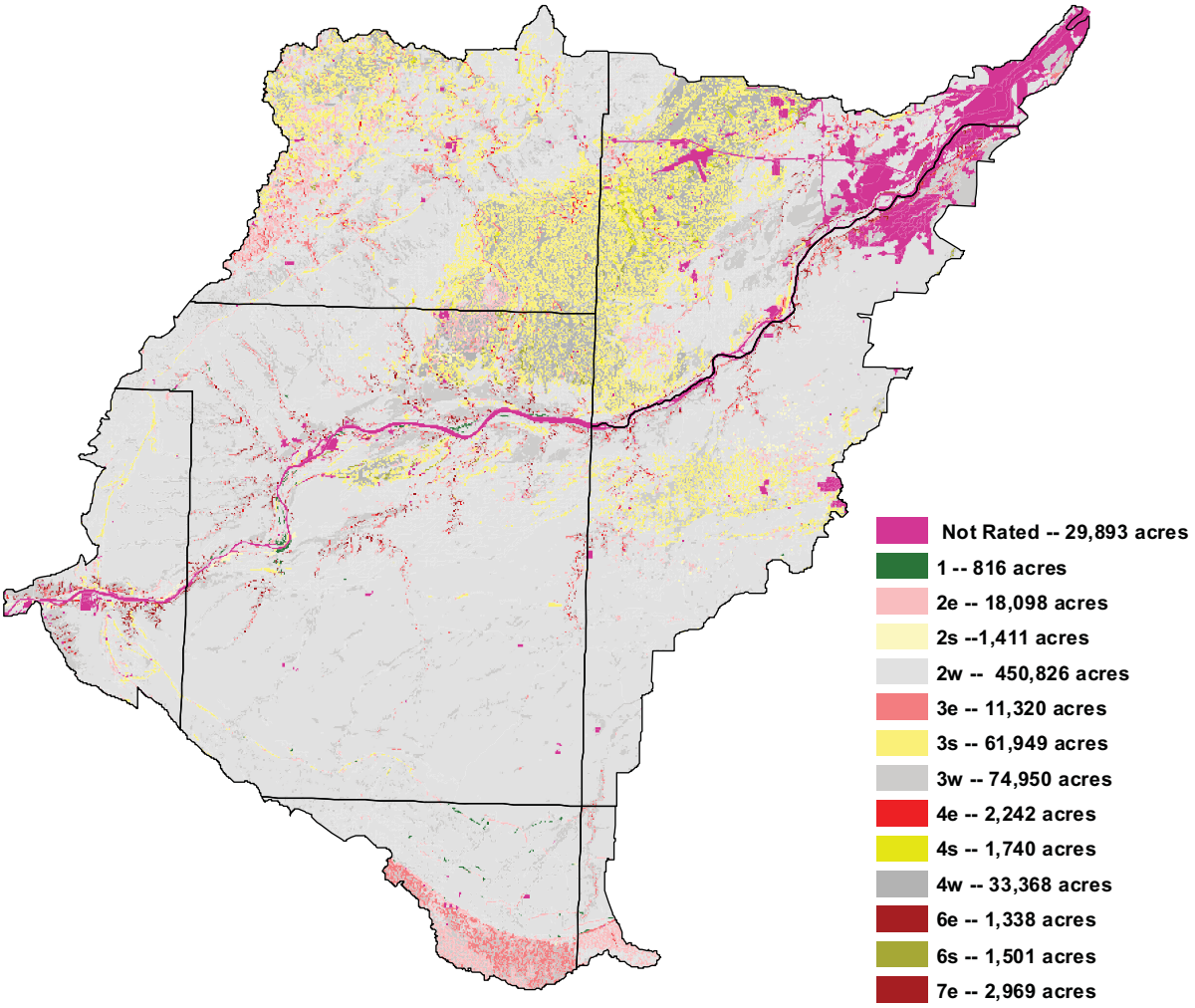
Capability subclasses are soil groups within one class and are designated by adding a lower case letter e, w, or s to the class number denoting a hazard of erosion, wetness, or a restricted root zone respectively.

In general, there are about 800 acres of Class I soils (having no significant limitations); 470,000 acres of Class II soils; 148,000 acres of Class III soils; 37,000 acres of Class IV soils; 3,000 acres of Class VI soils; and 3,000 acres of Class VII soils.

Table 11 - Land Capability Subclasses

Land Capability Subclass	Acres
1	816
2e	18,099
2s	1,411
2w	450,826
3e	11,320
3s	61,949
3w	74,950
4e	2,242
4s	1,740
4w	33,368
6e	1,338
6s	1,501
7e	2,969
Not Rated	29,893

Figure 12 - Land Capability Subclasses



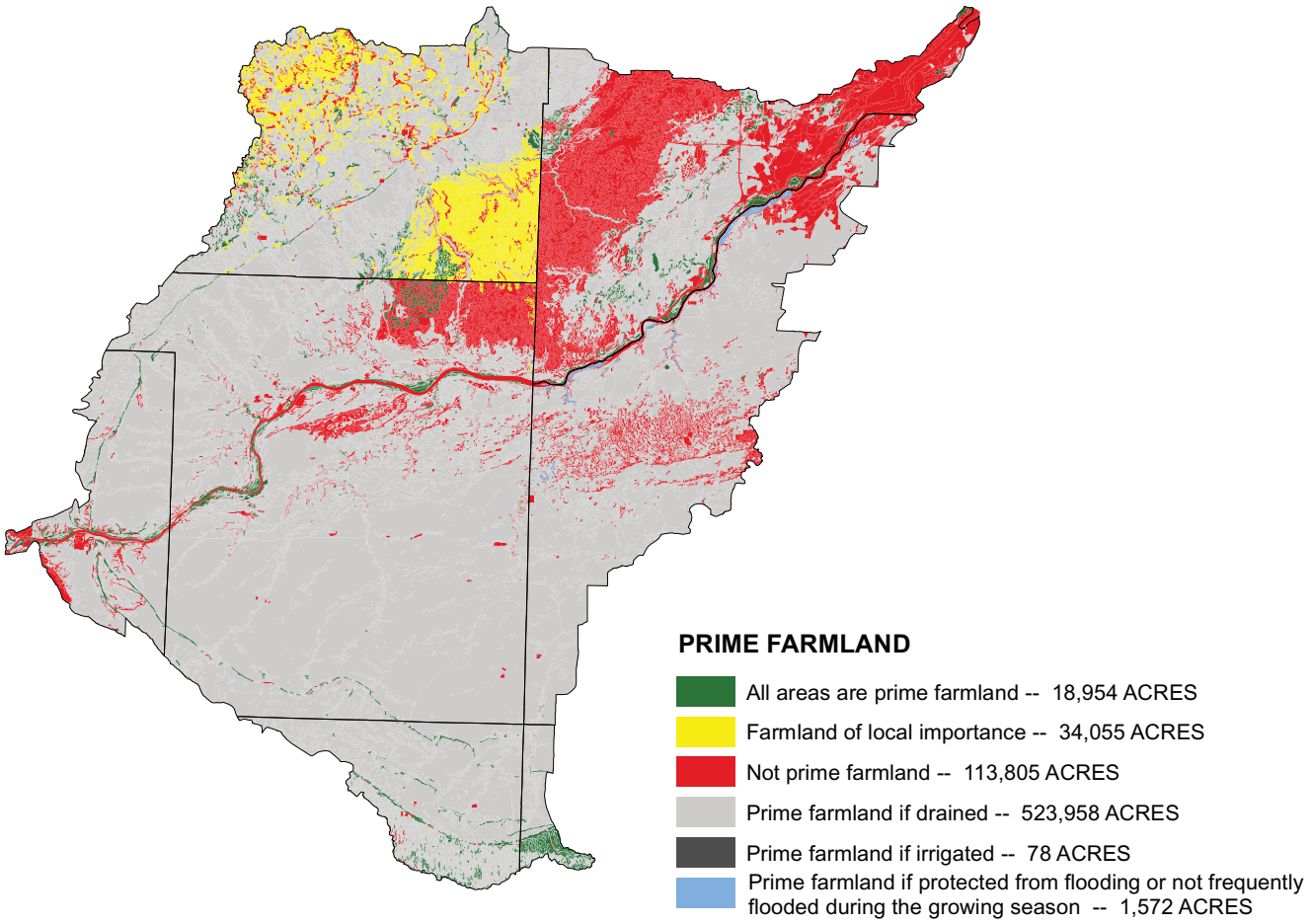
Prime Farmland Classification

Prime farmland is one of several kinds of important farmland defined by the USDA.

In the watershed, about 524,000 acres are listed as “prime farmland if drained,” including areas of Hoytville, Mermill, Nappanee, Haskins, Millgrove, Rimer, Toledo, Colwood, Gilford, Sloan, Del Rey, Wauseon, Fulton, Lenawee, and Pewamo soils; 19,000 acres are listed as “all areas are prime farmland” including areas of Galen, Dixboro, Oshtemo, Eel, Glynwood, Dunbridge, and Ross soils; 1,500 acres listed as “prime if protected from flooding or not frequently flooded during the growing season” including frequently flooded areas of Eel, Genesee, Landes, and Ross soils; and about 80 acres of Del Rey Variant soils listed as “prime farmland if irrigated.”

In the Lower Maumee Watershed, about 114,000 acres are listed “not prime farmland,” including Granby, Tedrow, Ottokee, Spinks, Oakville, and Paulding soils; and 34,000 acres have been designated “farmland of local importance,” including areas of Ottokee, Granby, Tedrow, and Seward soils, primarily in Fulton County.

