The Grand Lake/Wabash Watershed Alliance is a partnership between the Darke Soil and Water Conservation District, the Auglaize Soil and Water Conservation District, the Mercer Soil and Water Conservation District, and the City of Celina.

The 2009 Grand Lake/Wabash Watershed Alliance Joint Board of Supervisors

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The Grand Lake/Wabash Watershed Alliance Nondiscrimination Policy:

The Grand Lake/Wabash Watershed Alliance prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status. (Not all prohibited bases apply to all programs)

This organization adheres to the nondiscrimination policies of the US Department of Agriculture, Natural Resources Conservation Service, the Ohio Department of Natural Resources, Division of Soil and Water, and Mercer County, Ohio.

This watershed action plan has been fully endorsed on May 14, 2008, by the Ohio Department of Natural Resources and the Ohio Environmental Protection Agency. This plan not only includes the new Wabash River Watershed information, but also includes updates to the previously endorsed Grand Lake St. Marys watershed action plan. This is a full, comprehensive plan for the Grand Lake/Wabash River Watershed.

This watershed action plan was resubmitted to ODNR and OEPA on December 31, 2008, with changes to the format and updates on objectives. This plan was originally written unconventionally. This change is format is in efforts to make the format of this watershed action plan similar to others across the state.

This watershed action plan is reviewed annually by the stakeholders. During the 2009 review, stakeholders requested several of the objectives be improved. This was due to meeting several of the objectives and the interests of the stakeholders. No objectives were decreased. After these improvements to the objective section, the plan was resubmitted to the ODNR and OEPA on December 31, 2009.

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TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF MAPS

LIST OF MAPS (continued)

LIST OF MAPS (continued)

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF TABLES (continued)

LIST OF TABLES (continued)

LIST OF FIGURES

LIST OF APPENDICES

EXECUTIVE SUMMARY

Mission Statement

The mission of the Grand Lake/Wabash Watershed Alliance is to improve the quality of life by promoting stewardship of the natural resources in the Grand Lake/Wabash River Watershed.

There is a trend of increasing human use of the watershed's land and water resources; these activities can impact the watershed and the lake in negative ways. Consideration must be given to these impacts so that the land, the lake, and the river basin can remain enjoyable and productive far into the future. To this end, the Grand Lake/Wabash Watershed Alliance has developed this watershed action plan, both to address issues that the watershed may face in the future, and to reduce the pollution potential from existing situations to improve the quality of life for the watershed residents and visitors.

Physical setting

The Grand Lake/Wabash River watershed is located in west-central Ohio. Approximately 80% of the watershed is located in southern Mercer County, 10% of the watershed is in western Auglaize County, and the remaining 10% of the watershed in located in northern Darke County. The entire watershed covers approximately 312 square miles (200,000 ac) of which 21 square miles (13,500 ac), consists of the Grand Lake St. Marys basin.

The Grand Lake St. Marys watershed is a unique watershed in that it overlies two major drainage basins. Approximately 60% of the watershed lies west of the drainage divide and has an historical Ohio River drainage via Beaver Creek to the Wabash River. The remaining 40% of the watershed historically drained to the St. Marys River and on to the Maumee River to Lake Erie. Since the current drainage to Lake Erie is through a feeder canal, and discharge volume is estimated to be as little as 10% of the lake outflow, the watershed is considered to be a part of the larger Wabash River Hydrologic Unit, and is administered as such by state and federal agencies. This fact was part of the final decision to combine the Grand Lake St. Marys Watershed Project and the Wabash Watershed Project in January of 2005, creating the Grand Lake/Wabash Watershed Alliance.

INTRODUCTION

1.1 History

Grand Lake St. Marys

Grand Lake St. Marys has long been an interest point of western Ohio. Construction for the lake began in early 1837 and was intended to primarily be used as a feeder for the Miami & Erie Canal. The workers constructing the lake basin were paid $0.35 per diem and also were provided with a jigger of whiskey for the prevention of malaria. According to some local historians, the idea that the lake was dug is simply untrue; “the water was already here. They diked up the southern end of the swamp”. Many workers were drawn from far and near to work on the project and after completion, a good portion of them remained in the area, settled with their families, and began farming the land. Taking nearly ten years, the basin was completed in 1841 with an original acreage of over 17,000 acres and an estimated cost near $528 million.

The Miami and Erie Canal brought industry to the area, lowered freight prices and supplied the local residents with a thriving income. Deliveries of goods and visitors from both Toledo and Cincinnati were nearly around the clock. However, soon came the railroads and the transportation of both travelers and items was made more rapid and cost effective. The lake was no longer needed as a feeder to the canal. It wouldn’t be too long before the lake provided the area with another boom of interest and income.

In the late 1880’s oil was discovered near St Marys and on January 24, 1891 in the St Marys Argus it was printed that “It is said that an oil well derrick has this week been put up on the reservoir, three or four hundred feet from the shore at the northeast corner. Verily, the days of the reservoir are numbered”. This was the first noted evidence of an offshore oil well and would continue to be so for over 100 years. Not long after the first derrick went up, several more followed, dotting the countryside and taking up farmland. At first, farmers were naïve about leasing the ground to the oilmen and selling the rights. An example of an early lease reads “For the term of 99 years, the consideration $100, to be paid at the expiration of ten years, IF oil was found”. It didn’t take long before the landowners learned the proper value of the oil leases. For instance leasees were soon being paid approximately $1,000 when drilling began, $1,000 when oil was discovered and up to one third of the oil pulled from the site. Two of the most successful oilmen of the area were averaging over 3,000 barrels of oil per day. All that is left of the oil boom is a small pile of rock at the site where the last producing derrick was located.

Another bit of local folklore surrounding the lake area is the legend of how the lake was named. The lake’s name list includes Mercer Reservoir, Celina Lake, Celina Grand Lake, Lake St Marys, Grand Reservoir and finally Grand Lake St Marys. The legend of the area involves two men being selected; one from Celina, the other from St Marys, and given the task of naming the lake. Furthermore, legend has it that the gentleman from St Marys provided mass amounts of alcohol to the gentleman from Celina finally tricking him into agreeing on naming the lake after St Marys. In the end, several local authorities hold that the legend is purely a legend with no truth behind it.

The lake has attracted visitors from throughout the region from the very beginning. These tourists come to enjoy the recreational opportunities, including boating, fishing, and the numerous festivals and events in the lake area. Places in and around the lake have been filled in to better accommodate the recreational aspect of the area. This has led to the massive loss of water acreage estimated to be at least 3,500 acres. Construction of parks and other attractions included dance halls, athletic parks, fishing areas and even small scale water parks. By today's standards, tourism plays a vital role in the economic success of both Auglaize and Mercer counties. For instance, in the year 2007 the travel and tourism industry in Mercer and Auglaize counties had an estimated income of $47,570,838.00 and supported approximately 2,378 jobs.

The Wabash River

The Wabash River begins in Northern Darke County near the Mercer-Darke County Line. The Wabash was first explored in 1669 by a French man named La Salle and was named "Ouabache", for the Indian word meaning "white." This was due to the river's clarity in Huntington County, Indiana where the river bottom is limestone. It had been used prior to La Salle's exploration by the Native Americans and traders between the Great Lakes and the Gulf of Mexico. Once the river was under French control, the river connected many settlements ranging from the lower Great Lakes to the Mississippi River. In the early 1990's, Indiana General Assembly and Indiana Department of Natural Resources worked together to establish the Wabash River Corridor Commission to preserve the Wabash River and promote heritage conservation and proper development.

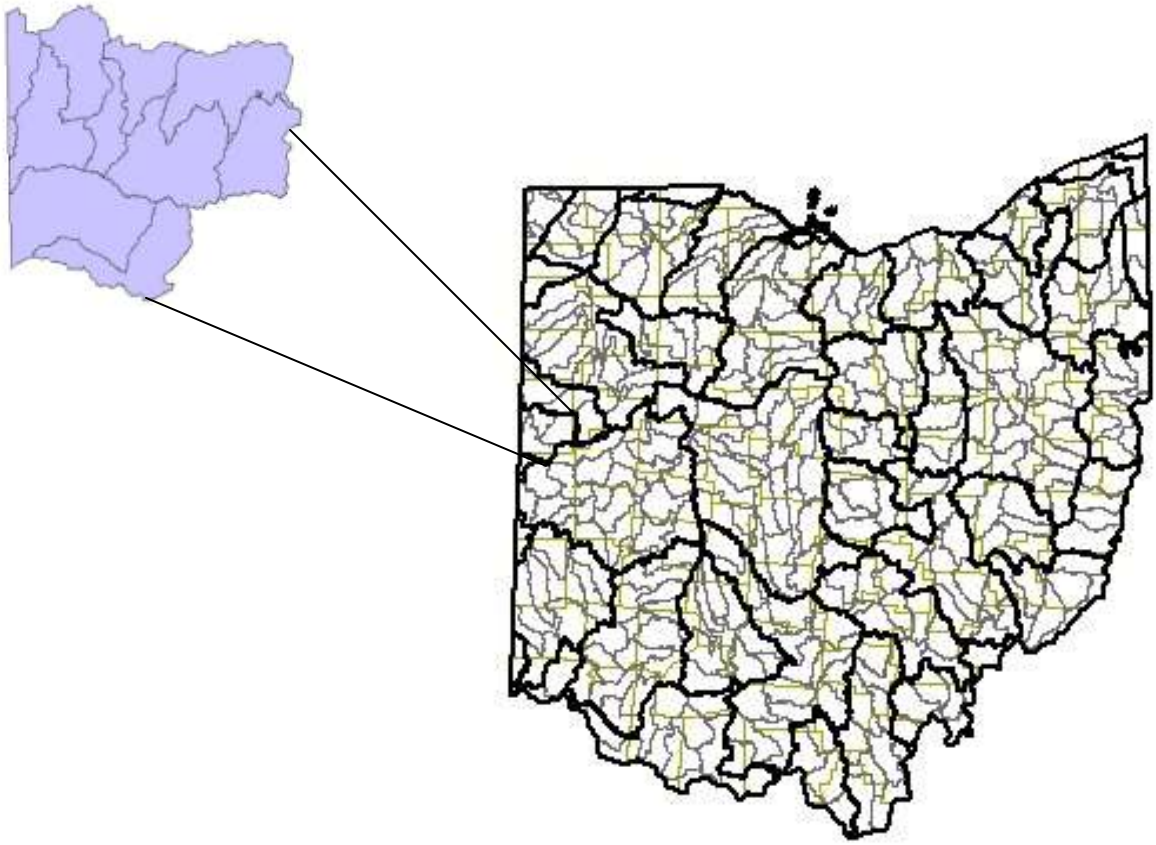
The Wabash River (excluding its tributaries) flows only approximately 43 miles within Ohio, where it enters Indiana and travels approximately 500 miles to the Ohio River. The Wabash flows from its beginning in west-central Ohio to the state of Indiana where it crosses nearly the entire state. The Wabash then enters the Ohio River near southwest Indiana, just south of Evansville.

From the earliest settlers in the area, agriculture has been a mainstay in every portion of the watershed. As more and more people settled in the area due to completion of Grand Lake St Marys, success of the canal system or the discovery of oil, families were started and continued in the farming lifestyle. Agriculture still proves to be social, cultural, and economic staple in the watershed and very important when dealing with water quality and the protection of the water resources.

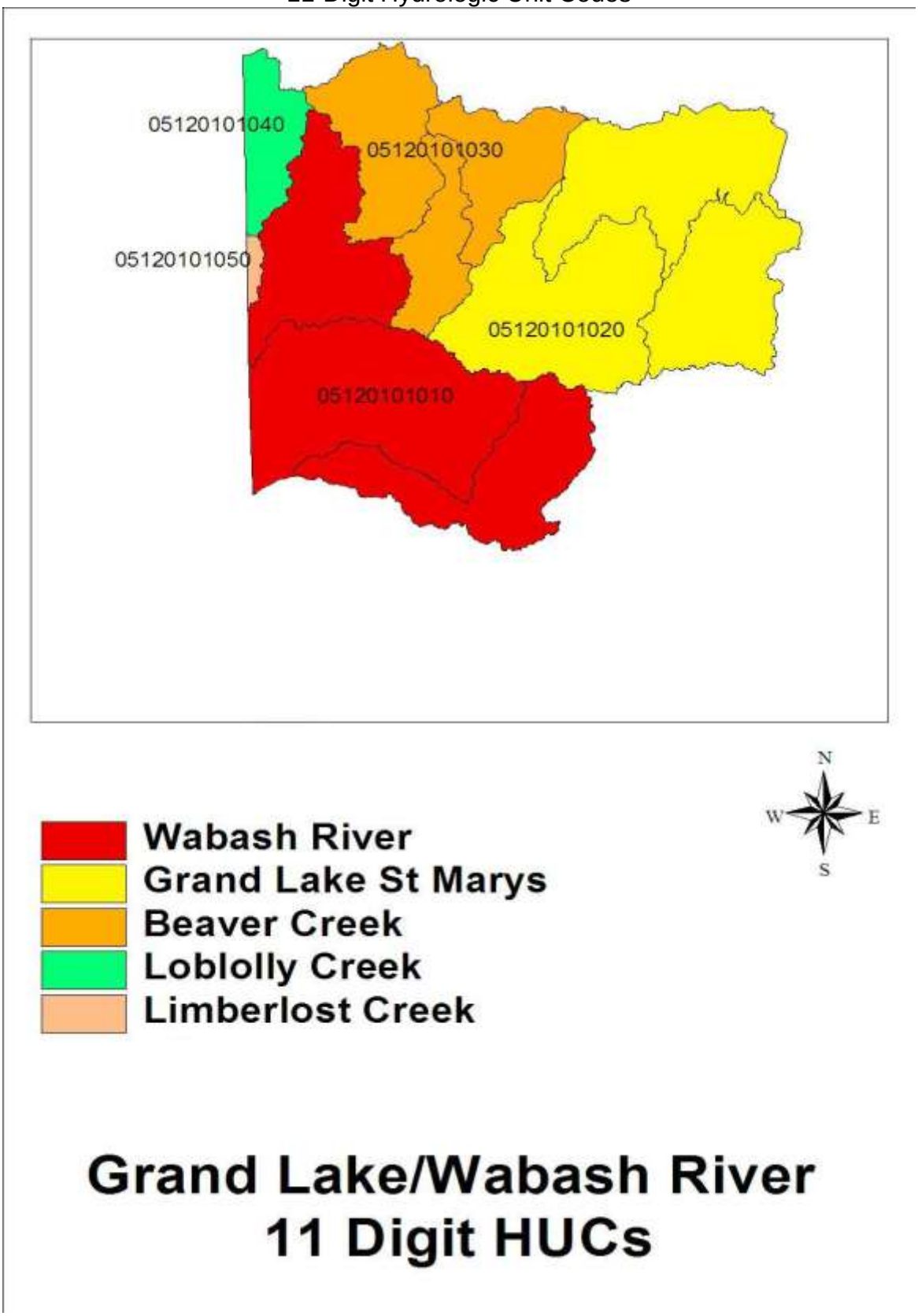
1.2 Administrative Boundaries

The Grand Lake/Wabash watershed consists of nearly 13,500 acres of lake and approximately 193,000 acres of land which primarily drains to the Ohio River. The watershed spans portions of Auglaize (10%), Darke (10%) and Mercer (80%) counties and can be considered as a tributary to both the Ohio River drainage Basin and the Lake Erie drainage Basin. Outflow from Grand Lake St. Marys' west spillway drains to Beaver Creek and then to the Wabash River. The outflow from the east embankment sluice gate drains to the St. Marys River via the Miami & Erie canal system. This outflow has been estimated at or below 20% thus, the Grand Lake St. Marys watershed is administered as a portion of the Wabash River Hydrologic Unit Code (HUC) 05120101 at both federal and state levels. The following maps indicate the HUC 8, HUC 11 and HUC 14 codes for associated drainage units in the Grand Lake/Wabash watershed.