Figure 13 - Prime Farmland



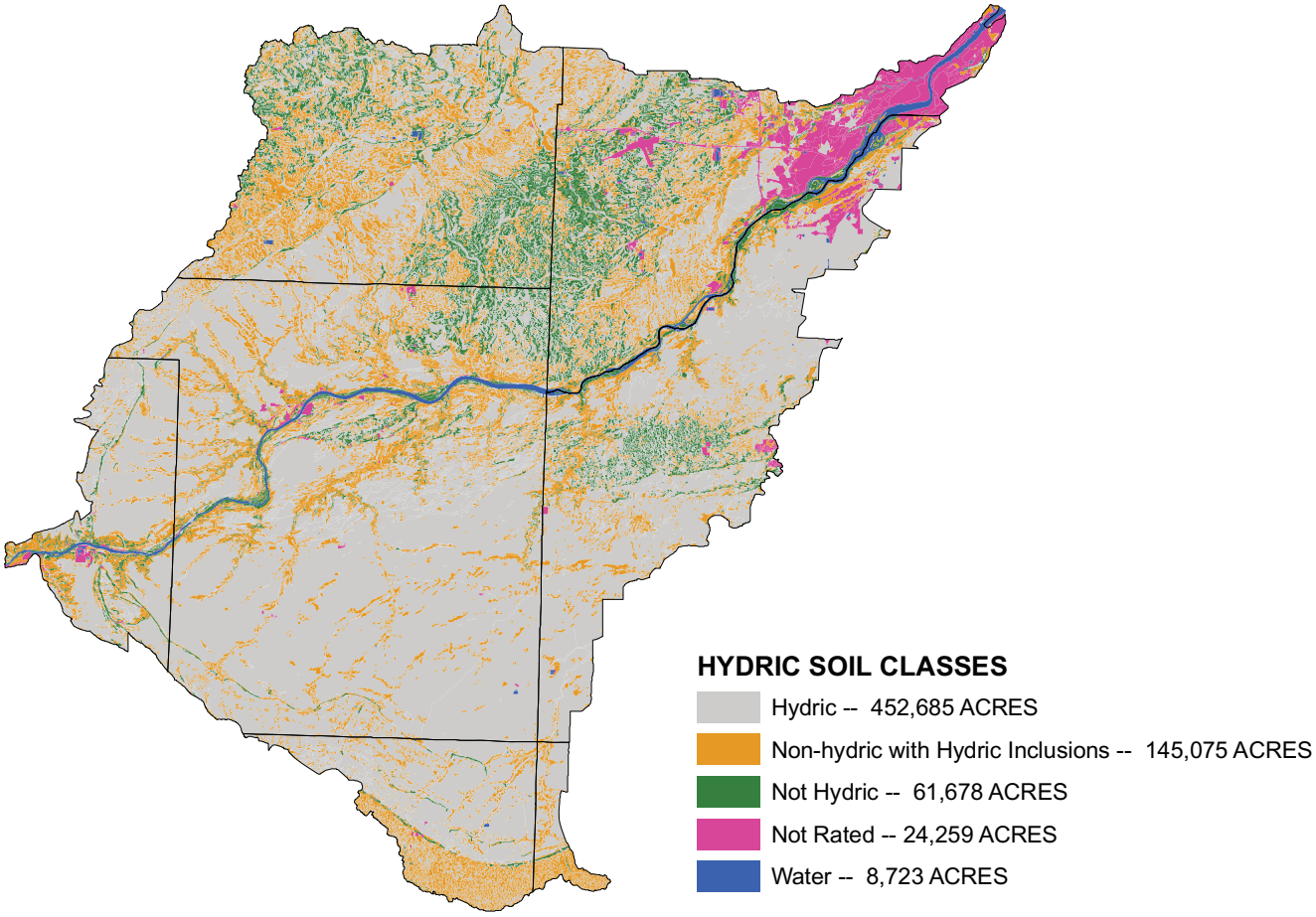
Hydric Soil Distribution

Hydric soils are those soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part and support the growth and regeneration of hydrophytic vegetation.

In the Blanchard Watershed, hydric soils occur in depressional areas. In MLRA 99, hydric soils, such as Paulding clay, typically occur in wide, expansive flats on lake plains. In MLRA 111 hydric soils, such as Pewamo silty clay loam, typically occur in relatively narrow swales on glacial ground moraine.

Of the 256 different soil types occurring in the watershed, 66 soil types are hydric soils occupying about 208,000 acres or about 42 percent of the watershed. Pewamo silty clay loam and Paulding clay are the two most extensive hydric soils and are about 100,600 and 24,100 acres, respectively. Other hydric soils include Hoytville, Latty, Lenawee, Mermill, Millgrove, Millsdale, Pandora, Rensselaer, Sloan, Toledo, and Westland soils.

Figure 15 - Hydric Soil



Soil Loss

Soil erosion in the Lower Maumee Watershed is caused by both wind and water.

Average soil erosion rates by water on all cropland in the Lower Maumee Watershed has declined from about 1.6 T/Ac/Year in 1982 to about 1.0 T/Ac/Year in 1997. In 1997 using land capability classes, average soil erosion rates were estimated at about: 1) 1.6 T/Ac/Year on Class 1 land; 2) 2.6 T/Ac/Year on Class 2e; 3) 0.9 T/Ac/Year on Class 2w land; 4) 3.8 T/Ac/Year on Class 3e; 5) 1.2 T/Ac/Year on Class 3w land; 6) 2.0 T/Ac/Year on Class 4e cropland; and 7) 0.6 T/Ac/Year on Class 4w cropland.

In 1997, Class 2w and 3w soils accounted for about 66 and 11 percent of gross soil loss respectively in the Lower Maumee Watershed despite the fact that only about 1 T/Ac/Year of soil eroded from those classes (NRI). The high clay content of these fine textured surface layers produces runoff containing a high content of suspended clays that can enter and pollute surface water. In 1997, soils having a hazard of erosion as a management concern (Classes 2e, 3e, 4e, 6e, and 7e) accounted for about 14 percent of gross soil loss due to low acreage.

Relative to wind erosion, in 1982, about 27,700 acres of cropland exceeded a tolerable rate of soil loss in the Lower Maumee Watershed. This was reduced to about 7,700 acres of cropland eroding by wind by 1997 (NRI).

Figure 16 - 1997 Annual Gross Soil Loss on Cropland by Land Capability Subclass
(Tons/Year and Percentage)

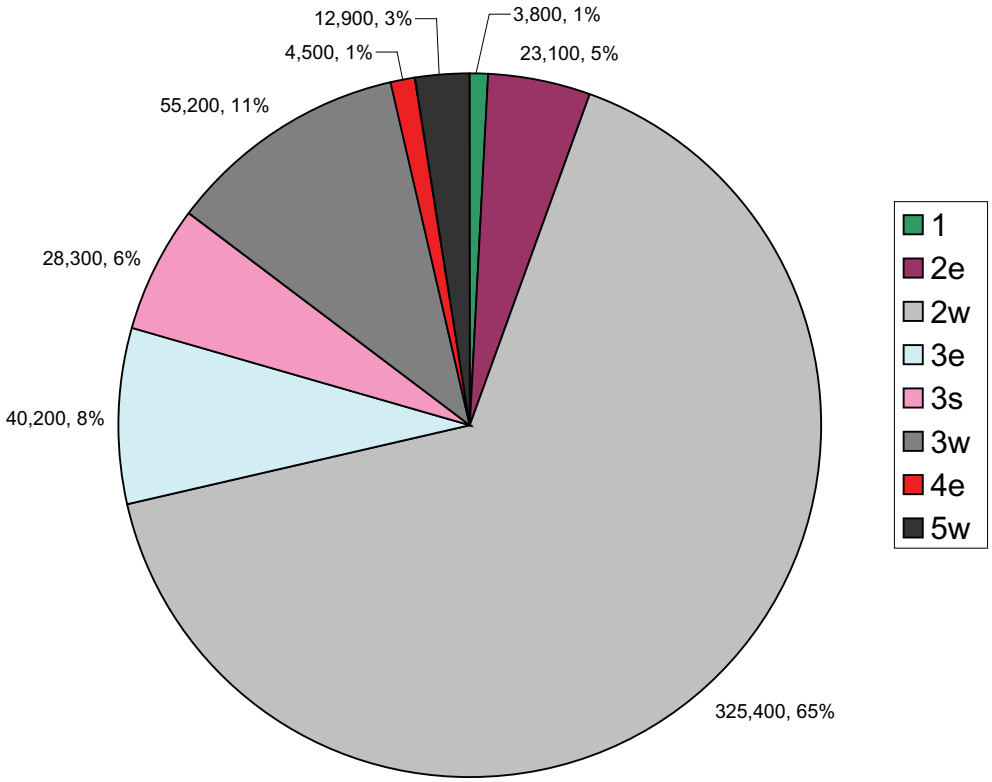


Table 12 - Estimated 1997 Gross Soil Loss from Cultivated Cropland by Land Capability Subclass

Land Capability Subclass	Annual Gross Soil Loss (Tons/Year)	Percent of Total
1	3,800	1%
2e	23,100	5%
2w	325,400	66%
3e	40,200	8%
3s	28,300	6%
3w	55,200	11%
4e	4,500	1%
5w	12,900	3%
Total	493,400	100%

Note: some land capability subclasses not estimated in NRI due to statistical probabilities and low acreages: 2s, 4s, 6e, 6s, and 7e.

NOAA 3-13-2009 Satellite photo captures the sediment plume from the March 8 – March 13 rain storms that occurred over the Maumee Basin. The Lower Maumee River delivers sediment from the 7 hydrologic units in the watershed into the Toledo Harbor and Maumee Bay.

The Maumee sediment plume can be seen in the lower left corner of Lake Erie, with additional plumes from the Portage, Sandusky, Raisin ,and Lake St. Clair Watersheds also visible. Note the contrast between Maumee Bay and the Western Basin and the rest of Lake Erie.

Analysis of Soil Erosion Potential Within the Watershed

The flat nature of this watershed often masks differences in soil erosion potential when typical highly erodible land measurements are used. For this reason, soil erosion potential was calculated for each map unit in the watershed by multiplying the Rainfall Factor (R) times the Soil Erodibility Factor (K) times the Length Slope Factor (LS). These resulting values were grouped by ranges. The higher the resulting RKLS value, the greater the potential for the soil to erode.

Figure 16 depicts areas within each range. Areas that are yellow, orange, or red show highest inherent potential for the soil to erode. This analysis does not account for any land treatment in place that will affect the actual rates of erosion. It only measures potential.

Figure 16 - Soil Erosion Potential (R x K x LS)

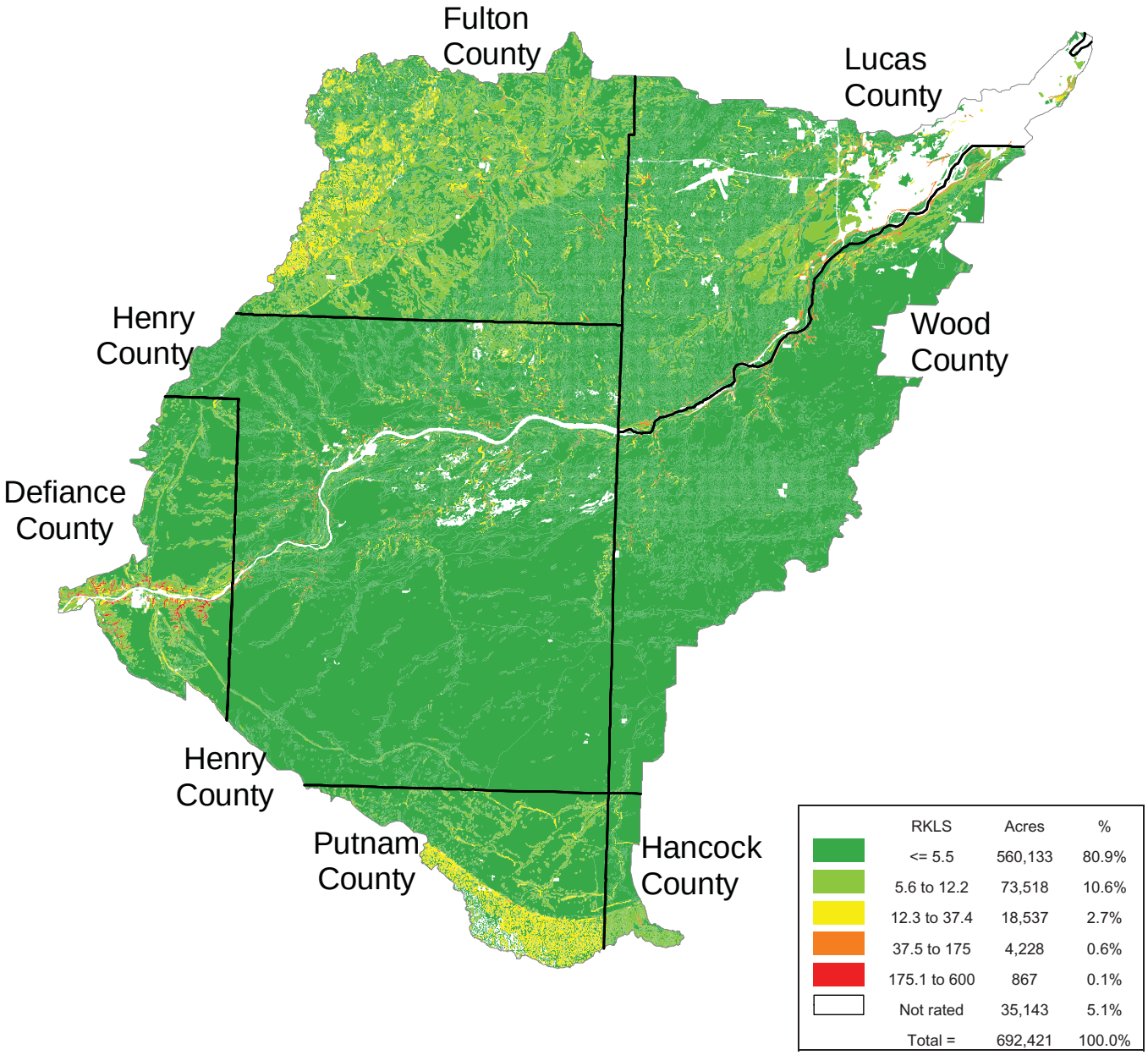
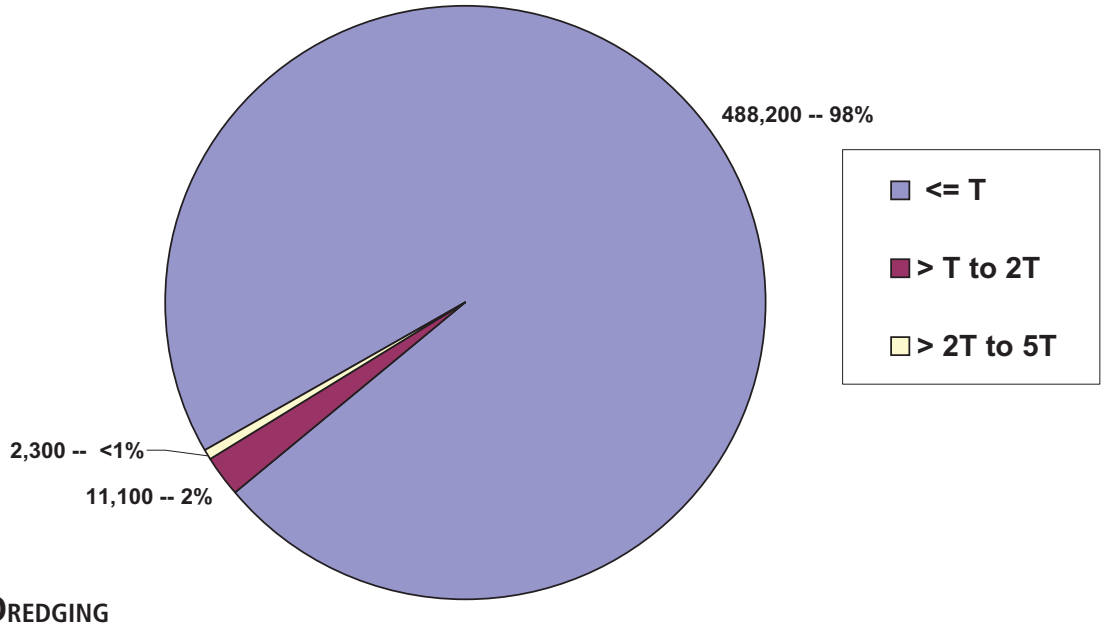


Figure 17 - 1997 All Cropland Soil Erosion Rates as a Multiple of "T" (Acres)



Toledo Harbor Dredging

The outlet channel of the Lower Maumee River coincides with the Toledo shipping harbor. This channel is the passageway for more sediment to the Great Lakes than any other river and approximately 33 percent of the transported sediment is captured in Toledo Harbor. The river's large sediment load is partly due to the large size of its watershed (6,608 square miles) and partly due to the intensively cultivated agricultural land use of the watershed (approximately 75 percent) compared to more forested drainage areas. Further features of this nexus of river and harbor include the following:

The Army Corps of Engineers needs to dredge approximately 850,000 cubic yards of sediment annually to keep up with deposition and keep open the shipping lanes of the harbor at a cost of at least $2.2 million. The dredged material is presently disposed of in Combined Disposal Facilites (CDFs) and by dumping in the open lake. Because of the contamination with heavy metals and much of the sediment dropping out in the river portion of the shipping lane (as opposed to the cleaner sediment that plugs the Lake Approach Channel), the contaminated sediments must be placed in the CDFs which are getting full. Alternative disposal sites and methods have been sought for some time.

"The Port of Toledo Seaport is the eighth largest port on the Great Lakes and the 53rd largest in the nation based upon material shipments that have averaged approximately 11.0 million tons annually over the 2004-2007 period. ...Collectively, commercial navigation activity accounts for approximately 500 local and 50,000 regional jobs, with an estimated $69.5 million generated annually in personal income for port jobs."[1]

Conservation practices, including reduced tillage, conservation buffers, and conservation cover, reduce erosion and the sediment load carried downstream to the harbor and Lake Erie. The results of investing in best management practices on the agricultural landscape include benefits of "increased agricultural productivity, improved water quality and aquatic habitat, enhanced recreational opportunities, reduced dredging needs, and reduced pressure on CDFs."[2] Pilot projects of funding conservation practices in the upland areas through Soil and Water Conservation Districts have been successfully completed resulting in higher rates of adoption of conservation tillage practices.

---

1 Army Corps of Engineers, Western Lake Erie Basin Study, Lower Maumee Watershed Assessment, Final Draft, August 29, 2008, p. 113.

2 Ibid, p. 119.

Flood Plain Soils

Soils formed in recent alluvium on naturally occurring flood plains comprise about 16,680 acres or about 2.4 percent of the Lower Maumee Watershed. These soils are on relatively narrow flood plains along streams that commonly occur at the base of sloping to very steep uplands. These soils formed in recent deposits of alluvium that were deposited by stream bank overflow. These soils may flood frequently (usually about once per year) or occasionally (usually about once every other year). Soil maps identify alluvial soils by soil map unit name and are landform based.