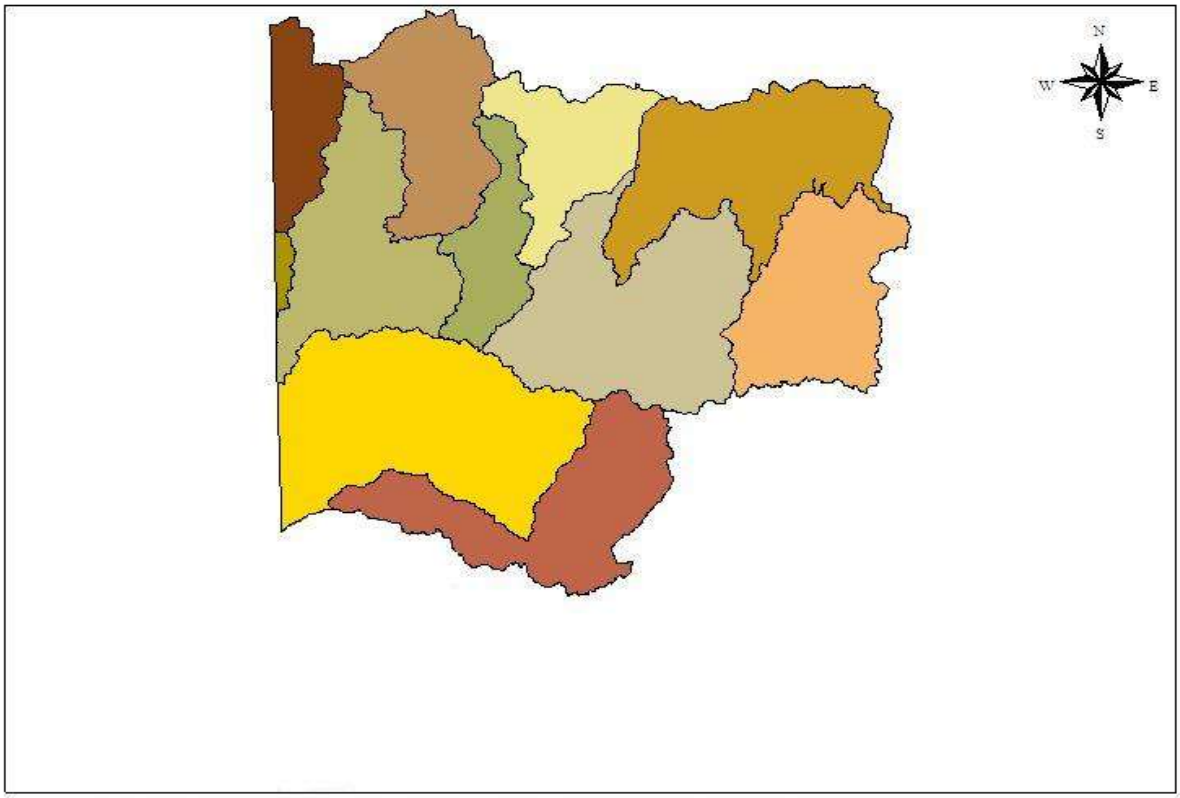
MAP 1
Wabash River 8-Digit Hydrologic Unit Code Location



Map 2
11-Digit Hydrologic Unit Codes



Map 3
14-Digit Hydrologic Unit Codes



- Wabash Headwaters to below Bear Creek
- Wabash R above Bear Cr below Stony Cr
- Wabash R below Stony Cr above Beaver Cr
- Chickasaw & Barnes Crs
- Coldwater & Beaver Crs
- N Shore/Lake/Grassy & Monroe/Up Prairie Cr Up Barnes Cr
- Beaver Cr from Grand Lake to above Little Beaver Cr
- Little Beaver Creek
- Beaver Cr below Little Beaver to Wabash R
- Wabash R below Beaver to New Corydon
- Limberlost Cr Headwaters to below Bull Cr (IN)

Grand Lake/Wabash River Watershed
14 Digit HUCs

14-digit HUCs

Wabash Headwaters to below Bear Creek	05120101-010-010
Wabash River above Bear Cr below Stony Creek	05120101-010-020
Wabash River below Stony Cr above Beaver Creek	05120101-010-030
Chickasaw and Barnes Creeks	05120101-020-010
Coldwater and Beaver Creeks	05120101-020-020
N Shore/Grassy Monroe/ Prairie Creeks	05120101-020-030
Beaver Creek from Grand Lake to above Little Beaver Creek	05120101-030-010
Little Beaver Creek	05120101-030-020
Beaver Creek below Little Beaver to Wabash River	05120101-030-030
Wabash River below Little Beaver Creek to New Corydon	05120101-040-010
Limberlost Creek Headwaters to below Bull Creek	05120101-050-050

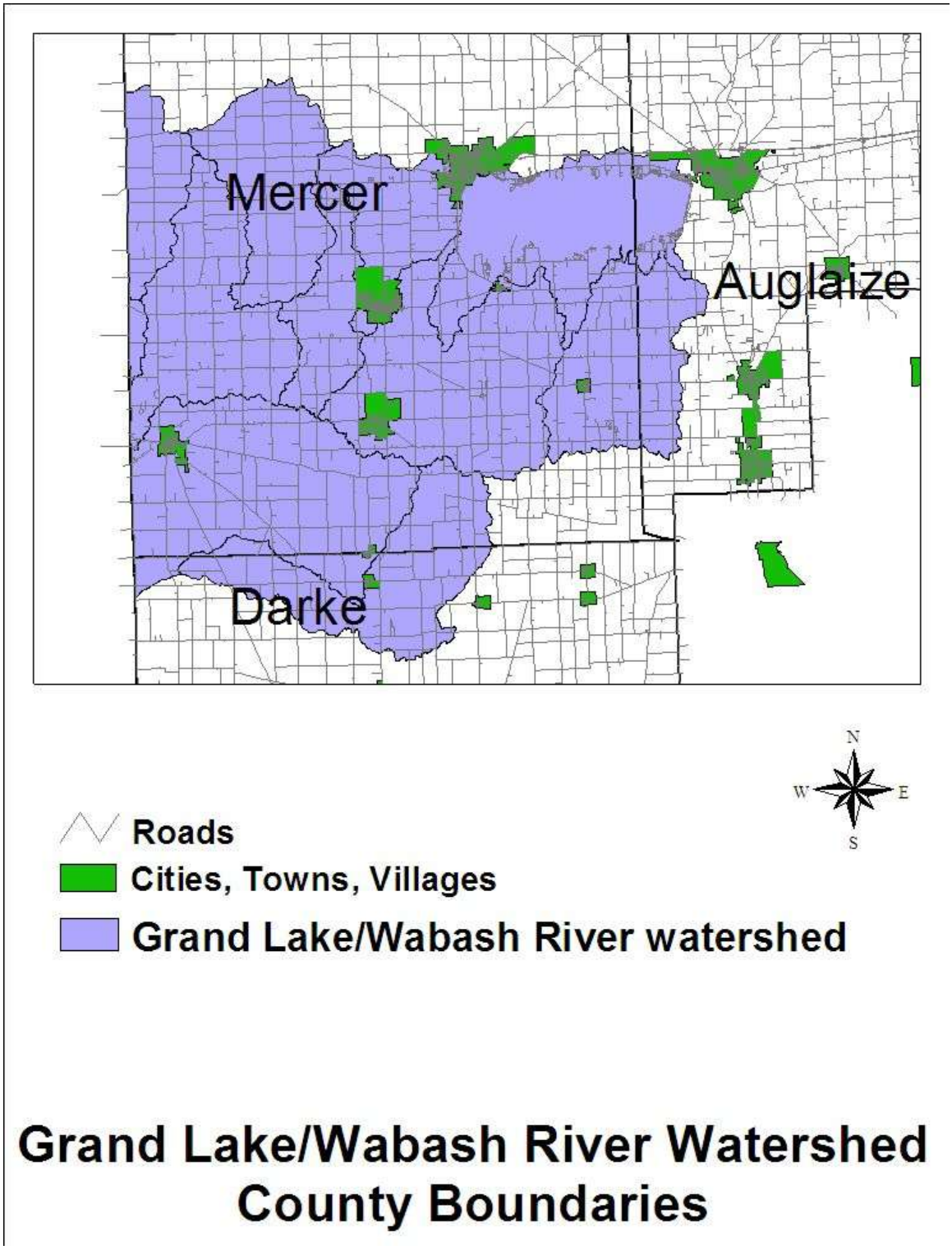
The Grand Lake/Wabash watershed contains numerous levels of local governments, including portions of Butler, Franklin, Gibson, Granville, Hopewell, Liberty, Marion, Jefferson, Recovery, and Washington townships in Mercer County. Small portions of German, Jackson, Noble, and St. Marys townships in Auglaize County and Allen, Mississinawa, and Wabash townships in Darke County are also included in the watershed. The Grand Lake/Wabash River watershed also contains a portion of the City of Celina and the City of St. Marys.

Several villages located entirely in the watershed are: Chickasaw, Coldwater, Ft. Recovery, Montezuma, and St. Henry. Several non-incorporated areas include: Carthagena, Cassella, Cranberry, Durbin, Macedon, Maria Stein, Philothea, Sebastian, Sharpsburg, St. Anthony, St. Johns, St. Joseph, St. Peter, St. Rose, Wabash and Wendelin.

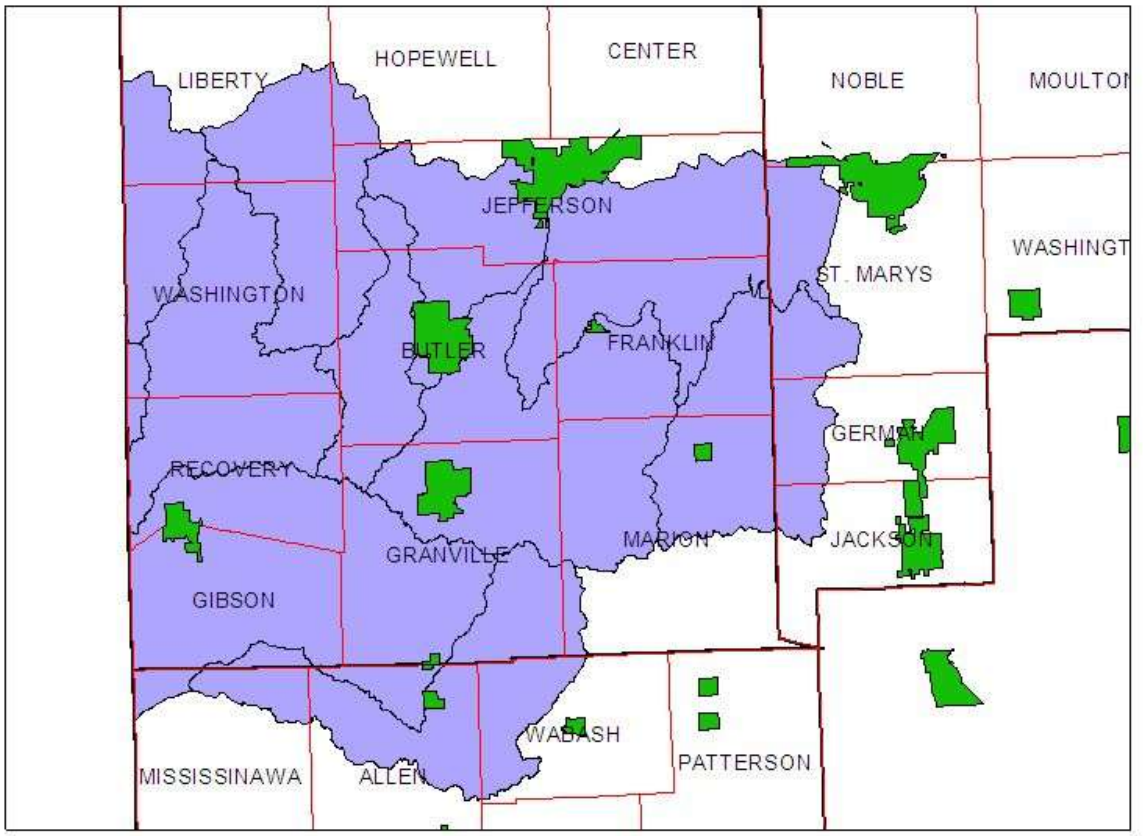
The Auglaize portion of the watershed has no sizeable cities, villages, or non-incorporated areas. However, the City of St. Marys, and the Villages of New Bremen and Minster are located just outside of the eastern watershed border. Burkettsville and New Weston are the two Darke County villages that are located within the boundaries of the watershed.

The maps on the following pages show the watershed with the boundaries of the counties, townships, cities, and villages; sewer districts; township zoning; and school districts within the Grand Lake/Wabash watershed boundaries.