Figure 18 - Flood Prone Soils

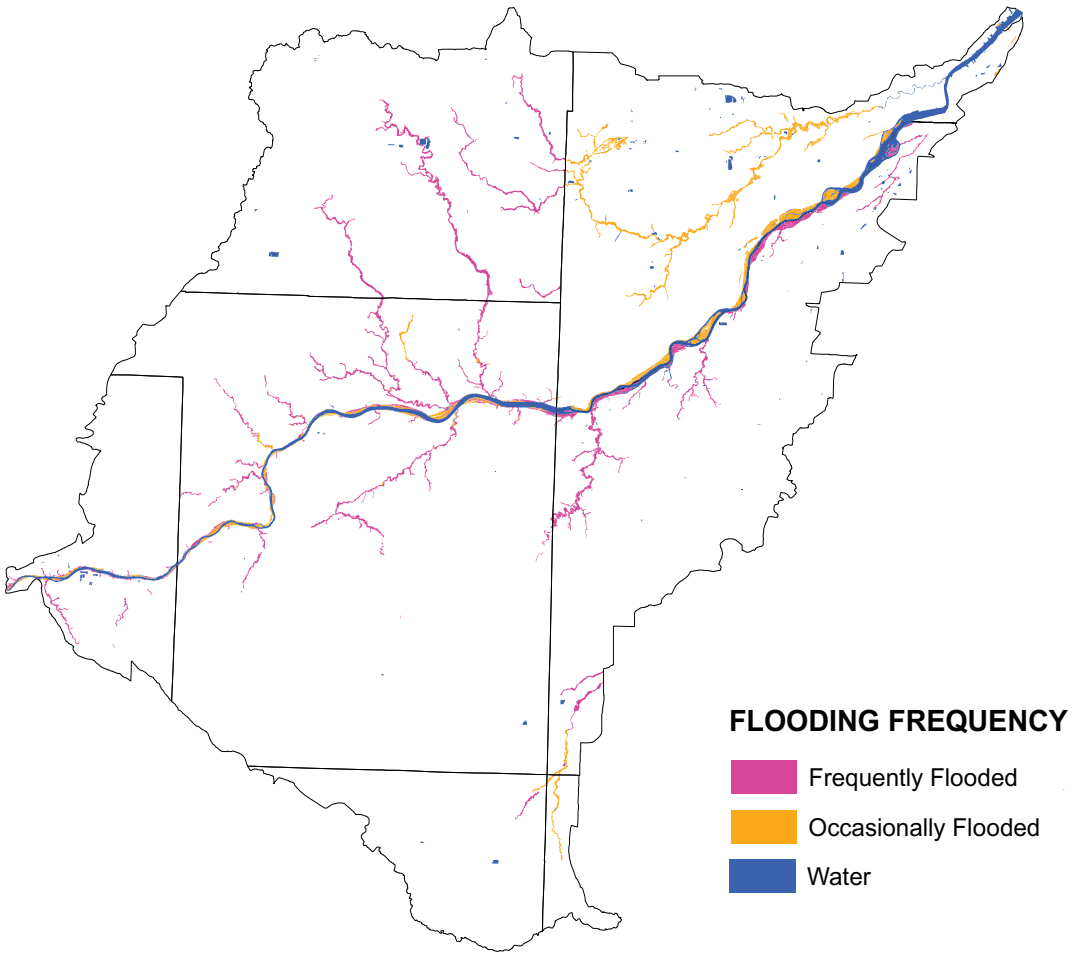
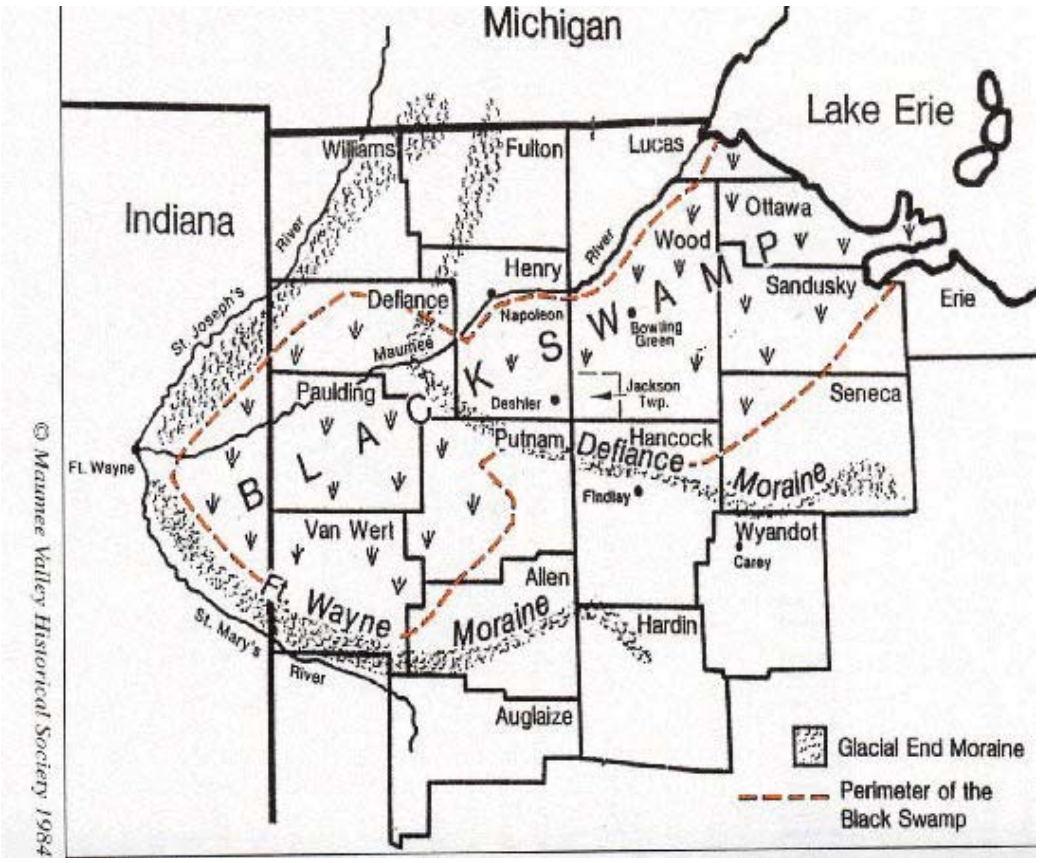


Table 13 - Flood Prone Soils Data

	Acres
Frequently Flooded	9,914
Occasionally Flooded	6,763

Flooding and Water Drainage in the Lower Maumee Watershed

Despite successful efforts during the 1800s to convert what was originally a great swamp into productive farmland, remaining flooding and water drainage issues remain for the Maumee basin including the Lower Maumee portion.



Using the USGS gage at Waterville (gage No. 04193500), out of 83 years of record (1922-2006, missing years 1937-1938), 76 years had river peak levels at or above the beginning flood stage. Fourteen of those years had river levels that reached 4 ft. to 7 ft. above flood stage. Maximum height above flood stage has been 10.9 ft. in 1913. The record discharge was in March 1913 at 180,000 cfs (estimated) followed by March 1982 at 121,000 cfs. The USGS estimates the 100-year flood flow at 123,000 cfs (Water-Resources Investigations Report 03-4164). A table of the largest flows, in descending order of magnitude, is shown below on the next page.

Efforts to reduce or remove flooding from municipalities along the Maumee River by structural measures such as levees and diversions often are not financially justified from a benefit/cost ratio.

1 Western Lake Erie Basin, Lower Maumee Watershed Assessment, Army Corps of Engineers, 2008.

Table 14 - Lower Maumee Flood Discharges

Year	Discharge(cfs)
1913	180,000
1982	121,000
1985	100,000
2005	94,100
1950	94,000
1978	91,900
1991	90,700
1981	89,800
1959	85,000
1967	80,800

Structural works that have been installed include a Swan Creek Flood control project completed in 1995 and the diversion of Grassy Creek around the village of Perrysburg complete in 1965.[1]

Smaller tributaries and waterways carrying runoff from heavy, more local, rains are often the source of flooding in Toledo rather than flood waters coming from the Maumee River. This was the case from the storms of June 21, 2006, and early July of the same year, where flooding was not from the Maumee River, but numerous areas in the greater Toledo area had flooded basements and streets.

Efforts such as the Toledo-Lucas County Rain Garden Initiative (http://www.raingardeninitiative.org/) seek to address local runoff that contributes to flooding.

Rural drainage is very important due to the historically swampy character of the watershed. Highly productive agriculture depends on the maintenance of the extensive drainage systems that drain the often naturally poorly drained soils. The high resolution National Hydrography Dataset maps 2,460 miles of rivers, streams, and ditches in the watershed. This computes to a stream density of 2.27 miles of stream per square mile of drainage area. Maintaining these systems in an environmentally responsible manner is challenging from a financial and workload perspective. Except for the highly urbanized Lucas County, all 7 counties wholly or partly in the watershed have over 200 miles of open ditches, subsurface mains, and grassed waterways on their county ditch maintenance program.[2]

1 Ibid
2 Pamphlet "Rural Drainage Systems", ODNR/OFSWCD, January, 2008, p.3.

Wind Erosion

There are about 130,250 acres in the Lower Maumee Watershed comprised of soils subject to a severe wind erosion hazard. These soils have sandy surface layers and occur on glacial beach ridges and deltas and nearshore bars on lake plains. They are subject to blowing and wind erosion if left bare during the winter and spring months.