MAP 4
County Boundaries



MAP 5
Township Boundaries



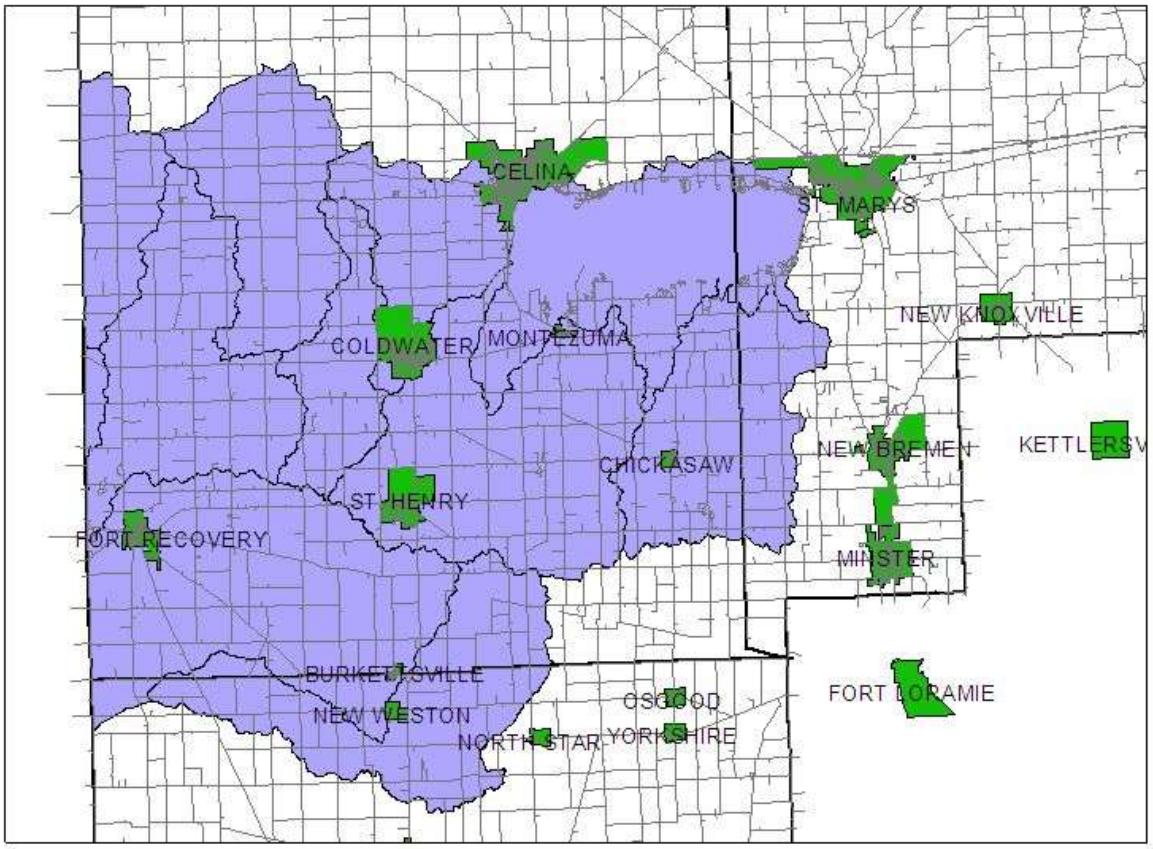
Cities, Towns, Villages

Township Boundaries

Grand Lake/Wabash River watershed

Grand Lake/Wabash River Watershed Township Boundaries

MAP 6
Cities, Towns and Villages



Roads

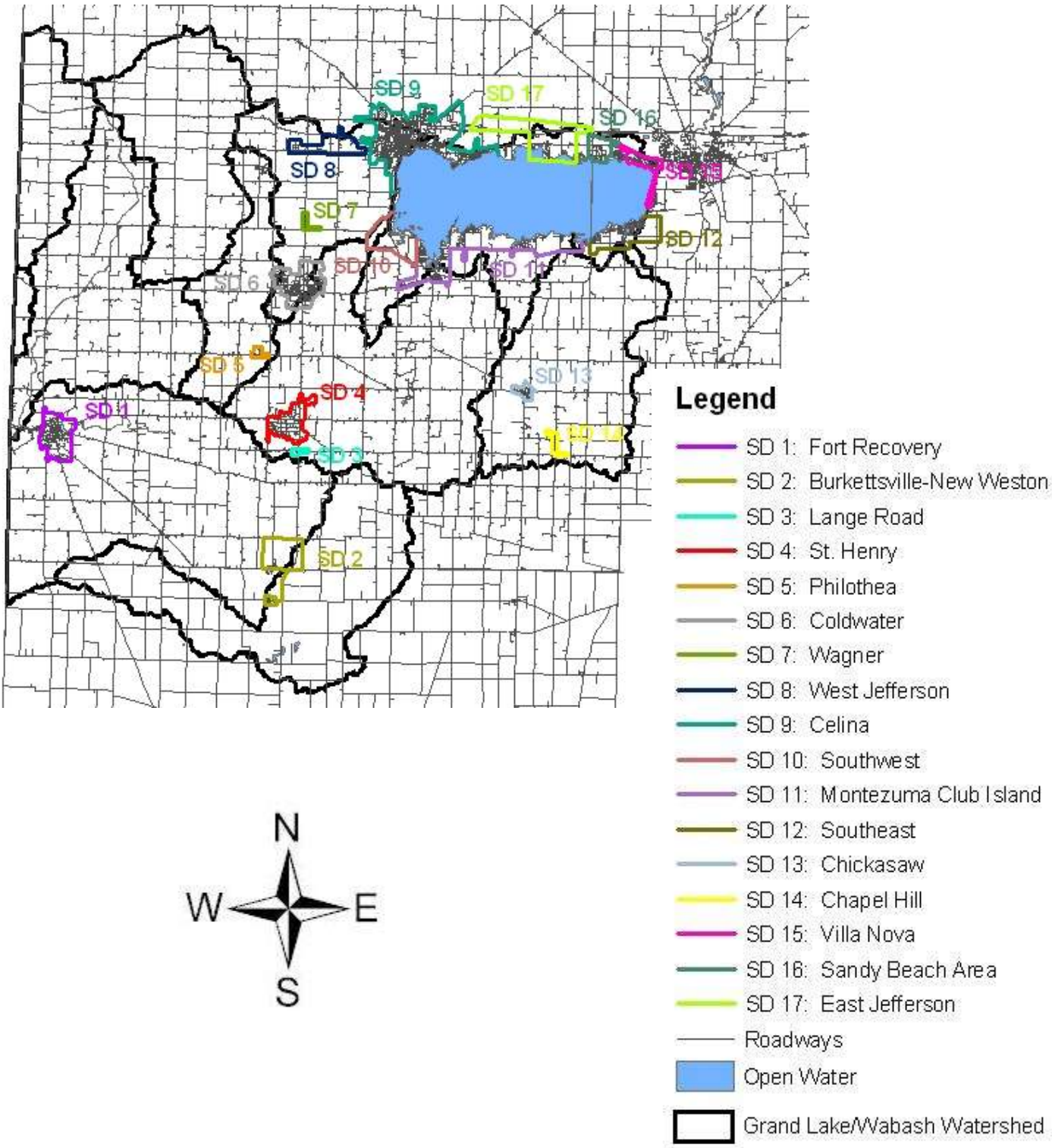
Cities, Towns, Villages

Grand Lake/Wabash River watershed

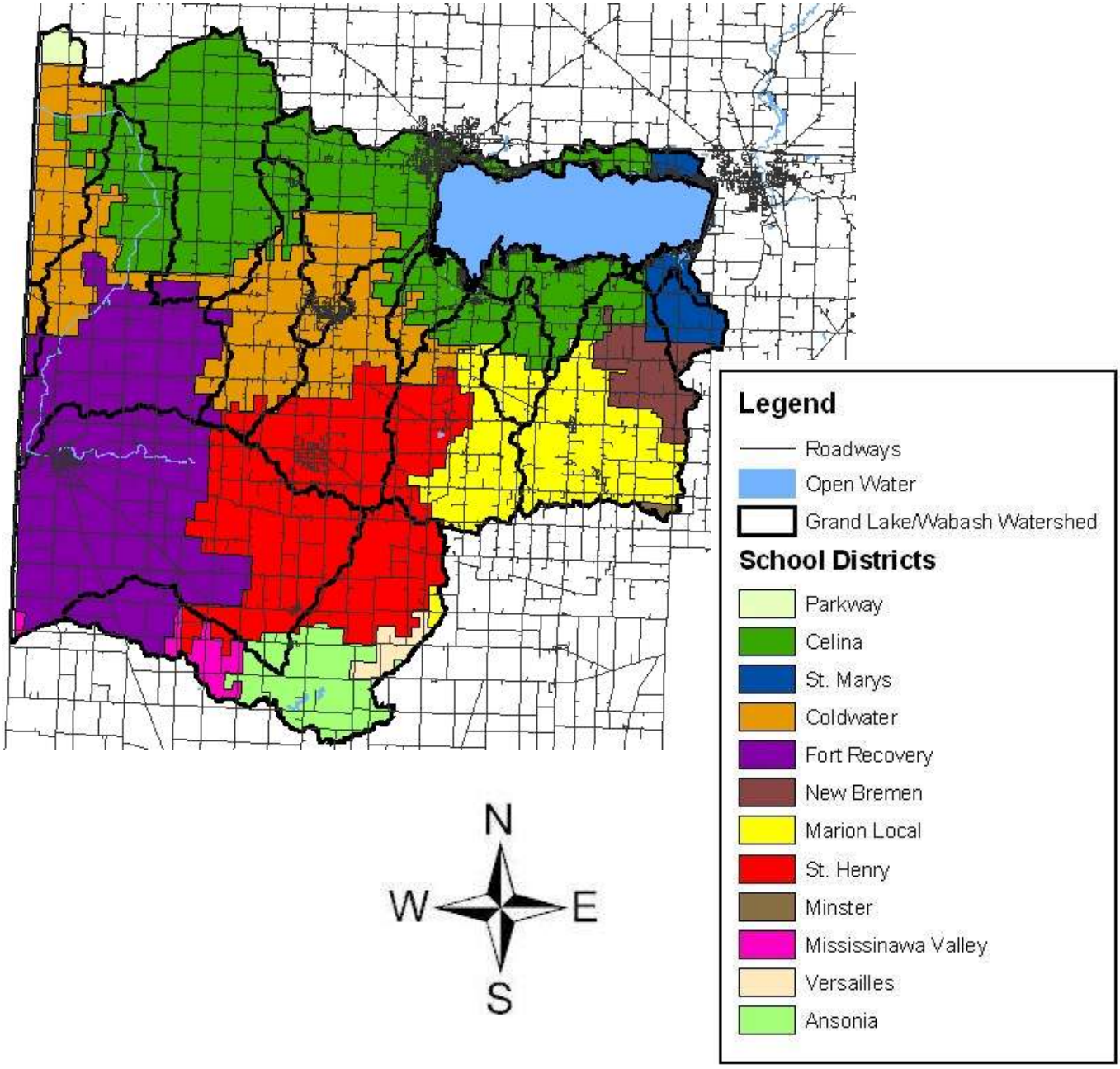
Grand Lake/Wabash River Watershed Cities, Towns, Villages

The map below shows the sanitary sewer districts that are located within the Grand Lake/Wabash River watershed. The map includes the centralized sewer systems within the corporation limits of the City of Celina, the Village of St. Henry, the Village of Ft. Recovery, the Village of Coldwater and the Village of Chickasaw.

Map 7
Sewer Districts



MAP 8
School Districts



1.3 Demographics

Auglaize, Darke and Mercer counties are very similar when referring to the demographics of the watershed. The three counties have seen a steady increase in their populations for the last few years. The tables below show a few representative categories that give an overview of the status of the watershed. The information for the tables in this section was obtained from the Ohio State University Data Center at the website: http://osuedc.org/current/main.php and/or the United States Bureau of Census.

TABLE 1

Median Age Auglaize, Darke and Mercer Counties, Ohio			
COUNTY	Auglaize	Darke	Mercer
Total Population	46,611	53,309	40,924
Largest Age Population	35-44 years	35-44 years	35-44 years
Median Age	36	37	36

*Data is based on 2000 Census

According to the aforementioned website, the population for Mercer and Auglaize counties is projected to rise throughout the years, nearing or surpassing 50,000 people in each county in the year 2030. However, the opposite is true for Darke County as projections through the year 2030 is a decline in population to nearly 52,000 citizens.

The table on the following page shows information gathered by Richard Hupman & Associates, supplemented by additional information, regarding the populations of Auglaize, Darke and Mercer Counties and the associated percentage of increase per decade. Populations of cities or villages in the township are included in the township population total. For example, the population for New Bremen is included in the total population for German township. A similar table has been developed for the population trend in Darke County, including percentage of population increase or decrease over the decades.

Data used for the table was collected from the United States Bureau of Census, Population of County Subdivisions. This is also the source of the data used to create the second table showing the population in 1990 and comparing it with the population in 2000. The percentages indicate the population increase or decrease from the previous decade.