Figure 19 -Soils Subject to Severe Wind Erosion

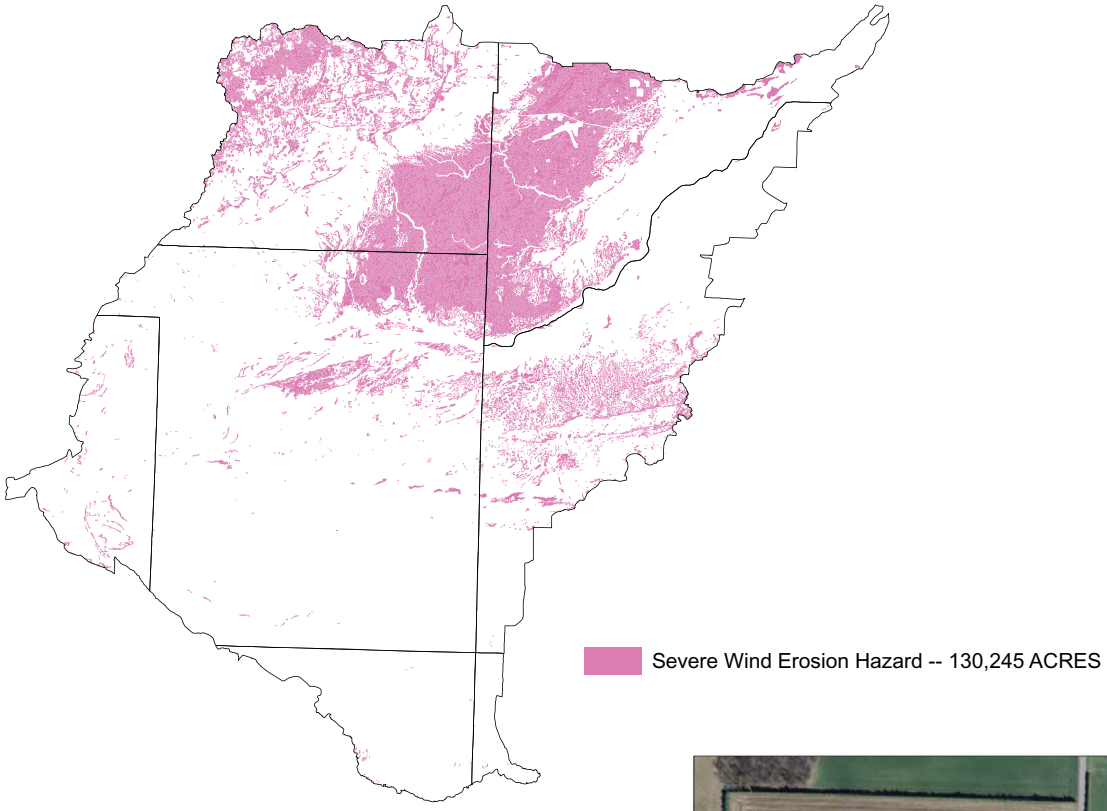


Table 15 - Air Resource Concerns Table

Soils Subject to Wind Erosion (acres)	
Organic Soils	Mineral Soils
532	130,245

Field Windbreak in the Lower Maumee Watershed

Plant and Animal Resources

Livestock Resources Information

Most of the livestock in the watershed is raised in confinement operations with the high percentage of cropland in the watershed. Pasture is a minor land use. Dairy/beef, swine, and poultry are all significant components of the livestock industry in this watershed. Horses for pleasure are a livestock component of this watershed surrounding the Toledo urban area.

Dairy/beef produces the most manure on a dry tonnage basis, and poultry litter is second. The livestock waste generated in the watershed is utilized via application to cropland. Waste is handled in both the liquid and solid form.

There are estimated to be 402 livestock operations in this watershed and 181 are estimated to have (or following) a recent current/sufficient Comprehensive Nutrient Management Plan (CNMP) (or following the 633 Waste Utilization Standard). The remaining 221 producers need a new or revised CNMP plan or partial CNMP planning assistance. There is ample land in the watershed to utilize the livestock waste generated. The waste generated is estimated to supply 16 percent of the total phosphorous needs for the crops grown in this watershed.

Large permitted confinement operations often generate considerable publicity and public interest. There are however, only 6 permitted operations in this watershed, less than 2 percent of the operations in the watershed (by number).

Table 16 - Livestock Operations Data

Lower Maumee Watershed Livestock Operations Data	Number
Total Number of Confined Livestock State Permitted Operations in the Watershed	6
Estimated Number of Nonpermitted Confined Livestock Operations in the Watershed	402
Number of Nonpermitted Facilities in the Watershed with Recent Comprehensive Nutrient Management Plans or following NRCS Waste Utilization Standard 633	181
Estimated Number of New Comprehensive Nutrient Management Plans (CNMPs) that may be needed in the Watershed	221

Table 17 - Estimated Livestock Animal Units, Manure Production, and Nutrient Production

County & Watershed Totals	AU	AU	AU	AU	Manure Production(Tons/ Yr.)			Nutrient Production (1000 Lbs./Yr.)		
	Dairies	Beef	Swine	Poultry	Dairy/Beef	Swine	Poultry	N	P2O5	K2O
Defiance	8,876	4,145	1,269	4	158,393	15,655	43	1,761	878	1,325
Fulton	5,349	9,803	6,987	0	149,579	86,185	0	2,536	1,580	1,873
Hancock	2,897	1,645	2,661	0	51,913	32,824	0	916	579	675
Henry	4,457	724	1,037	0	65,516	12,793	-	805	295	603
Lucas	1,114	66	1,228	7,918	15,465	15,150	94,022	2,238	3,182	1,404
Putnam	9,360	2,763	8,311	1,451	147,459	102,513	11,873	2,965	2,028	2,142
Wood	2,229	1,908	819	5,600	45,038	10,100	66,500	1,913	1,692	1,244
Lower Maumee Watershed	7,761	4,532	6,539	9,893	140,903	80,660	115,605	3,185	3,901	3,180

Note: Poultry estimates err on the low side because yearly statistics do not report them. Some poultry data is taken from the 2002 Census of Agriculture, but there, as well, the data may be unreported where it would disclose individual farm numbers.

	Nutrients/Cropland Acre (Lbs/Ac/Yr)		
Lower Maumee W/S	N	P2O5	K2O
Produced by animals in the watershed	6.7	8.2	6.7
Needed for crop production in the watershed	71.4	49.0	80.0

Wildlife and Endangered Species

Wildlife habitat in the majority of the watershed is influenced by the predominance of land devoted to intensive cropping. In these areas, virtually all native vegetation has been removed. Most of the agricultural land provides marginal habitat for common edge or disturbance adapted species; lack of winter cover or food for resident species is severely limiting. Permanent cover in the form of woodland, wetlands, or grasslands is limited (approximately 7 percent), fragmented and subject to a variety of disturbances. Although this area was the heart of the Great Black Swamp, a large wooded wetland which occupied much of the watershed in pre-settlement time, the amount of wetland now is less than 3 percent of the watershed. Within the rural areas of the watershed, woodlands occur mostly as small isolated woodlots or narrow riparian borders. Very few large grassland areas (CRP, old field, pasture) exist and most are subject to disturbance such as mowing which negatively impacts wildlife use. There are increasing amounts of narrow grass borders in cropland areas, but these are still very minimal in terms of benefits to wildlife. Within the urban areas, significant wildlife habitat is limited to a few parks or natural areas.

Habitat quality in streams and rivers in the watershed is negatively impacted by excess sediments, nutrients, stream modification, and lack of permanent riparian cover in both rural and urban areas. Smaller tributaries and headwaters are the most severely impacted. The main stem of the Maumee River does support some significant habitat for fish and other aquatic species.

In the majority of the watershed, the presence of unique plant communities and threatened or endangered species is minimal. However, the watershed does contain a globally significant ecosystem, the Oak Openings. This area just west of Toledo contains more rare species than any other area in Ohio. The Oak Openings also supports the only significant concentration of woodland in the watershed. The Oak Openings is an area of ancient beach ridges in which sandy soils are intermixed with areas of shallow water tables. The area supports a high concentration of rare plant species and associated wildlife. Several unique plant communities find their highest acreage in this area and some are found nowhere else in Ohio. However, the unique plant communities such as oak barrens or twigrush prairies and the flora and fauna associated with them face several threats. Outright loss to development and degradation due to fragmentation, lowered water tables, woody plant succession, and spread of invasive plants are reducing the extent of this unique ecosystem.

Table 18 primarily reflects the limited fish and wildlife habitat associated with most of the rural and urban areas. Table 19, listing some of the rare and endangered species, is primarily an indication of the high species diversity found only in the Oak Openings area. Because of the extensive number of listed species in this area, this table only includes those species which are federally listed as well as those listed as endangered by the State of Ohio.

Table 18 - Habitat Reference Information

	Availability and Condition of Wildlife Habitat				
	Much Less Than Typical State Watershed	**Less Than Typical State Watershed**	**Comparable to Typical State Watershed**	**Better Than Typical State Watershed**	**Much Better Than Typical State Watershed**
Stream Habitat	N/A	Condition degraded in many places	N/A	N/A	N/A
Grassland Habitat	Limited extent Low quality	N/A	N/A	N/A	N/A
Wetland Habitat	Limited extent Low quality	N/A	N/A	N/A	N/A
Forest Habitat	Limited extent Low quality	N/A	N/A	N/A	N/A
These designations were based on information from OEPA Water Quality reports, Ohio Division of Wildlife Comprehensive Wildlife Plan, and qualitative review of land cover information using broad wildlife habitat models and expert opinion.					