TABLE 2

POPULATION and PERCENT CHANGE, 1950-2000 STATE OF OHIO, AUGLAIZE, DARKE AND MERCER COUNTIES, and OTHER SELECTED JURISDICTIONS							
CENSUS YEAR **JURISDICTION**	**1950 Population**	**1960 Pop. (% Change)**	**1970 Pop. (% Change)**	**1980 Pop. (% Change)**	**1990 Pop. (% Change)**	**2000 Pop. (% Change)**	**1950-2000 % Change**
OHIO	7,946,627	9,706,397 (+22%)	10,652,017 (+10%)	10,797,630 (+1%)	10,847,115 (+0.5%)	11,353,140 (+5%)	43%
AUGLAIZE CO	**30,637**	**36,147 (+18%)**	**38,602 (+7%)**	**42,554 (+10%)**	**44,585 (+5%)**	**46,611 (+4.5%)**	**52%**
GERMAN TWP	2,293	2,769 (+21%)	2,976 (+7%)	3,171 (+7%)	3,400 (+7%)	3,831 (+13%)	67%
NEW BREMEN	1,541	1,972 (+28%)	2,185 (+11%)	2,393 (+10%)	2,570 (+7%)	2,909 (+13%)	89%
JACKSON TWP	2,401	2,889 (+20%)	3,130 (+8%)	3,298 (+5%)	3,415 (+4%)	3,577 (+5%)	49%
MINSTER	1,728	2,193 (+27%)	2,405 (+10%)	2,557 (+6%)	2,650 (+4%)	2,794 (+5.4%)	62%
ST. MARYS TWP	8,106	9,970 (+23%)	10,438 (+5%)	11,214 (+7%)	11,562 (+3%)	11,600 (+0.3%)	43%
ST. MARYS	6,208	7,737 (+25%)	7,699 (-0.5%)	8,414 (+9%)	8,441 (+0.3%)	8,342 (-1%)	34%
MERCER CO	**28,311**	**32,559 (+15%)**	**35,558 (+9%)**	**38,334 (+8%)**	**39,443 (+3%)**	**40,924 (+4%)**	**44.6%**
BUTLER TWP	3,505	4,256 (+21%)	5,337 (+25%)	6,049 (+13%)	6,181 (+2%)	6,459 (+4.5%)	84%
COLDWATER	2,217	2,766 (+25%)	3,533 (+28%)	4,220 (+19%)	4,335 (+3%)	4,482 (+3.4%)	102%
FRANKLIN TWP	1,166	1,369 (+14%)	1,606 (+17%)	1,790 (+15%)	2,126 (+19%)	2,302 (+8%)	97%
MONTEZUMA	299	287 (-4%)	260 (-10%)	200 (-23%)	199 (-0.5%)	191 (-4%)	-36%
GIBSON TWP	1,586	1,872 (+18%)	1,826 (-2%)		1,855	1,869 (+0.8%)	18%

POPULATION and PERCENT CHANGE, 1950-2000 STATE OF OHIO, AUGLAIZE, DARKE AND MERCER COUNTIES, and OTHER SELECTED JURISDICTIONS							
FORT RECOVERY (PART)	828	999 (+21%)	810 (-19%)		956	997 (+4.3%)	20%
GRANVILLE TWP	2,295	2,912 (+27%)	3,326 (+14%)	3,591 (+8%)	3,615 (+0.7%)	3,885 (+7%)	69%
ST. HENRY	715	978 (+37%)	1,276 (+30)	1,596 (+25%)	1,907 (+20%)	2,271 (+19%)	218%
HOPEWELL TWP	845	910 (+8%)	961 (+6%)		968	1,066 (+10%)	26%
JEFFERSON TWP	7,784	9,885 (+27%)	10,904 (+10%)	12,151 (+11%)	12,983 (+7%)	13,231 (+2%)	70%
CELINA	5,703	7,659 (+34)	8,072 (+5%)	9,137 (+13%)	9,650 (+6%)	10,303 (+7%)	81%
LIBERTY TWP	1,178	1,002 (-15%)	997 (-0.5%)		964	917 (-5%)	-22%
MARION TWP	2,199	2,554 (+16%)	2,699 (+6%)	2,753 (+2%)	2,784 (+1%)	2,969 (+6.6%)	35%
CHICKASAW	166	275 (+66%)	326 (+19%)	381 (+17%)	378 (-0.7%)	364 (-3.7%)	119%
RECOVERY TWP	1,305	1,335 (+2%)	1,531 (+15%)		1,381	1,550 (+12%)	19%
FORT RECOVERY (PART)	408	438 (+7%)	337 (-23%)		375	401 (15%)	-2%
WASHINGTON TWP	1,188	1,188 (0%)	1,261 (+6%)		1,259	1,218 (-3%)	3%
DARKE CO	**41,799**	**45,612 (+9%)**	**49,141 (+8%)**	**55,096 (+12%)**	**53,619 (-3%)**	**53,309(-0.6%)**	**27%**
ALLEN TWP	1,325	1,526 (+15%)	1,517 (-0.6%)	1,441 (-5%)	1,457(+1%)	1,158(-20%)	-13%
BURKETTSVILLE	211	290 (+37%)	279 (-3.4%)	295 (+6%)	268 (-9%)	254 (-5%)	20%
NEW WESTON	136	146 (+7%)	174 (+19%)	184 (+6%)	148 (-20%)	135(-9%)	0%
ROSSBURG	203	295 (+45%)	275 (+7%)	260 (-5%)	250 (-4%)	224 (-10%)	10%

POPULATION and PERCENT CHANGE, 1950-2000 STATE OF OHIO, AUGLAIZE, DARKE AND MERCER COUNTIES, and OTHER SELECTED JURISDICTIONS							
REMAINDER	775	795 (+3%)	789 (-0.8%)	702 (-11%)	791 (+12%)	545 (-31%)	-30%
MISSISSINAWA TWP	926	885 (-4%)	848 (-4%)	855 (+0.8%)	795 (-7%)	779 (-2%)	-16%
WABASH TWP	981	1,055 (+7%)	1,022 (-3%)	958 (-6%)	931 (-3%)	934 (+0.3%)	-5%
NORTH STAR	166	169 (+2%)	296 (+75%)	254 (+14%)	246 (+3%)	209 (-15%)	25%
REMAINDER	815	886 (+8%)	726 (-6%)	704 (+3%)	685 (-3%)	725 (-6%)	-11%
THREE COUNTY TOTAL	**100,747**	**114,318 (+13.5%)**	**123,301 (+8%)**	**136,794 (+11%)**	**137,647 (+0.6%)**	**140,844 (+2%)**	**40%**

As shown in the table below and the table on the previous page, nearly all of the areas located within or near the watershed have experienced an increase in population over the last decade, 1990-2000. There are some minor fluctuations in population seasonally. In Mercer County alone there are approximately 458 housing units that are labeled as seasonal, recreational or occasional use. There are an additional 159 units in Auglaize county and 114 units in Darke County in the same category.

Table 3

Population and Percent Change 1990-2000

CENSUS YEAR	1990 Population	2000 Pop (% change)
JURISDICTION		
OHIO	**10,847,115**	**11,353,140 (+5%)**
THREE COUNTY TOTAL	**137,047**	**146,844 (+7%)**
DARKE CO	**53,619**	**53,309 (-0.6%)**
ALLEN TWP	1,347	1,158 (-20%)
BURKETTSVILLE	268	254 (-5%)
NEW WESTON	148	135 (-9%)
ROSSBURG	290	224 (-10%)
MISSISSINAWA TWP	795	779 (-2%)
WABASH TWP	931	934 (+0.3%)
NORTH STAR	246	209 (-15%)
AUGLAIZE CO	**44,585**	**46,611 (+2%)**
GERMAN TWP	3,400	3,831 (+13%)
NEW BREMEN	2,570	2,909 (+13%)
JACKSON TWP	3,415	3,577 (+5%)
MINSTER	2,650	2,794 (+5.4%)
ST. MARYS TWP	11,562	11,600 (+0.3%)
ST. MARYS	8,441	8,342 (-1%)
MERCER CO	**39,443**	**40,924 (+4%)**
BUTLER TWP	6,181	6,459 (+4.5%)
COLDWATER	4,335	4,482 (+3.4%)
FRANKLIN TWP	2,126	2,302 (+8%)
MONTEZUMA	199	191 (-4%)
GIBSON TWP	1,855	1,869 (+0.8%)
FT RECOVERY (PART)	956	904 (-5.4%)
GRANVILLE TWP	3,615	3,885 (+7%)
ST HENRY	1,907	2,271 (+19%)
HOPEWELL TWP	968	1,066 (+10%)
JEFFERSON TWP	12,983	13,231 (+2%)
CELINA	9,650	10,303 (+7%)
LIBERTY TWP	964	917 (-5%)
MARION TWP	2,784	2,969 (+6.6%)
CHICKASAW	378	364 (-3.7%)
RECOVERY TWP	1,381	1,550 (+12%)
FT RECOVERY (PART)	375	369 (-2%)
WASHINGTON TWP	1,259	1,218 (-3%)

TABLE 3 (continued)

The Education Indicators table shows the enrollment statistics for both public and non-public schools in those counties. Also included are the graduation rates county wide, and the highest degree completed for the population over 25 years of age.

Table 4

Education Indicators Auglaize, Darke and Mercer Counties, Ohio			
EDUCATION	Auglaize	Darke	**Mercer**
Public Schools	22	21	**21**
Enrollment	8,483	10,595	**8,622**
Non public Schools	2	2	**1**
Enrollment	327	138	**176**
Graduation Rate	95.8%	94.3%	**96.7%**
Last Completed Degree (pop 25yrs+)			
High school (or some higher)	85.6%	82.9%	**83.8%**
Bachelor's Degree (or some higher)	**13.4%**	**10.1%**	**12.6%**

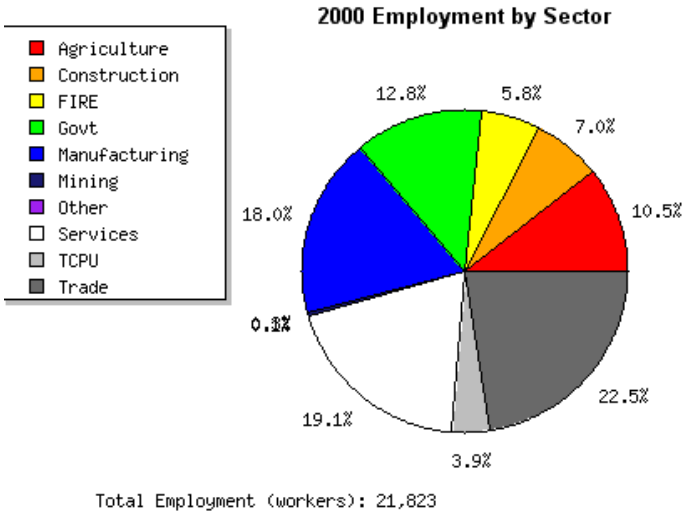
The Employment and Income table below reports the median income, along with the unemployment rates for the previous four years.

Table 5

Employment and Income Indicators Auglaize, Darke and Mercer Counties, Ohio			
Employment and Income	Auglaize	Darke	Mercer
Median Per Capita Income	$19,593	$18,670	$18,531
Unemployment Rate			
2004	5.1%	6.0%	4.5%
2003	5.2%	6.6%	4.6%
2002	5.8%	6.2%	5.2%
2001	4.3%	4.3%	4.5%
2000	3.3%	3.9%	4.0%

This pie chart shows that for Mercer County 22.5% of the workforce is located in the Trade Industry, which includes both wholesale and retail trade. Another 19% is associated with services such as education, health and social services. The third largest employer, with 12.8% of the eligible workers is the Government offices located in the county. Agricultural workers account for approximately 10.5% of the Mercer county employed.

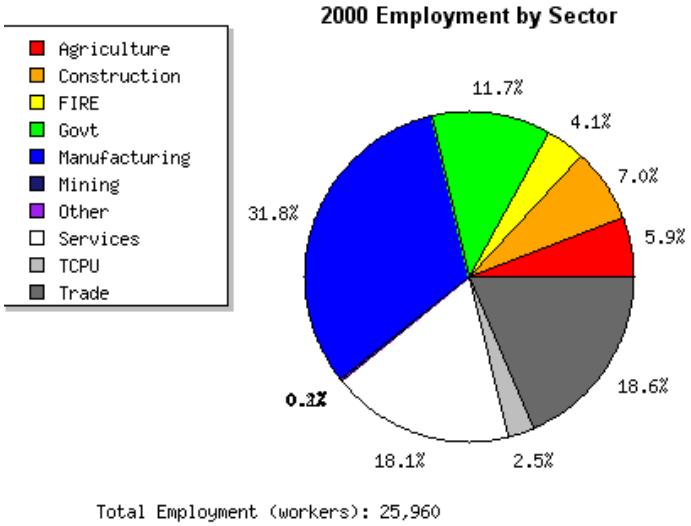
Figure 1: Mercer County Employment Statistics



Source: OSU Extension Data Center / www.osuedc.org

The Auglaize County employment statistics closely resemble those of Mercer County, as seen below. A small difference is noticed regarding the Manufacturing and trade sectors. Manufacturing in Auglaize county accounts for 31.8% of workers, ranking first overall, while the trade sector ranks second with 18.6% of eligible workers. Third and fourth highest percentages, 18.1% and 11.7%, respectively are the Services industry and the Governmental employees.

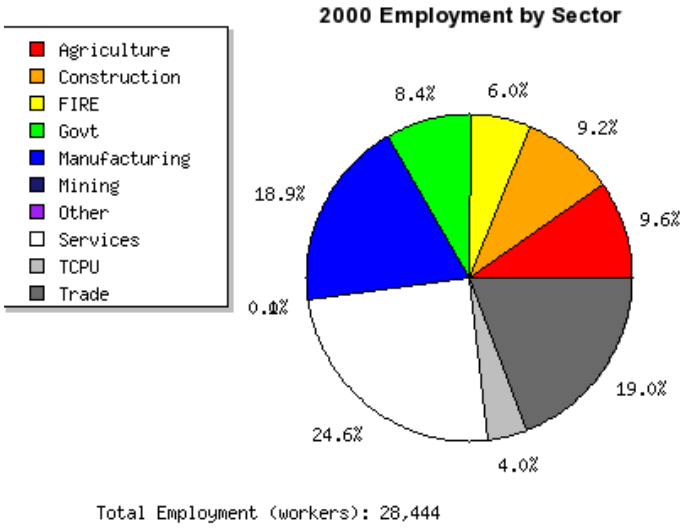
Figure 2: Auglaize County Employment Statistics



Source: OSU Extension Data Center / www.osuedc.org

This pie chart shows that for Darke County 24.6% of the workforce is associated with services such as education, health and social services. Another 19.0% is located in the Trade Industry, which includes both wholesale and retail trade. The third largest employer, with 18.9% of the eligible workers is the manufacturing industry located in the county. Agricultural workers account for approximately 9.6% of the Darke County employed.

Figure 3: Darke County Employment Statistics



Another important industry that seemingly overlaps the industries mentioned above is the Travel and Tourism industry. Due to the location of Grand Lake St. Marys, Mercer and Auglaize counties have a joint county Convention and Visitors Bureau which works to bring events to the area, as well as promotes local events, attractions, and resources at other major travel and tourism events. An example of the economic impact travel and tourism has on the two county area follows.

According to the Auglaize/Mercer Convention and Visitors Bureau, the travel industry bases its formula for the economic impact of tourism upon the area by utilizing the following formula:

- 3 times the amount for room rental will be spent on gasoline, oil and automotive supplies.
- 3.5 times the amount for room rental will be spent on restaurants and clubs.
- 0.81 times the room rental will be spent for entertainment and recreation.
- 1.21 times the room rental will be spent on general retail sales.
- The total number of jobs that tourism supports is calculated by multiplying the spending by 0.00005.