Figure 20 - Oak Openings Boundary

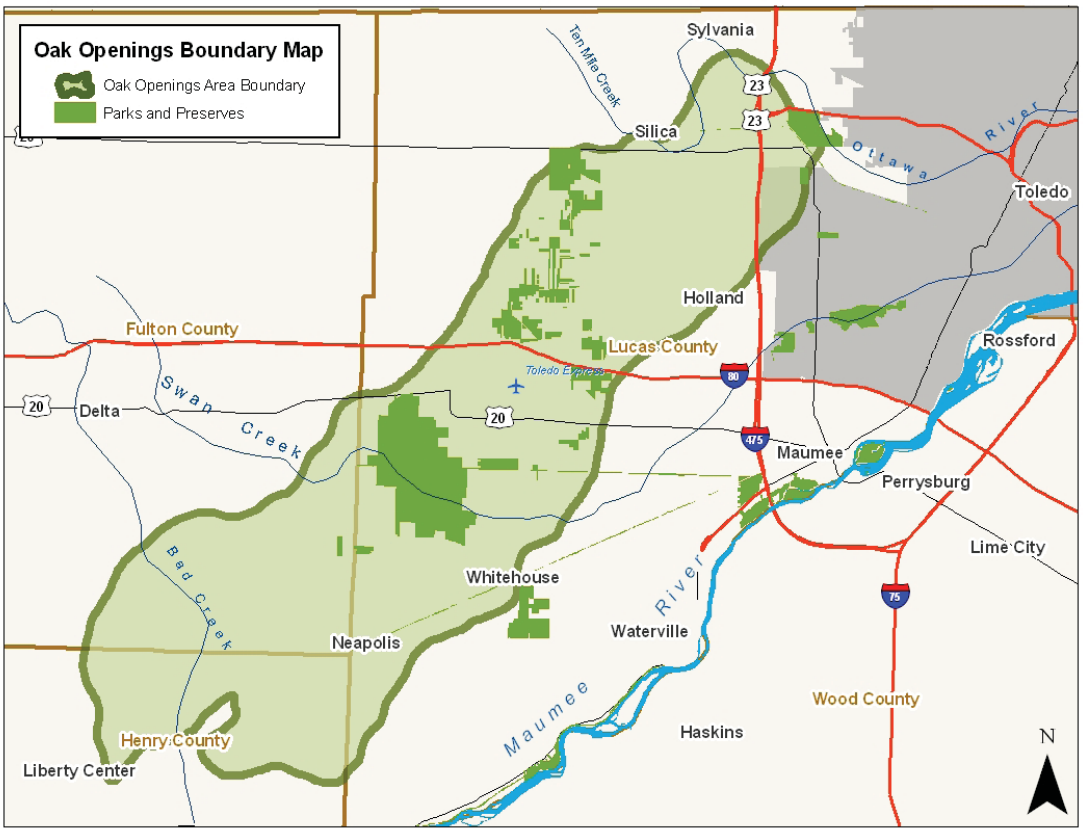


Table 19 - Rare or Endangered Species Information

Rare or Endangered Plant Species Reported from Watershed	Rare or Endangered Animal Species Reported from Watershed
Leasthery Grape Fern Botrychium multifidum	Karner Blue Butterfly Lycaeides melissa samuelis
Least Grape Fern Botrychium simplex	Frosted Elfin Incisalia irus
Variegated Scouring-rush Equisetum variegatum	Persius Duskywing Erynnis persius
Common Oak Fern Gymnocarpium dryopteris	Purplish Copper Lycaena helloides
Northern Appressed Clubmoss Lycopodiella subappressa	Unexpected Cycnia Cycnia inopinatus
Northern Adders-tongue Ophioglossum pusillum	Rayed Bean Villosa fabalis
Skinner's-foxglove Agalinis skinneriana	Blacknose Shiner Notropis heterolepis
Rock Serviceberry Amelanchier sanguinea	Blue-spotted Salamander Ambystoma laterale
Missouri Rock Cress Arabis missouriensis	Easter Massassauga Sistrurus catenatus
Prairie Fern-leaved False Foxglove Aureolaria pedicularia var. ambigens	Bald Eagle Haliaeetus leucocephalus
Long's Sedge Carex longii	Golden-winged Warbler Vermivora chrysoptera
Fire Sedge Carex lucorum	Lark Sparrow Chondestes grammacus
Fernald's Sedge Carex merritt-fernaldii	
Northern Croton Croton glandulosus	
Engelmann's Spike-rush Eleocharis engelmannii	
Fireweed Epilobium angustifolium	
Prairie Gentian Gentiana puberulenta	
Soapwort Gentian Gentiana saponaria	
Bicknell's Crane's-bill Geranium bicknellii	
Long-bearded Hawkweed *Hieracium longipilum*	
Canada St. John's-wort *Hypericum canadense*	
June Grass *Koeleria macrantha*	
Drummond's Dwarf Bulrush *Lipocarpha drummondii*	
Dotted Horsemint *Monarda punctata*	
One-flowered Wintergreen *Moneses uniflora*	
Plains Muhlenbergia *Muhlenbergia cuspidata*	
Cleland's Evening-primrose *Oenothera clelandii*	
Balsam Poplar *Populus balsamifera*	
Hairy Mountain-mint *Pycanthemum verticillatum var. pilosum*	
Green-flowered Wintergreen *Pyrola chlorantha*	
Tall Grass-like Beak-rush *Rhynchospora recognita*	
Grass-leaved Arrowhead *Sagittaria graminea*	
Atlantic Blue-eyed-grass *Sisyrinchium atlanticum*	
Missouri Ironweed *Vernonia missurica*	

Conservation Systems and Practice Application Data

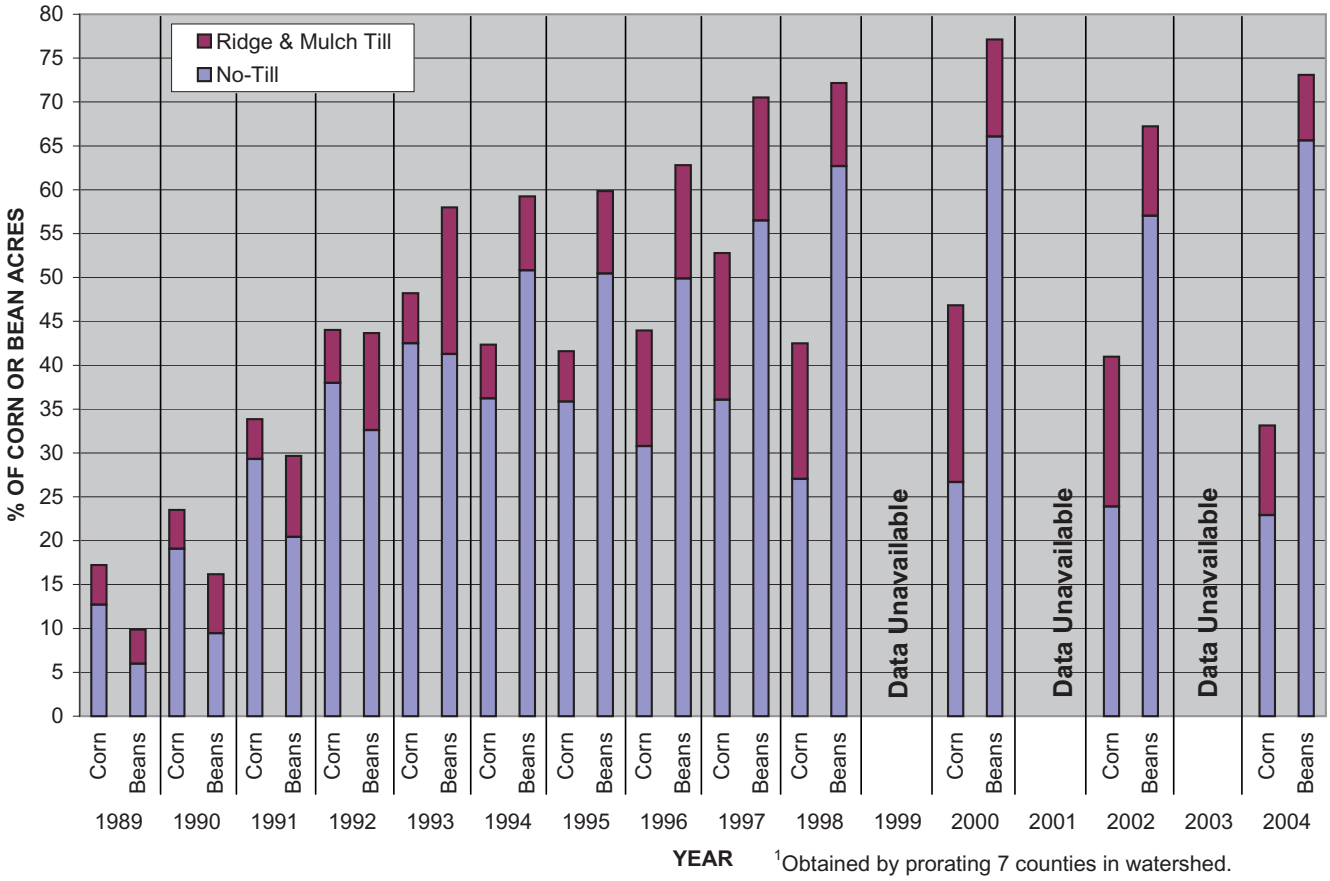
The following table was produced using NRCS's Performance Results System (PRS) and shows the application of key conservation practices and systems plus the number of conservation system acres applied by Farm Bill programs. PRS is used to track, analyze, and report NRCS conservation accomplishments. For more information on these and other reports, visit: http://ias.sc.egov.usda.gov/PRSHOME/.

Table 20 - NRCS Conservation Progress Performance Measures

	FY01	FY02	FY03	FY04	FY05	FY06	Total
Total Conservation Systems Planned (acres)	7,917	9,028	2,992	N/A	4,577	2,603	27,117
Total Conservation Systems Applied (acres)	7,722	13,096	3,162	N/A	4,139	2,201	30,320
Conservation Practices							
Erosion Control Total Soil Saved (tons/year)	14,473	16,314	2,969	N/A	4,034	7,700	45,490
Filterstrips (393) (acres)	287	430	496	159	67	84	1,364
Grassed Waterways (412) (acres)	3	2	4	2	1	0	10
Prescribed Grazing (528 and 528A) (acres)	0	17	0	0	0	0	17
Residue Management (329A-C) (acres)	5,879	8,188	2,834	910	5,527	1,293	23,721
Riparian Forest Buffers (391) (acres)	7	20	7	0	0	1	35
Tree and Shrub Establishment (612) (acres)	8	62	47	12	14	3	134
Total Nutrient Management (acres)	7,097	5,885	1,471	2,451	3,410	3,017	20,880
Total Waste Management (313) (numbers)	0	1	7	2	0	0	8
Total Wetlands Created, Restored, or Enhanced (acres)	25	37	17	24	0	38	117
Total Wildlife Habitat (644 - 645)	488	570	287	1	0	236	1,581
Acres Enrolled in Farm Bill Programs							
Conservation Reserve Program	5,666	2,844	1,636	N/A	107	468	10,721
Environmental Quality Incentives Program	0	64	889	N/A	162	739	1,854
Farm and Ranch Land Protection Program	0	0	0	N/A	0	0	0
Wetlands Reserve Program	0	0	0	N/A	0	20	20
Wildlife Habitat Incentives Program	0	0	0	N/A	0	0	0

Performance Results System (PRS) data was extracted (at the Hydrologic Unit Code level) for conservation systems and practices for six years (starting in fiscal year 2001). Information at the hydrologic unit code level was not available where N/A is listed. For more information on these and other performance reports, visit: http://ias.sc.egov.usda.gov/PRSHOME/.