Table 6

Economic Impact of Tourism in Auglaize and Mercer Counties

Years	***2004***	***2005***	***2006***	***2007***
Total Room Sales	$ 4,933,655	$ 5,144,802	$ 5,370,339	$ 4,996,937
Gasoline, Oil, Auto Repairs, Auto Sales	$ 14,800,965	$ 15,434,406	$ 16,111,017	$ 14,990,811
Restaurants & Clubs	$ 17,267,792	$ 18,006,807	$ 18,796,186	$ 17,489,279
Entertainment & Recreation	$ 3,996,260	$ 4,167,289	$ 4,349,975	$ 4,047,518
General Retail Purchases	$ 5,969,722	$ 6,225,220	$ 6,498,110	$ 6,046,293
Total Tourism Income	**$ 46,968,394**	**$ 48,978,524**	**$ 51,125,626**	**$ 47,570,838**
Jobs Supported by Tourism Dollars	2348	2448	2556	2378

Source: Donna Grube, Director, Auglaize/Mercer Convention and Visitors Bureau. Written correspondence to GLSM watershed project.

The agricultural industry is another major component of the economic base for the watershed. As detailed below the value of the food and agricultural industry affects more that those that farm. The following information was provided by Ohio Farm Bureau.

Auglaize County	Darke County	Mercer County
Agriculture contributes $477.5 million in output and employs nearly 5,000 people in Auglaize County.	Agriculture contributes $598.6 million in output and employs 6,400 people in Darke County.	Agriculture contributes $621.7 million in output and employs 6,500 people in Mercer County.
Crop production represents 51% of production agriculture in Auglaize County.	Livestock and poultry production represents over 67% of production agriculture in Darke County.	Livestock and poultry production represents over 78% of production agriculture in Mercer County.
Dannon, G A Wintzer & Son, and *Hoge Lumber Company* are major food and forestry processors located in Auglaize County.	*Creative Cabinet Systems, Keller Grain & Feed, Weaver Brothers, and Whiteford Food Products* are major food and forestry processing businesses located in Darke County.	*Basic Grain Products, Cooper Farms, and Fort Recovery Equity Exchange* are food processing businesses located in Mercer County.
212,000 acres of land are farmed in Auglaize County.	346,000 acres of land are farmed in Darke County.	273,000 acres of land are farmed in Mercer County.
Auglaize County Farmers produce over 3.5 million bushels of corn, 2.5 million bushels of soybeans, 20,500 cattle, 41,300 hogs, and 92.6 million pounds of milk.	Darke County farmers produce over 7.8 million bushels of corn, 4.1 million bushels of soybeans, 27,500 cattle, 126,500 hogs, and 138.8 million pounds of milk.	Mercer County farmers produce over 4.4 million bushels of corn, 2.9 million bushels of soybeans, 41,900 cattle, 145,200 hogs, and 314.5 million pounds of milk.
Among Ohio's counties, Auglaize ranks 8th in hogs, 11th in wheat harvested, 13th in milk production, and 17th in cattle.	Among Ohio's counties, Darke ranks 2nd in hogs, 5th in soybean production and processed tomatoes, 6th in cattle, 7th in corn harvested, and 8th in milk production.	Among Ohio's counties, Mercer ranks 1st in hogs, 2nd in cattle and milk production, 8th in oats harvested, and 12th in wheat production.
Cash receipts from marketing of farm commodities totaled nearly $85 million.	Cash receipts from marketing of farm commodities totaled over $226.3 million.	Cash receipts from marketing of farm commodities totaled over $282.5 million.
In Auglaize County, food and forestry processing accounted for $313.2 million in total output.	In Darke County, food and forestry processing accounted for $128.2 million in total output.	In Mercer County, food and forestry processing accounted for $171 million in total output.

1.4 Past Attempts at Watershed Protection

There have been several projects and studies completed on the subject of how to protect and/or enhance the Grand Lake/Wabash River watershed. These range from studying the avian species of the Grand Lake St Marys area, as Clarence Clark and James Sipe did in 1960 with *Birds of the Lake St Marys Area: An Annotated Check List and Migration Dates*, to the current efforts undertaken by the GLWWA Watershed Project's Joint Board of Supervisors.

Several early reports account management techniques that were utilized to ensure the Grand Lake St. Marys was a successful fishery for the sportsmen. These reports focused on techniques such as providing the proper habitat for the fish and other wildlife and the stocking of species within the lake. From there, the 1980's would provide the next crucial study, document and actions taken to protect the lake and the citizens who used the lake for recreation.

The United States Geological Survey, the US EPA, Army Corps of Engineer's, Ohio Department of Natural Resources, and other similar agencies have produced reports, studies, and suggestions on the status of the watershed, how to reduce the degradation occurring, and why it is important to protect the resources of the area.

In more recent years, Ohio EPA conducted water quality sampling in the summer of 1999 to provide a more comprehensive look at the quality of the Grand Lake/Wabash watershed. Samples taken from these sites indicate potential locations and sources of the non-point source pollution that has had such an impact on the watershed. The watershed project continues to use this sampling data as a tool when discussing the importance of watershed protection.

The watershed project also utilized a consulting firm, Richard Hupman & Associates, to complete an inventory of the Grand Lake St. Marys watershed, funded through an ODNR Canal Lakes Grant. The document was completed in 1999 and contains numerous tables, charts, and graphs that present and interprets the findings of the inventory, provides vast amounts of background information on various portions of the study, and also provides a section on findings and recommendations for the watershed. This document has been valuable for the production of this action plan and other documents, funding applications and information materials produced by the watershed project. The document proved to be extremely valuable for the production of the original Grand Lake St. Marys Watershed Management Plan that was endorsed in 2005. The entire report can be obtained by contacting the Grand Lake/Wabash Watershed Alliance office or the Mercer Soil and Water Conservation District office.

In August of 2004, Ohio EPA Region 5, in conjunction with Tetra Tech, Inc., a consulting firm in Cleveland, Ohio, finalized a Total Maximum Daily Load (TMDL) Report for the Wabash River watershed. The report was completed to attain water quality standards and determine designated uses for the Wabash River in Mercer County, Ohio. The report identified total phosphorus, nitrate-nitrite and total suspended solids as major

pollutants of the Wabash River and its tributaries. Target levels for the three pollutants were established based on various methodologies. The TMDL report was especially valuable during the development of this watershed action plan. The entire TMDL report can be obtained from Ohio EPA's website or by contacting the Grand Lake/Wabash Watershed Alliance office or the Mercer Soil and Water Conservation District office.

A similar report was completed by Ohio EPA for the Grand Lake St. Marys and Beaver Creek watersheds. Sampling data for the TMDL report was collected during July of 1999 to June of 2006. Ohio EPA held a public outreach meeting on the TMDL results in February of 2007. The finalized report includes similar information as the TMDL completed for the Wabash River and was finalized August 27, 2007. The entire report can be obtained from the Ohio EPA's website or by contacting the Grand Lake/Wabash Watershed Alliance office or the Mercer Soil and Water Conservation District office. The information from the draft report has proved to be especially valuable during the creation of this watershed action plan.

Furthermore, local agencies in Mercer, Darke, and Auglaize counties, such as the Health Departments, OSU Extension, Soil and Water Conservation Districts, Natural Resource Conservation Service, and many other citizen based organizations, are continuously searching for funding, resources, and information to provide to stakeholders regarding water quality protection. Several publications and events have been produced and conducted in an attempt to provide education and insight as to how individuals can make small changes for the betterment of the watershed, the waterways, Grand Lake St. Marys and the Wabash River.

1.0 WATERSHED PROJECT DEVELOPMENT

2.1 Mission

The mission of the Grand Lake/Wabash Watershed Alliance is to improve the quality of life by promoting stewardship of the natural resources in the Grand Lake/Wabash River watershed. The project objectives are:

1) *To promote wise management of nutrients and chemicals from all sources.*

2) *To reduce agricultural, construction site, shoreline, and streambank soil erosion and sedimentation.*

3) *To promote comprehensive water quality enhancement and protection.*

4) *To educate and develop better understanding and cooperation among all citizens, partners, stakeholders who live, work or recreate in the watershed.*

5) *To utilize and promote proper water management techniques to minimize damage caused by flooding within the watershed.*

The mission statement was developed in as a combination of the mission of the Grand Lake St. Marys Watershed Project and the Wabash Watershed Alliance. The advisory group discussed the need for a mission statement that reflected the needs of the lake environment as well as the river environment. It was stated by one of the advisory board members that the group should consider who the group was serving, and the purpose of the group. It was also advised that the group consider the mission statement to be a statement of the reason for being and how the group's goal would be described to others in the community. Those representing the two originally individual watershed groups expressed interest in seeing a melding of the mission statements as opposed to creating an entirely new mission. Members also discussed the importance of stressing the quality of life and the quality of the water within the watershed. This mission statement remains the guiding statement as the watershed alliance develops newsletters, grant proposals and public presentations.

2.2 Public Involvement

Public Involvement was a central key to developing the original Grand Lake St. Marys Watershed Project Management Plan. A series of surveys were distributed to sets of stakeholders throughout the first year. Specific surveys were mailed to participants in the first year of the Precision Nutrient Application/ Grid Sampling cost share program, attendees of the Celina Water Treatment Plant's Open House, and they were included in an issue of the quarterly newsletter. These participants were surveyed on what the perceived pollution problems were in the watershed, how often they used the lake as a resource, farming practices on their land, and interest in other programs offered by the watershed project. Submission of completed surveys was high from all survey categories and information has been compiled and reported to the Joint Board of Supervisors. All comments have been taken into consideration when developing new project goals, ideas and grant proposals. Education materials have also been developed as a result of information being requested at a high level.

A series of subwatershed meetings was conducted during the summer and fall of 2002 for portions of the Grand Lake St. Marys watershed. This helped us to reach people in their own areas and provide them with an opportunity to interact with residents and neighbors of their subwatershed. Topics for discussion during the course of the meeting included; What is a watershed, Developing a Management Plan, Grand Lake St. Marys Watershed information; and information specifically relevant to the sub-watershed where the meeting took place. After information was provided, each attendee was asked to write comments, questions, concerns and both positive and negative issues related to what they have seen or experienced in the area. The potential or perceived pollution problems were then listed, discussed, and prioritized by the group. Discussion is also encouraged on how to enhance the positive actions that were mentioned during the evening. General informational requests or concerns were also addressed at the end of the evening.

The Grand Lake/Wabash Watershed Alliance has employed a similar method for the development of this watershed action plan. This plan includes all of the new information for the Wabash River watershed as well as updated information for the Grand Lake St. Marys portion of the watershed. Ideas from the original watershed management plan have been incorporated into this plan and were used to develop the action plans for the remaining Wabash River watershed. Three different stakeholder meetings (open to the public) were held to discuss goals and objectives for the plan along with the general watershed information (including TMDL results). Attendance at the meetings included a broad spectrum of people, particularly county commissioners, farmers, lake interest groups, municipality representatives, water and wastewater treatment plant representatives, farm bureau, local health departments, SWCD representatives and many more. Surveys were conducted at each of the meetings, and a survey was sent in the Winter 2007 newsletter. Local citizens associated with the topic areas were called on to provide assistance in various ways. They provided insight on specific BMP's, proofread pertinent information, or spoke at events to promote the watershed and its programs. Attempts were made to obtain a broad spectrum of advice and

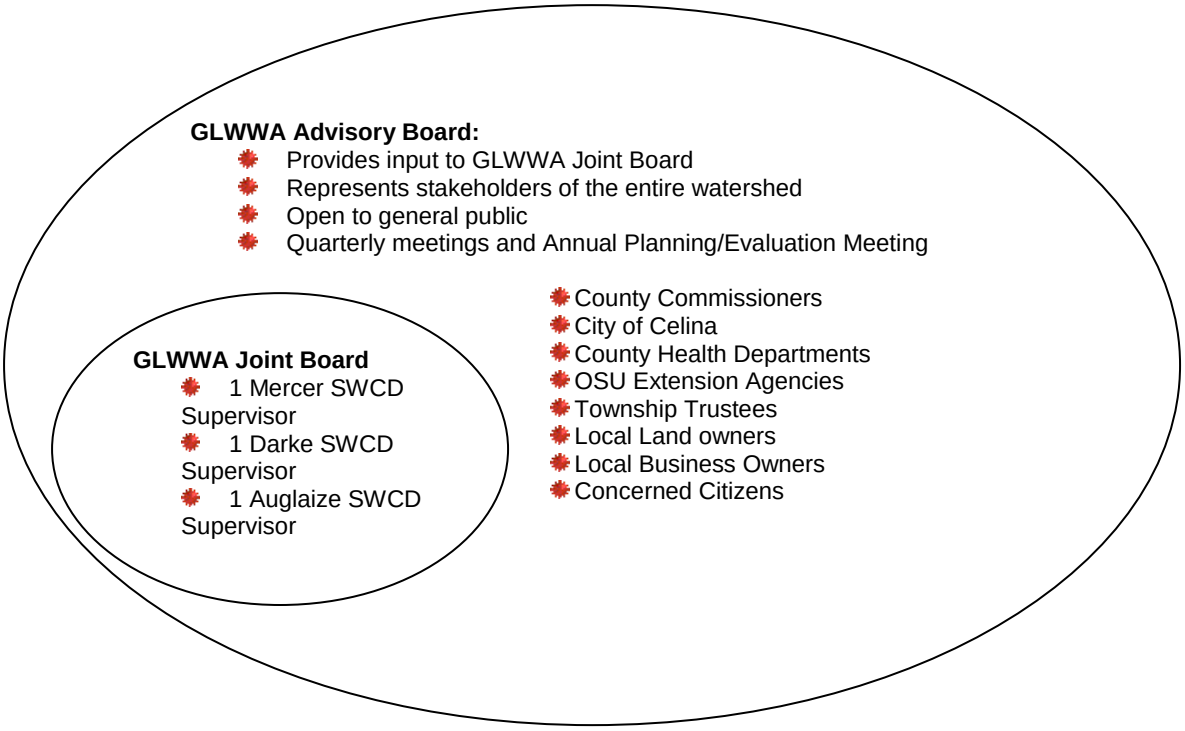
opinions regarding developing new programs and to evaluate the success of both current and past programs offered by the alliance.

2.3 GLWWA Organizational Structure

The Grand Lake/Wabash Watershed Alliance is a partnership of Mercer, Darke and Auglaize Counties, and the City of Celina, directed by a Joint Board of Supervisors, consisting of one representative from Mercer SWCD, one representative from Auglaize SWCD and one representative from Darke SWCD.

The Joint Board of Supervisors provides oversight for programmatic decisions such as grant applications and objectives, day to day operations and budgetary items. Input and direction from the watershed coordinator is strongly encouraged and utilized when making decisions regarding the watershed project. The watershed project also receives suggestions and insight from the Advisory Board. Final programmatic and fiscal decisions are made with a majority vote by the Joint Board of Supervisors. Personnel related decisions are made by the Mercer SWCD Board with guidance from the GLWWA Joint Board.

The following is an organizational diagram, which provides a pictorial setup for the alliance.



The office for the watershed project is currently housed with the Mercer Soil and Water Conservation District. This provides the benefit of shared resources, close proximity to other natural resource departments and the ability to collaborate on development and implementation of protection efforts.

The funding for the watershed project comes in several forms, including federal, state and local resources. The GLWWA watershed project received a six-year ODNR Watershed Coordinator Grant, which provided primary funding for salary and fringe benefits; a CWA Section 319 grant from Ohio EPA, which provided funding for several cost share programs and educational components; a 319 Operations Support Grant, which provided funding to help alleviate a portion of the associated costs with implementing a 319 grant; an ODNR-DSWC state pollution abatement cost share grant, and other smaller grants that provided funding for short term or one-time events. This funding has allowed the project to produce informational brochures, newsletters, provide BMP cost share and incentive payments for conservation efforts, purchase equipment, and provide funding for a full time coordinator position.

Funding similar to the above is always sought by the watershed project. In 2007 the watershed project applied for and will be receiving a watershed coordinator implementation grant. This grant is for a watershed coordinator's salary. Match for this grant was provided by the City of Celina and Auglaize, Darke and Mercer County Commissioners. This grant is provided by the Ohio Department of Natural Resources and 319 grant funds through Ohio EPA. This is a three year grant and after the three years, it is expected by ODNR and OEPA that the watershed project will be self-sufficient.

The watershed project is a partner with many other organizations, stakeholders, and agencies that work together to protect and enhance various aspects related to and directly involving Grand Lake St. Marys, the Wabash River and its tributary streams.

2.4 Partnership

This plan was developed primarily by the Grand Lake/Wabash Watershed Project with added assistance provided by the members of the Advisory Board, partnering agencies and those otherwise involved in the development and/or implementation of the programs to be offered by the watershed project.

The following is provided as a listing of other agencies, groups, and partners that will be crucial in the implementation and evaluation of this plan. We certainly will not be able to list everyone that has partnered with the project to protect and enhance Grand Lake St. Marys and the Wabash River.

Auglaize County Commissioners: The Commissioners have generously provided a significant portion of the local match required for the Watershed Coordinator grant. They will continue to cooperate with the GLWWA to promote the use of conservation practices on the land within Auglaize County. The Commissioners will also encourage the county and community planning agencies to plan land management within the best interests of the respective watershed and natural resources.

Darke County Commissioners: The Commissioners have also generously provided a significant portion of the local match required for the Watershed Coordinator grant. They will continue to cooperate with the GLWWA to promote the use of conservation practices on the land within Darke County. The Commissioners will also encourage the county and community planning agencies to plan land management within the best interests of the respective watershed and natural resources.

Mercer County Commissioners: The Commissioners have also generously provided a significant portion of the local match required for the Watershed Coordinator grant. They will continue to cooperate with the GLWWA to promote the use of conservation practices on the land within Mercer County. The Commissioners will also encourage the county and community planning agencies to plan land management within the best interests of the respective watershed and natural resources.

City of Celina: The City of Celina has also provided a significant portion of the local match for the Watershed Coordinator grant. The working partnership will continue as the need for clean drinking water is imperative. As the City of Celina strives to meet stormwater requirements and has developed long term plans for lake side beautification, there will be many opportunities for education, outreach and community involvement in understanding the impact that we all have on our surroundings, and how vital that is to protecting the natural resources and the health of the residents of the city.

The following agencies have agreed to provide assistance when possible regarding the promotion of new programs and projects, public outreach and education, design and implementation of individual practices or structures, and general technical assistance per area of expertise.

Auglaize County Engineer's Office

Auglaize County Farm Bureau

Auglaize County Health Department

Auglaize Soil and Water Conservation District

Coldwater Young Farmers

Darke County Engineer's Office

Darke County Farm Bureau

Darke County Health Department

Darke Soil and Water Conservation District

Lake Improvement Association

Marion Young Farmers

Mercer County Engineer's Office

Mercer County Farm Bureau

Mercer County Farm Service Agency

Mercer County Health Department

Mercer Soil and Water Conservation District

Natural Resources Conservation Service

Ohio State University Extension, Auglaize County

Ohio State University Extension, Darke County

Ohio State University Extension, Mercer County

The GLWWA operational documents, such as the Bylaws (including voting procedures and decision making process guidelines), Job Description, and Memorandum of Understanding with the Mercer Soil and Water Conservation District, can be found in Appendix B.

3.0 WATERSHED DESCRIPTION

3.1 Topography

The majority of the GLWWA watershed lies in the Central Lowland physio-geographic province, and more specifically in the Indiana and Ohio Till Plain section. Throughout the watershed, the relief is nearly level with some gentle sloping areas, with the greatest elevation found at approximately 1,070 ft mean sea level (msl) in the watershed's southwest corner near the Mercer-Darke County Line.

"Mercer County is a part of two continental watersheds. The Ohio-Erie Divide crosses the county in a general east-west direction and is partly oriented to the Wabash moraine through its central extension in the county. North of this divide, the county is mostly drained into Lake Erie by the St. Marys River and its tributaries. … Grand Lake lies across the Ohio-Erie divide. It is an artificially created body of water 13,500 acres in size, two-thirds of which is in Mercer County. The lake was created by damming each end of a long, narrow swale to provide water for the Ohio-Erie Canal system. It drains to Lake Erie from the east and to the Ohio River from the west by Beaver Creek, a major tributary of the Wabash River in Mercer County." [Priest, T.C. 1979]

Historical and current topographical maps of Ohio and each county can be found at the following website: http://historical.maptech.com/statemap.cfm?stateabr=OH.

MAP 9

STATE OF OHIO
Bob Taft, Governor

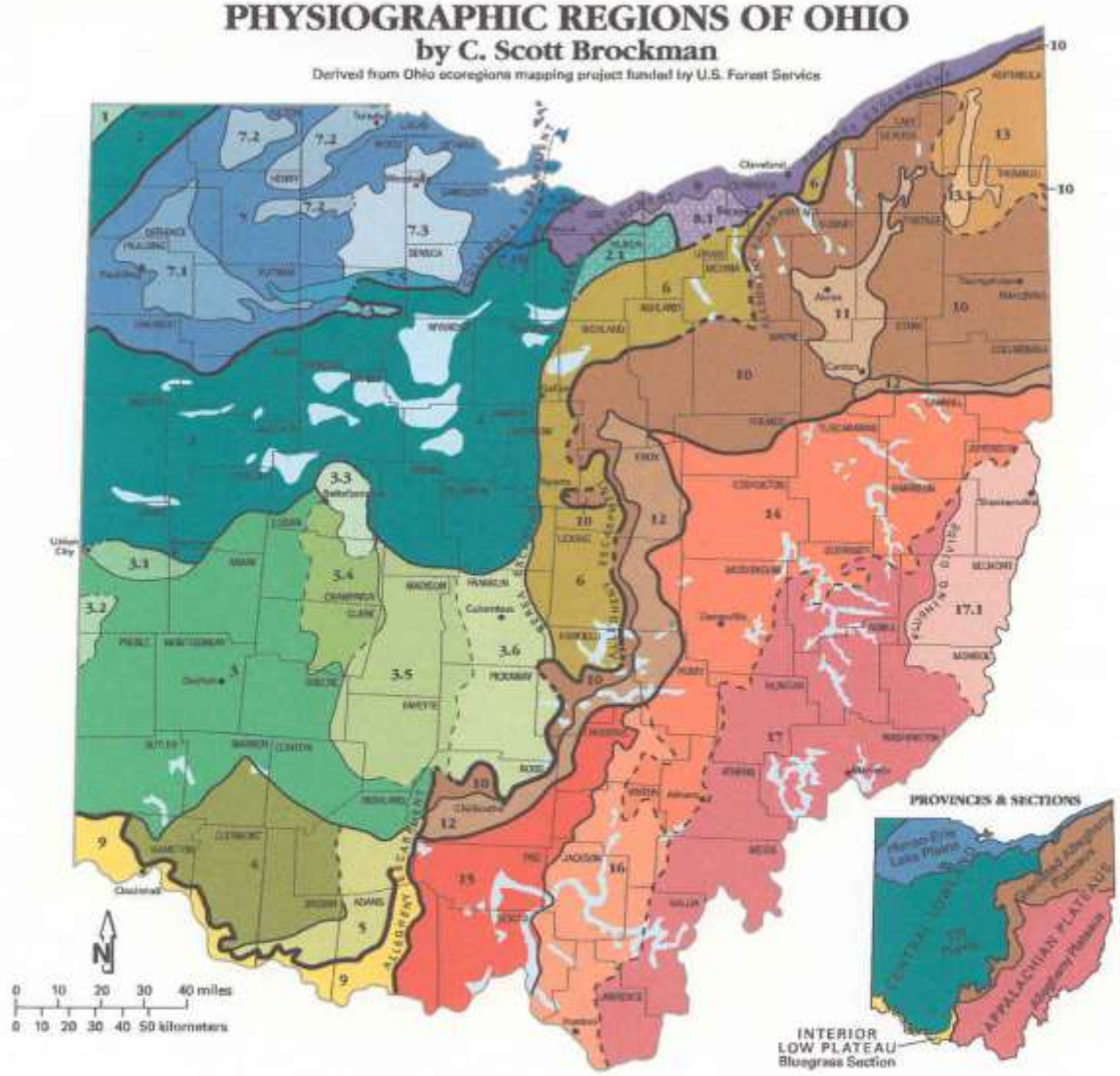
DEPARTMENT OF NATURAL RESOURCES
Samuel W. Speck, Director

DIVISION OF GEOLOGICAL SURVEY
Thomas M. Berg, Chief

PHYSIOGRAPHIC REGIONS OF OHIO

by C. Scott Brockman

Derived from Ohio ecoregions mapping project funded by U.S. Forest Service



Till Plains

- 1. Steuben Till Plain
- 2. Central Ohio Clayey Till Plain
  - 2.1. Berea Headlands of the Till Plain
- 3. Southern Ohio Loamy Till Plain
  - 3.1. Union City-Bloomer Transitional Terrain
  - 3.2. Whitewater Interlobate Plain
  - 3.3. Bellefontaine Upland
  - 3.4. Mad River Interlobate Plain
  - 3.5. Darby Plain
  - 3.6. Columbus Lowland
- 4. Illinoian Till Plain
- 5. Dissected Illinoian Till Plain
- 6. Galion Glaciated Low Plateau

Transitional boundary

Lake basin/deposits outside Huron-Erie Lake Plains

Huron-Erie Lake Plains

- 7. Maumee Lake Plains
  - 7.1. Paulding Clay Basin
  - 7.2. Maumee Sand Plains
  - 7.3. Woodville Lake-Plain Reefs
  - 7.4. Findlay Embayment
  - 7.5. Fostoria Lake-Plain Shoals
  - 7.6a and 7.6b. Bellevue-Castalia Karst Plain
- 8. Erie Lake Plain
  - 8.1. Berea Headlands of the Erie Lake Plain

Bluegrass Section

- 9. Outer Bluegrass Region

Glaciated Allegheny Plateaus

- 10. Killbuck-Glaciated Pittsburgh Plateau
- 11. Akron-Canton Interlobate Plateau
- 12. Illinoian Glaciated Allegheny Plateau
- 13. Grand River Low Plateau
  - 13.1 Grand River Finger-Lake Plain

Allegheny Plateaus

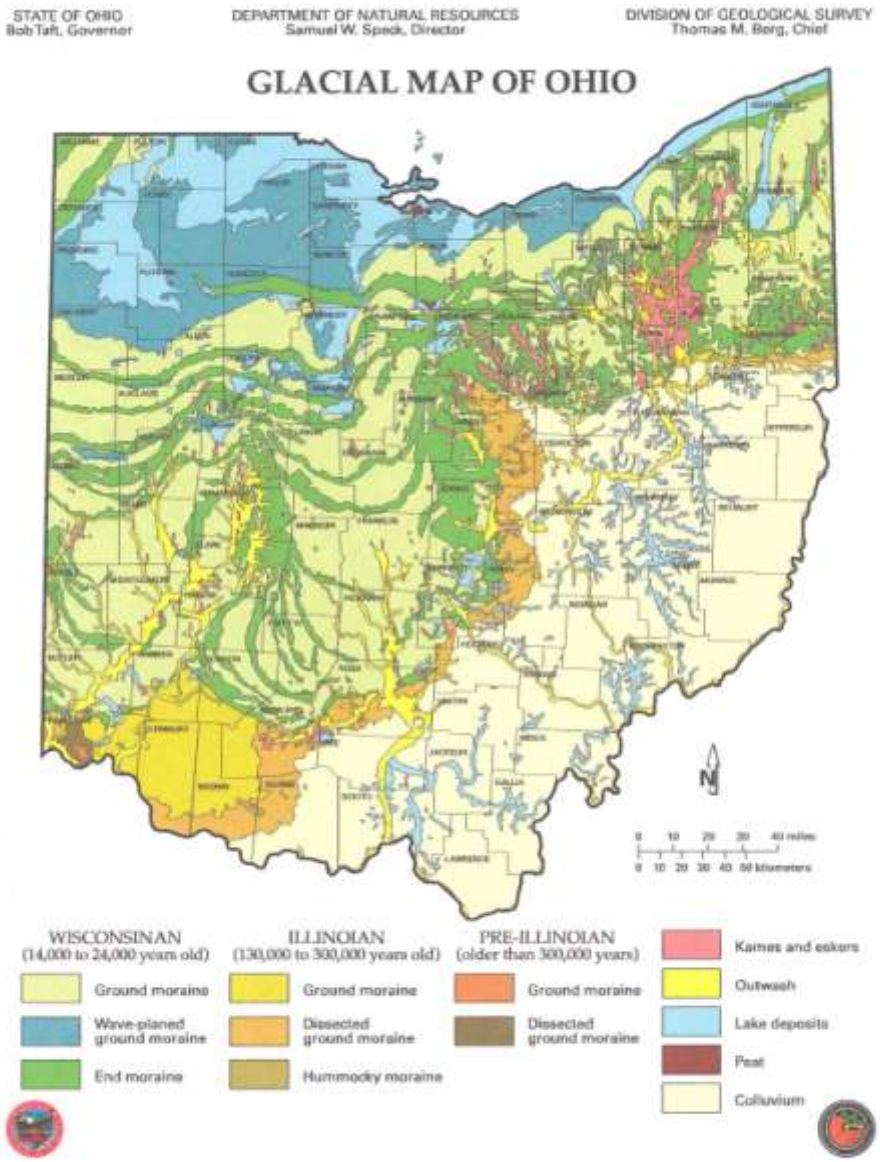
- 14. Muskingum-Pittsburgh Plateau
- 15. Shawnee-Mississippian Plateau
- 16. Ironton Plateau
- 17. Marietta Plateau
  - 17.1. Little Switzerland Plateau