Figure 21 - Conservation Tillage Trends



[1]Obtained by prorating 7 counties in watershed.

Corn and soybeans planted in crop residue.

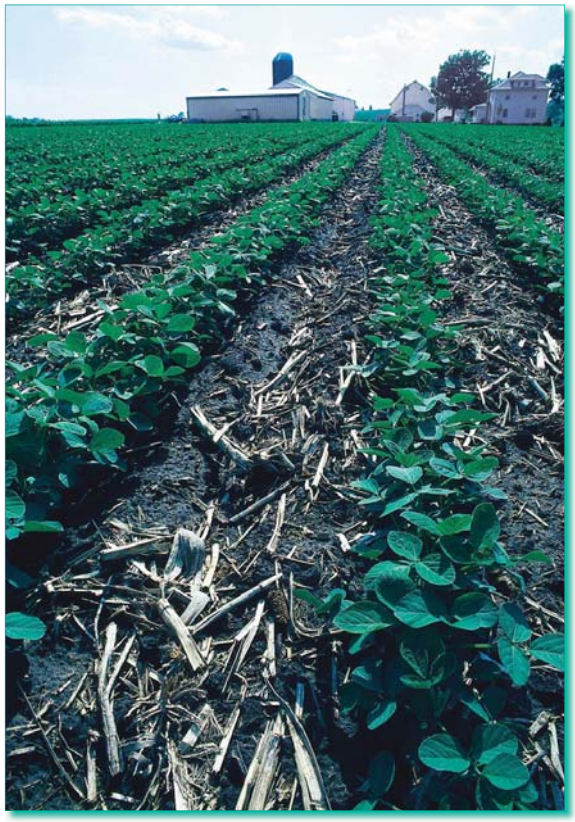


Figure 22 - 2006 Conservation Tillage in the Western Lake Erie Basin Corn and Beans

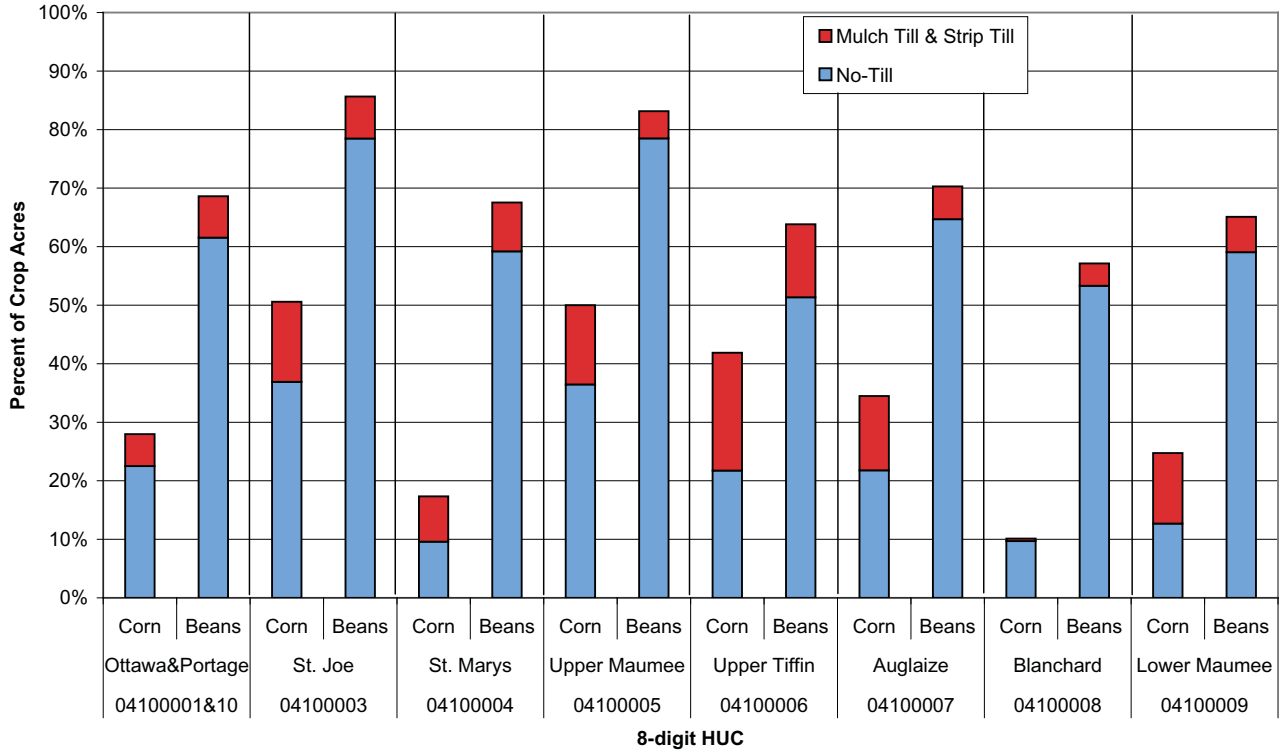


Figure 23 - 2006 Conservation Tillage in the Western Lake Erie Basin Corn, Soybeans, and Wheat

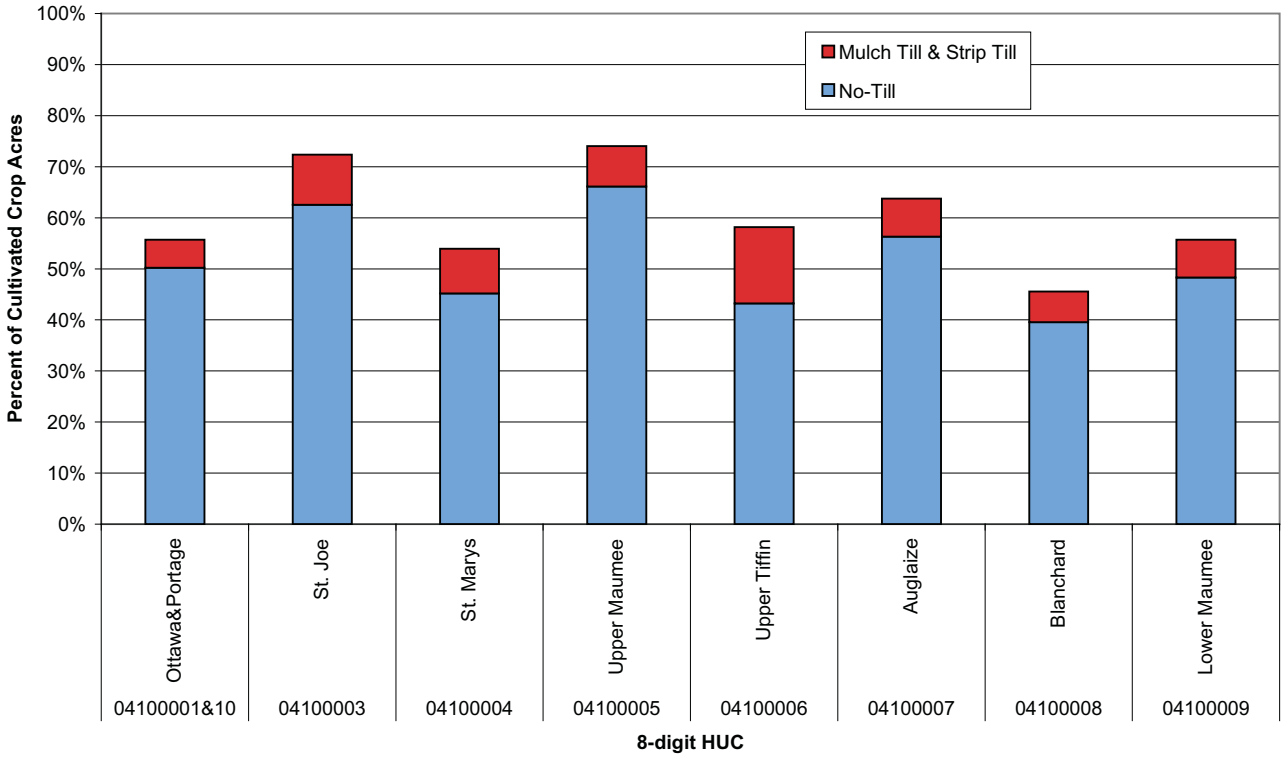


Table 21 - Agricultural Census Data and Economic Information

	Total County Data							Watershed Data[1]
USDA Census of Agriculture - 2002	**Defiance**	**Fulton**	**Hancock**	**Henry**	**Lucas**	**Putnam**	**Wood**	
Farms (number)	982	783	976	844	405	1,348	1,066	2,034
Land in farms (acres)	208,994	197,410	262,095	236,273	77,823	331,517	305,834	527,192
Average size of farm (acres)	213	252	269	280	192	246	287	256
Harvested cropland (acres)	163,332	174,093	234,260	217,777	70,853	291,447	270,360	471,543
Market value of crop products sold	$32,545,000	$43,517,000	$35,796,000	$53,308,000	$38,527,000	$54,258,000	$61,833,000	120,656,310
Market value of livestock, poultry and their products sold	$10,657,000	$26,592,000	$10,386,000	$5,610,000	$2,924,000	$34,068,000	$19,343,000	31,138,633
Vegetables harvested for sale (farms)	3	34	10	22	39	29	30	69
Vegetables harvested for sale (acres)	2	1,427	456	2,581	1,824	2,754	1,940	4,927
National Agricultural Statistics Service - 2006								
Wheat Winter - Harvested (acres)	26,900	24,100	43,100	38,300	6,100	53,300	57,300	79,822
Corn For Grain - Harvested (acres)	44,200	76,100	73,000	67,100	19,300	67,300	85,000	150,713
Soybeans - Harvested (acres)	94,400	85,700	125,000	98,600	19,400	131,100	136,700	218,497
Dry Hay - Harvested (acres)	6,000	4,200	4,900	7,200	1,500	12,200	5,300	13,790
NRCS Conservation Program Financial Assistance								
Environmental Quality Incentives Program ('02-'08)	$1,768,555	$1,205,141	$642,461	$292,212	$327,939	$844,973	$402,761	$1,525,130
Conservation Security Program ('04-'06)	$5,778,910	$1,220,844	$0	$0	$0	$3,204,467	$0	$1,956,079
Wetlands Reserve Program ('02-'07)	$300,652	$1,513,563	$153,990	$0	$259,000	$0	$0	$864,539
Wildlife Habitat Incentives Program ('02-'07)	$26,155	$9,660	$5,585	$0	$57,999	$10,000	$0	$38,013
Farm and Ranch Lands Protection Program	$120,042	$886,061	$0	$0	$164,863	$0	$0	$501,087
Grassland Reserve Program	$7,260	$11,670	$0	$0	$0	$0	$0	$6,511
Total 1996-2008 NRCS Administered Program Dollars	$8,172,172	$6,171,703	$802,036	$309,188	$809,801	$4,104,209	$526,730	$5,579,854