4/98

3.2 Geology

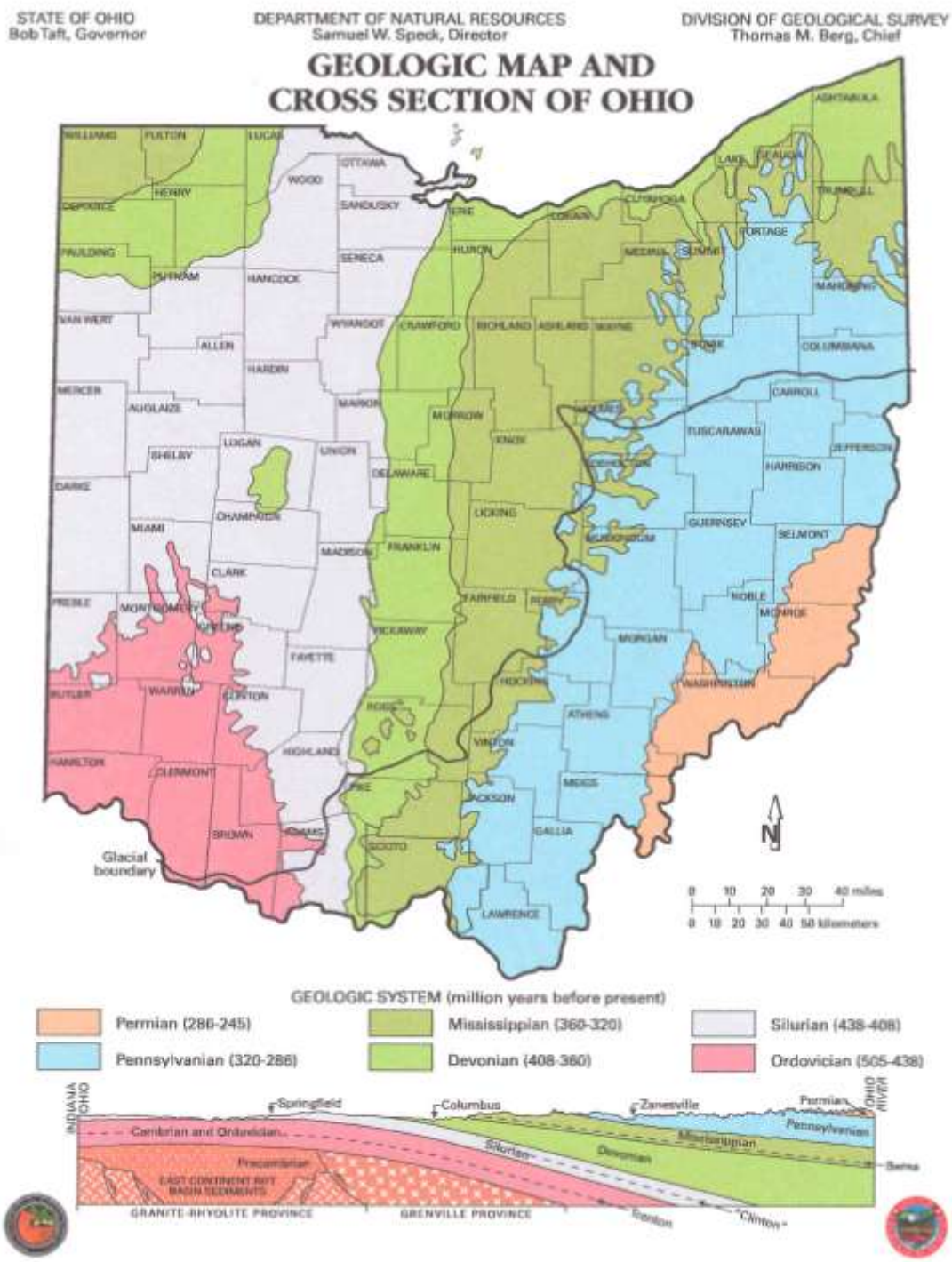
The watershed has been covered three times by glaciers, the most recent coverage by the Wisconsin advance (14,000 to 24,000 years old). The geology of the area is composed of glacial tills, clayey or silty materials deposited by water, and silty materials deposited by wind. Till materials contain a high percentage of limestone and dolomite, both fines and pebbles, and igneous rock transported from the north. Sub-soils in the watershed are classified as having permeabilities of slow to moderately slow due to their clayey nature.

MAP 10



The above illustration depicts the glacial advances and deposits in Ohio.

MAP 11


STATE OF OHIO
Bob Taft, Governor
DEPARTMENT OF NATURAL RESOURCES
Samuel W. Speck, Director
DIVISION OF GEOLOGICAL SURVEY
Thomas M. Berg, Chief
GEOLOGIC MAP AND CROSS SECTION OF OHIO
Glacial boundary
GEOLOGIC SYSTEM (million years before present)
Permian (286-245)
Pennsylvanian (320-286)
Mississippian (360-320)
Devonian (408-360)
Silurian (438-408)
Ordovician (505-438)
Springfield
Columbus
Zanesville
Cambrian and Ordovician
Precambrian
Silurian
Devonian
Mississippian
Pennsylvanian
Permian
GRANITE-RHYOLITE PROVINCE
GRENVILLE PROVINCE

3.3 Soils

Primary soil associations for the watershed consist of Blount-Pewamo association in the area south and west of the lake and the majority of the lake's shoreline, and a large portion of Blount-Glynwood association, found in more sloping areas in the southern and western portion of the watershed and portions of the lake's northern shoreline. Areas directly surrounding much of the Wabash River consist of the Shoals-Genesee association. Also present in smaller amounts are the Montgomery-McGary, Defiance-Wabasha, Millgrove-Digby-Gallman and Sloan associations. Highly erodible land is more common in the Blount Glynwood association, and hydric soils are more common in the Blount-Pewamo association. The following descriptions of these soil associations and included soil types are taken from the "Soil Survey of Mercer County, Ohio" published by the USDA Soil Conservation Service in 1979:

Blount-Pewamo: *Level, nearly level and gently sloping, somewhat poorly drained and very poorly drained soils formed in glacial till.* This map unit makes up about 62 percent of the county. It is about 50 percent Blount soils, 40 percent Pewamo soils, and 10 percent soils of minor extent. Blount soils are poorly drained, nearly level and gently sloping, medium textured soils on slight rises, low knolls, and foot slopes. Permeability is slow or moderately slow, and runoff is slow and medium. Pewamo soils are very poorly drained, level and nearly level, moderately fine textured and fine textured soils in depressions. Permeability is moderately slow and runoff is very slow. Some areas are ponded. Both soils have a seasonal high water table near the surface. The major soils are used for cash grain farming in the northern part of the county and for cash grain and livestock farming in the southern part. Corn, soybeans, wheat, oats, hay, pasture grasses, and tomatoes are the principal crops. The soils have good potential for farming and woodland. The potential is poor for building site development and sanitary facilities and fair or poor for most recreational uses. The seasonal high water table is the main limitation for most uses. Maintaining the tilth of both soils and controlling erosion on the gently sloping Blount soils are also major concerns for farming. The moderately slow or slow permeability severely limits these soils for such uses as septic tank effluent fields. Low strength limits building site development.

Blount-Glynwood: *Nearly level to sloping, somewhat poorly drained and moderately well drained soils formed in glacial till.* This map unit makes up about 25 percent of the county. It is about 45 percent Blount soils, 35 percent Glynwood soils and 20 percent soils of minor extent. Blount soils are somewhat poorly drained, nearly level and gently sloping, medium textured soils on flats, low knolls, and foot slopes. Permeability is slow or moderately slow, and runoff is slow and medium. The seasonal high water table is near the surface. Glynwood soils are moderately well drained, gently sloping and sloping, medium textured soils on knolls and side slopes along drainageways. Permeability is slow, and runoff is medium and rapid. The seasonal high water table is between depths of 24 and 36 inches. The major soils are used mainly for cash grain and livestock farming and woodland. Corn soybeans, wheat, oats, hay, and pasture grasses are the principal crops. The soils have good and fair potential for farming. They have fair or poor potential for building site development and sanitary facilities. The potential is good for woodland and fair for recreational development. The main limitation of these soils is the erosion hazard, especially on the sloping to steep Morley soils. Also, the Blount soils are wet. They dry out more slowly in spring than Glynwood soils and are not suited to grazing early in spring or to crops that are planted early in spring. Glynwood soils are better suited than Blount soils to building site developments. Both soils are poorly suited to such sanitary facilities as septic tank effluent fields because of the slow or moderately slow permeability.

Although the following five associations are of much smaller extent on the Mercer County general Soil Map, they identify the location of distinctly different soils adjacent to streams.

The Montgomery-McGary association consists of level, nearly level, and gently sloping, very poorly drained and somewhat poorly drained soils formed in lake-deposited clay and silt. These soils are most common in the portions near the lake in the Coldwater Creek and Grassy/Monroe Creeks subwatersheds. These soils are also present in the Wabash Headwaters to below Bear Creek, the Wabash River above Bear Creek below Stony Creek and the Beaver Creek from Grand Lake to above Little Beaver Creek subwatersheds.

The Defiance-Wabasha association consists of level and nearly level, somewhat poorly drained and very poorly drained soils formed mainly in fine textured and moderately fine textured recent alluvium. These soils are most common on floodplains in the lower part of Beaver Creek subwatershed. These soils are also present along portions of Beaver Creek and the Wabash River in the Beaver Creek from Grand Lake to above Little Beaver Creek, Beaver Creek below Little Beaver to Wabash River and Wabash River below Beaver Creek to New Corydon subwatersheds.

The Shoals-Genesee associations consists of level and nearly level, somewhat poorly drained and well drained soils formed in medium textured and moderately course textured recent alluvium. These soils are common on floodplains in the Coldwater Creek subwatershed upstream from the confluence of Coldwater and Burntwood Creeks. The Shoals-Genesee association is also present along a large percentage of the floodplains along the Wabash River throughout the watershed as well as along a portion of Little Beaver Creek.

The Sloan association consists of level and nearly level, very poorly drained soils formed in moderately coarse textured to moderately fine textured recent alluvium. Sloan soils are most common on floodplains in the Beaver Creek subwatershed downstream from the confluence of Beaver and Montezuma Creeks.

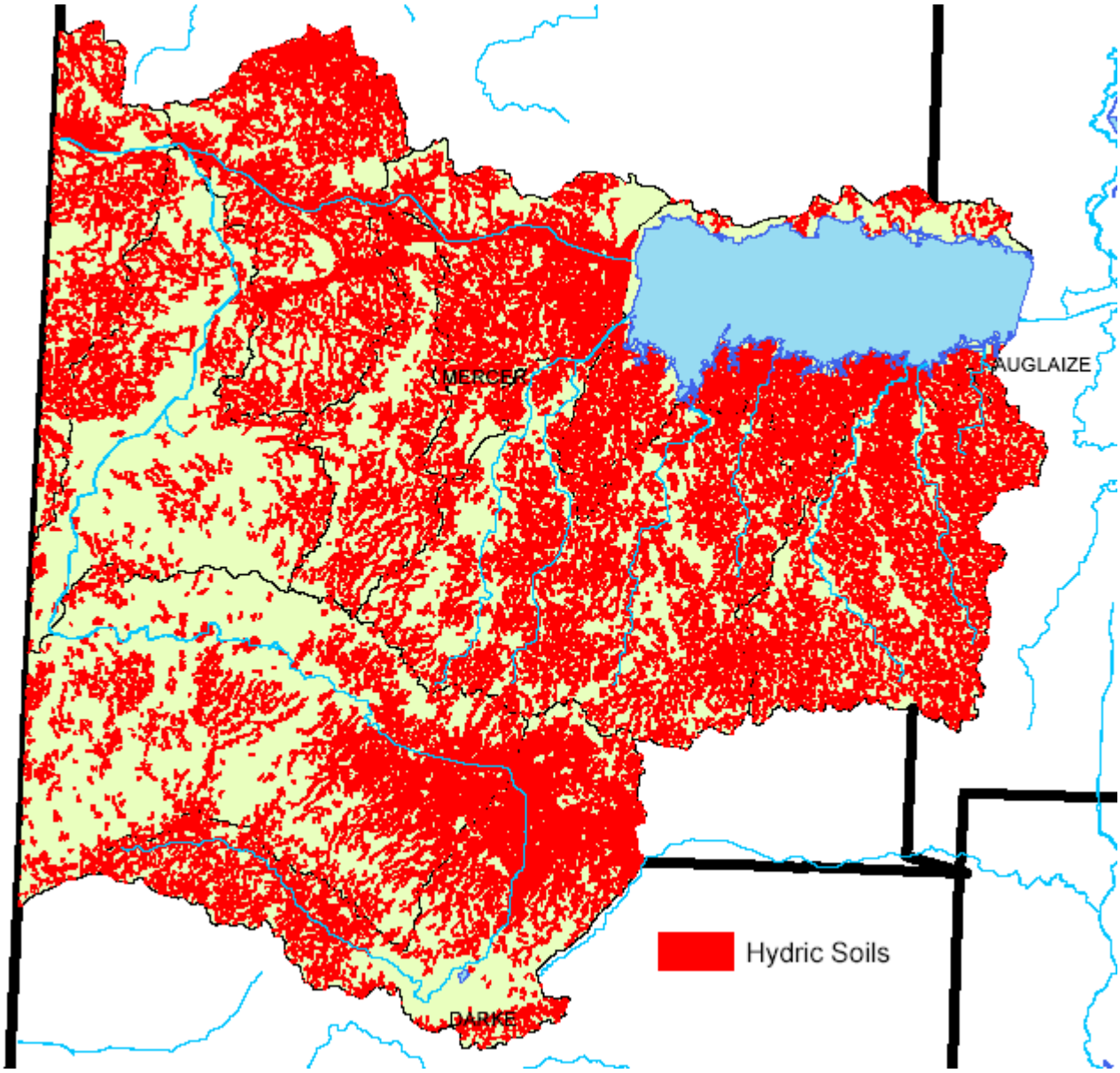
The Millgrove-Digby-Gallman association consists of level, nearly level, and gently sloping, very poorly drained to well drained soils formed in glacial outwash. These soils are most common along Big Run Creek, Beaver Creek and Little Beaver Creek in the Beaver Creek below Little Beaver to Wabash River and Little Beaver Creek subwatersheds.