[1] Prorated by county area in watershed

Table 22 - Local Watershed Related Organizations Identified in the Watershed

Organization Name	Description/Purpose/Benefits	Contact Information	Type of Group (Govt., NGO, Partnerships)
Toledo Metropolitan Area Council of Governments (TMACOG)	Serves as a forum for assessing and acting on regional issues and problems through cooperative efforts by formulating policies, plans, and programs, and facilitating actions that are common and regional, including, but not limited to, matters affecting health, safety, welfare, education, economic conditions, and regional development.	Website: http://www.tmacog.org/ Email: horvat@tmacog.org	Governments, NGO
Black Swamp Audubon Society	Promote the conservation and restoration of ecosystems, including agricultural systems, while focusing on the enjoyment of birds and the natural environment through fellowship, education, and stewardship for the benefit of our future generations.	Ohio Chapter for Allen, Auglaize, Defiance, Henry, Paulding, and Putnam Counties Website: http://www.audubon.org/chapter/oh/oh/index.html	NGO
Ohio Pheasants Forever	To raise funds for local habitat projects, conservation education, and other worthy conservation causes.	Website: http://www.ohiopf.com/chapter_map.html Email Address: jinglis@pheasantsforever.org	NGO
Maumee Watershed Conservancy District	Help provide flood control and improve drainage for the Auglaize River basin.	1464 Pinehurst Drive Defiance, OH 43512 (419) 782-8746	Political subdivision of State of Ohio
The Joyce Foundation	Protecting the Great Lakes by promoting clean energy, combating global warming, restoring river ecosystems, and advocating investment in Great Lakes restoration.	www.joycefdn.org/	Environmental action group
Black Swamp Conservancy	To encourage conservation and protection of natural and agricultural lands in Northwest Ohio for the benefit of future generations.	bsc@wcnet.org	NGO

Table 23 - List of Relevant Published Watershed Plans, Studies, Reports

Name	Description
Maumee River Remedial Action Plan Strategic Plan (1997)	The Maumee River Remedial Action Plan is a community effort to restore the health and beauty of the Maumee River Ecosystem for the benefit of all who live here.
DRAFT Maumee Area of Concern Stage 2 Watershed Restoration Plan (Volume 1), January 2006	The *Stage 2 Watershed Plan* is a comprehensive regional water quality improvement plan intended to provide a one stop shop resource for all jurisdictions, agencies, organizations, and individuals who are working to restore this area's waterways.
Western Lake Erie Basin Water Resources Protection Plan	To 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 Areawide Watershed Planning Component. The implementation phase will involve using the planning information to accelerate land treatment.
FEMA Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies (FIS) are available for most Ohio villages and cities and unincorporated areas in Ohio on the flood map link at the website: www.fema.gov/hazard/flood/index.shtm.	Paper and digital copies of maps that are issued by FEMA. The maps show areas subject to flooding.
Groundwater Pollution Potential of Lucas County, 2002	Prepared using the DRASTIC system using existing data to rank areas with respect to relative vulnerability to contamination.
Groundwater Pollution Potential of Henry County, 2002	Prepared using the DRASTIC system using existing data to rank areas with respect to relative vulnerability to contamination.
Groundwater Pollution Potential of Fulton County, 2002	Prepared using the DRASTIC system using existing data to rank areas with respect to relative vulnerability to contamination.
Drinking Water Source Protection Plans: • None (Lucas Co.) • None (Fulton Co.) • None (Wood Co.) • None (Henry Co.)	List of Public Water Systems within watershed with Drinking Water Source Protection Plans endorsed by Ohio EPA (1/23/07).

Summary and Observations of Watershed Resource Concerns

- Of the seven Maumee Basin 8-digit subbasins, the Lower Maumee is the most urbanized, has the largest total population (278,000 in 2000 Census), and is the third in area.
- This watershed is predominantly flat with more than 88 percent of the land less than 2 percent slope.
- Using 2006 land use data, 67 pecent of the subbasin is cropland and 83 pecent of the cropland is corn and soybeans.
- There are 2,460 miles of streams in the watershed. Fifty-four pecent of these are first order streams (headwaters of the watershed).
- Nine percent (62,030 acres) of the land within this watershed is within 120 feet of a stream.
- From 2006 data, conservation tillage (87 percent no-till and 13 percent mulch/ridge till) is practiced on 56 percent of the cultivated cropland in this watershed.
- This watershed has adequate land to utilize the livestock waste produced in the watershed and, from a nutrient standpoint, capacity to utilize additional waste.
- Although groundwater and surface water are both important water sources in this watershed, surface water has predominated as the water source for large water users consistently over the last 15 years.
- Agriculture is a minor user of water in the watershed compared to other water users.
- There are 319 different soil types in the watershed. Most soils are nearly level and are very poorly drained or somewhat poorly drained and require artificial drainage for crop production. Seventy-seven percent (380,600 Tons/Year) of all soil erosion caused by water occurred on these soils in 1997.
- Seventy-five percent (524,000 acres) of the watershed are classed as “prime farmland if drained” and sixty-five percent (452,685 acres) are classed as hydric soil.
- About 19 percent (130,250 acres) of soils have a severe wind erosion hazard if left bare of vegetative cover.
- About two percent (16,680 acres) of the watershed are soils occurring on flood plains, subject to occasional or frequent flooding.
- Flooding occurs in the City of Toledo, the most significant recent flooding being that of June 21, 2006. Flooding from this storm and many others occurs from smaller rivers, streams, and drainageways rather than from out-of-bank flooding from the Maumee River.
- The Lower Maumee Watershed, though lacking a completed Total Maximum Daily Load (TMDL) study, has a Watershed Restoration Plan for the Maumee Area of Concern (AOC). This plan covers a portion of the Lower Maumee Watershed. The large river assessment units rate much better than the smaller streams. Reasons for non-attainment are typically non-point source pollution, siltation, and stream alteration.

Next Steps

Part two of the assessment process will include preparing a matrix to summarize the conservation practices and systems needed for this watershed, the amounts, and the estimated costs of implementation. Based on this assessment, the following conservation practices are significant practices that are needed and important in protecting the resources of this watershed. Also included is a listing of the USDA Farm Bill incentive programs which provide financial incentives for landowners to install these needed practices.

Needed Conservation Practices

Comprehensive Nutrient Management Plans
Conservation Tillage
Cover Crops
Drainage Water Management
Erosion Control Structures
Field Borders
Field Windbreaks
Filter Strips
Grassed waterways
Nutrient Management
Pasture and Hayland Plantings
Riparian Forest Buffers
Tree Plantings
Upland Wildlife Habitat Management
Wetland Wildlife Habitat Management
Wetland Restoration or Creation

Applicable USDA Farm Bill Programs

Conservation Reserve Program (CRP and CREP)
Conservation Stewardship Program (CSP)
Environmental Quality Incentives Program (EQIP)
Farm and Ranchland Protection Program (FRPP)
Grazing Lands Conservation Initiative (GLCI)
Resource Conservation and Development (RC&D) Program
Wetlands Reserve Program (WRP)
Wildlife Habitat Incentives Programs (WHIP)

References and Citations

1. Lower Maumee River Watershed 10-Meter Digital Elevation Model
   Source: Ohio EPA and USGS Ohio Water Science Center derived 10-meter DEM from 7 ½ minute hypsography DLGs.

2. Lower Maumee River Watershed Average Annual Precipitation
   Source: PRISM (Parameter-elevation Regressions on Independent Slopes Model) climate mapping system, 800-meter grid precipitation normals for 1971-2000, http://www.ocs.oregonstate.edu/prism/products/matrix.phtml?vartype=tmax&view=maps
   Last visited on 5/14/07.

3. Lower Maumee River Watershed Stream Orders
   Source: Stream order from National Hydrography Dataset (NHD) high-resolution streams layer, http://nhd.usgs.gov , as calculated by Arcview extension streamorder.avx.

4. Lower Maumee River Watershed Soil Erosion Potential
   Source: Data Source for LS values taken from typical values for SSURGO map units contained in Field Office Technical Guide, Section II, Cropland Interpretations.

5. The Livestock Estimate was prepared from county agricultural statistics data and a procedure developed in consultation with Ohio State University Extension and others. Reported livestock county numbers were prorated on a per acre basis to each of the county 8 digit HUC units. The resulting numbers were then evaluated and adjusted if needed by local NRCS field offices and NRCS/SWCD staff based on local knowledge of where the livestock was located within the county. Standard book values were then applied to estimate the manure production for each type of livestock based on common storage and application systems for that type of livestock. The results were totaled to provide an estimate of manure and nutrient production for the watershed.

   Users are cautioned that this is an estimate only for comparison purposes. There are limitations in the input data. One difficulty is that agricultural statistics data is not reported when there are few producers in a county because of confidentiality restrictions. These data are missing or unavailable in some cases for some operations.

   This analysis also makes no allowances for movement of manure into or out of the watershed by operations which border the watershed boundaries or by operators with farmland in more than one watershed. There is no available data to quantify the extent of this. Nevertheless, this analysis is a general estimate of the capacity of the watershed to properly utilize the nutrients produced within the watershed and the general need for export of waste out of the watershed or the importation of commercial fertilizer.