Hydric soils are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil. These soils are typically considered poorly drained with a high water table. Hydric soils are well suited for farming practices, assuming good subsurface drainage is provided. However, these soils are very well suited for vegetation growth and wildlife habitat. The

Lake Erie CREP wetland restoration practice requires that sites outside the 100-year flood plain include at least 50 percent hydric soils. Therefore, areas with hydric soils are well suited for wetland construction and/or restoration.

Map 12 illustrates the hydric soils within the watershed. There are approximately 54,270 total acres of hydric soils in the watershed. This data was derived from the 2004 Soil Data Mart and provided by the Ohio Department of Natural Resources – Division of Soil and Water. The hydric soil types include: Montgomery, Muskego, Pewamo, Lippincott, Patton, Defiance, Edwards, Millgrove, MIllsdale, Olentangy, Sloan and Wabasha.

MAP 12
Hydric Soils



3.4 Biological Features

3.4.1 Rare, Threatened, and Endangered Species

The following page shows a map of the recorded rare and/or endangered species for the Upper Wabash Watershed. This map was developed by Butch Grieszmer, Ecological Analyst with ODNR's Division of Natural Areas and Preserves. In the associated letter, Mr. Grieszmer writes that "There are no existing or proposed state nature preserves at the project site. We are also unaware of any unique ecological sites, geologic features, breeding or non-breeding animal concentrations, champion trees, state forests, scenic rivers, or wildlife areas within the project area". The letter goes on to state that "Our inventory program has not completely surveyed Ohio and relies on information supplied by many individuals and organizations. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from that area. Although we inventory all types of plant communities, we only maintain records on the highest quality areas. Also we do not have data for Ohio wetlands." [Grieszmer, 2003]

The table associated with the map lists the ID number as shown on map, the Scientific name of the species indicated, the common name of the species, a date when the species was last observed and the corresponding information was submitted to the department, the current state listing status and the current federal listing status. A key to the status abbreviations is found below.

State Status:	E	~	Endangered
	P	~	Potentially Threatened (Plants)
	SC	~	Special Concern (animals)
	T	~	Threatened
Federal Status:	FT	~	Federally Threatened

MAP 13
Rare & Endangered Species, Upper Wabash Watershed

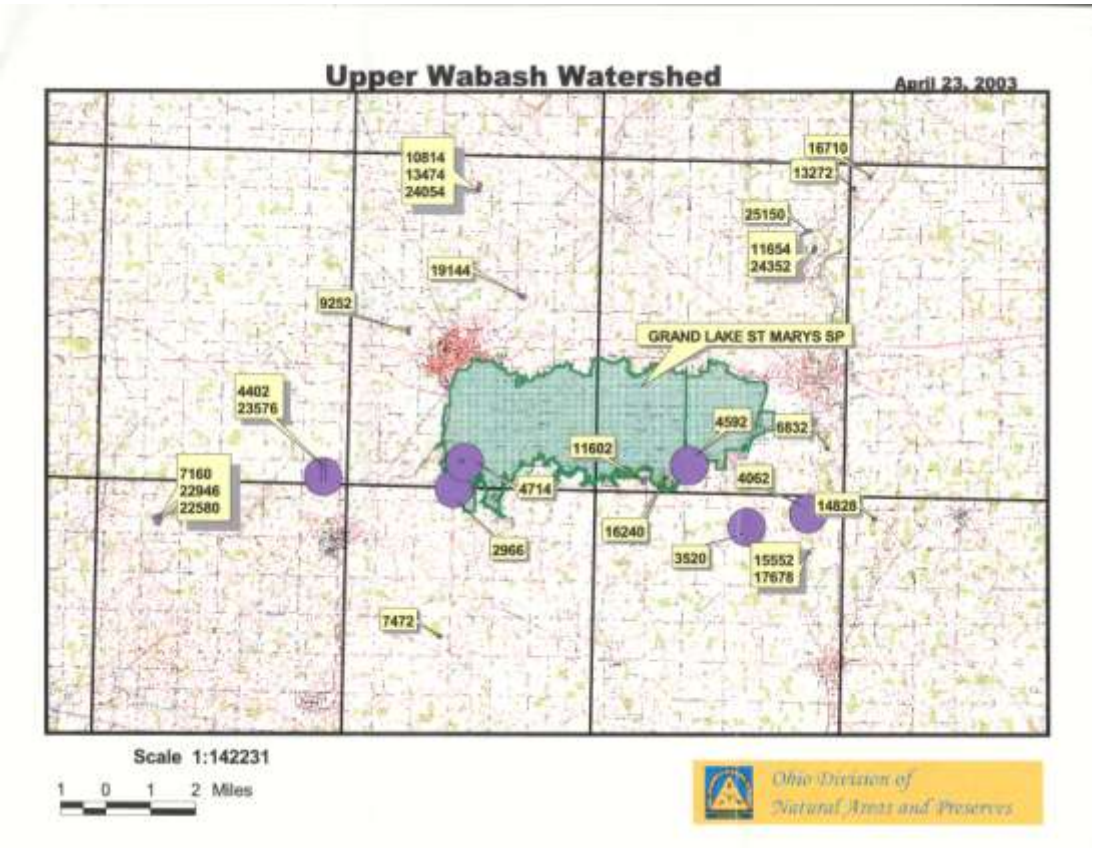


Table 7
Rare & Endangered Species, Upper Wabash Watershed

FEATURE_ID	SNAME	SCOMNAME	LASTOBS	STATE_STAT	FEDERAL_ST
2966	TURKEY VULTURE ROOST		1973-00		
3520	TRILLIUM RECURVATUM	PRAIRIE WAKE-ROBIN	1987-05	P	
4062	TRILLIUM RECURVATUM	PRAIRIE WAKE-ROBIN	1987-05	P	
4402	ARENARIA LATERIFLORA	GROVE SANDWORT	1991-05	P	
4592	LOPHOTOCARPUS CALYCINUS	SOUTHERN WAPATO	1967-09	P	
4714	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	2000-06	E	LT
6832	TRILLIUM RECURVATUM	PRAIRIE WAKE-ROBIN	1985-05	P	
7160	GREAT BLUE HERON COLONY		1989-05		
7472	ACCIPITER STRIATUS	SHARP-SHINNED HAWK	1987-07	SC	
10814	ARENARIA LATERIFLORA	GROVE SANDWORT	1991-06	P	
11654	VITIS CINEREA	PIGEON GRAPE	1989-08	P	
13272	VITIS CINEREA	PIGEON GRAPE	1985-10	P	
13474	CAREX CRUS-CORVI	RAVEN-FOOT SEDGE	1991-06	T	
14828	TRILLIUM RECURVATUM	PRAIRIE WAKE-ROBIN	1986-05	P	
16710	VITIS CINEREA	PIGEON GRAPE	1989-08	P	
15552	ARENARIA LATERIFLORA	GROVE SANDWORT	1985-05	P	
16240	GREAT BLUE HERON COLONY		1989-11		
16674	GREAT BLUE HERON COLONY		1991-04		
17678	TRILLIUM RECURVATUM	PRAIRIE WAKE-ROBIN	1985-05	P	
22946	PLATANTHERA FLAVA	TUBERCLED REIN ORCHID	1990-06	P	
24054	CAREX CRUS-CORVI	RAVEN-FOOT SEDGE	1989-07	T	
19144	MIXED EMERGENT MARSH		1989-08		
9252	OAK-HICKORY FOREST		1989-09		
11602	MAPLE-ASH-OAK SWAMP		1989-08-31		
23576	OAK-MAPLE FOREST		1989-10		
22580	BEECH-OAK-RED MAPLE FOREST		1989-05		
25150	FLOODPLAIN FOREST		1989-08-25		
24352	BUTTONBUSH SHRUB SWAMP		1989-08		

3.4.2 Invasive, Nonnative Species

It has been estimated that approximately 25 percent of Ohio's flora is considered to be alien species, also referred to as exotic or non-native species. Introduction of such species can be intentional, for a specified use or aesthetic value; or accidental, brought into the area by wildlife. Many of the non-native species are seemingly harmless and can add to the diversity of the area, finding and supporting various niches in the habitat. According to ODNR's Division of Natural Areas and Preserves, there are more than 700 species of non-native species in Ohio.

However, some alien species are classified as invasive due to their ability to rapidly grow, reproduce and overtake the surrounding area by oppressing the growth of the more common floral species. Another major problem with invasive plants is attributed to the lack of natural predators or natural control measures in the "invaded" areas. "The division (ODNR-DNAP) has compiled a list of more than 60 plants that are currently impacting nature preserves, wildlife areas, parks and forests throughout the state. Some of the top invasive non-native plants include; bush honeysuckles (Amur, Morrow and Tatarian), buckthorn (glossy and common), garlic mustard, purple loosestrife, common reed grass, reed canary grass, autumn olive, multiflora rose, Japanese honeysuckle, narrow-leaved cattail, Canada thistle and tree-of-heaven" More detailed information on invasive species can be found at the ODNR Division of Natural Areas and Preserves' website: (www.dnr.state.oh.us/dnap/invasive/default.htm)

The potential impacts of non-natives and invasive species are unlimited in nature. Managers of natural areas across the country may spend an exorbitant amount of man hours and dollars to control the invasive species. The non-native invasive species may also eliminate other important native species by out-competing them for water, nutrients and space.

The watershed also needs to consider the control of noxious weeds when dealing with agricultural issues. Noxious weeds are determined to be noxious if "They possess one or more of the following attributes: 1) aggressive competition with cultivated plants; 2) toxicity to livestock; 3) natural habitat degradation; 4) threat to public health, safety, or navigation" (Rose, 1998).

Plants that have been determined to be noxious and are also prohibited are listed below.

Shatter Cane	Russian Thistle
Johnsongrass	Wild Parsnip
Wild Carrot (Queen Anne's lace)	Oxeye Daisy
Wild Mustard	Grapevines
Canada Thistle	Poison Hemlock
Cressleaf groundsel	Musk Thistle
Purple loosestrife	Mile-A-Minute Weed

3.4.3 Flora and Fauna

(Entire section taken from the "Grand Lake St Marys Watershed Protection Project" report prepared by R. Hupman & Assoc., Dayton OH July 1999)

Terrestrial

The beech-maple forests that covered the Ohio till plains in pre-settlement times have long since disappeared and been replaced by agricultural uses in Auglaize and Mercer counties and the Grand Lake watershed (USCoE, 1981). Based on 1994 aerial photos, only about 3% of the watershed is wooded today, mostly in relatively small, scattered parcels. In 1979, as part of the 1981 Flood Survey report by the Corps of Engineers, a study of the vegetation at locations around the Lake, along tributaries, and in upland areas was conducted. Of the ten sites sampled, five were near the lake shore, three focused on Beaver, Coldwater and Prairie Creeks, and two were upland areas.

Although the Grand Lake watershed has lost most of its wooded areas, a sufficient variety of plant species remains as canopy, understory and ground cover to provide habitat for an impressive array of terrestrial, amphibious, and aquatic animal life.

Rick Jasper, Assistant Wildlife Manager at the Ohio Department of Natural Resources' Division of Wildlife District 5 office in Xenia, Ohio, provided the following list of species found in Auglaize and Mercer Counties:

MAMMALS
Badger
Beaver
Big Brown Bat
Coyote
Deer Mouse
Eastern Chipmunk
Eastern Mole
Eastern Pipistrel
Fox Squirrel
Gray Squirrel
Gray Fox
Ground Hog
Indiana Bat (range of)
Keen Myotis
Least Weasel
Little Brown Bat
Long-tailed Weasel
Meadow Vole
Mink
Muskrat
Opposum
Pine Vole
Prairie Vole
Raccoon
Red Fox
Red Bat
Red Squirrel
Short-tailed Shrew

MAMMALS
Striped Skunk
Thirteen Lined Ground Squirrel
White Footed Mouse
White Tailed Deer

SKINKS
Five-lined

SALAMANDERS
Eastern Tiger
Marbled
Red Back
Red-spotted
Small-mouthed
Spotted

SNAKES
Black Rat Snake
Blue Racer
Brown Snake
Garter Snake
Hognose
Milk Snake
Northern Water Snake

FROGS and TOADS
American Toad
Bullfrog
Chorus Frog
Cricket Frog
Fowler's Toad
Gray Tree Frog
Green Frog
Northern Leopard Frog
Pickerel Frog
Plains Leopard Frog
Spring Peepers
Wood Frog

TURTLES
Eastern Box
Map
Painted
Snapping
Soft Shell
Stinkpot

Southern Bog Lemming
Star-nosed Mole
Queen Snake

In addition to the wildlife listed above, bird life abounds in the Grand Lake area. Writing for the Ohio Department of Natural Resources' Division of Wildlife, Clarence Clark of the Division and James Sipe of St Marys prepared Publication 350, Birds of the Grand Lake St Marys Area. There is no publication date to be found on this soft-cover book, but the latest date in the list of sources is 1967. The study lists 290 varieties ranging from humming birds to the Bald Eagle plus five additional "hybrids and exotics." Mr. Jasper of the District 5 Wildlife office believes that this inventory of 290 is still fairly accurate and reports that three varieties indicated by Clark and Sipe to have nearly disappeared from the area by the late '60s, the Bald Eagle, Osprey, and Snow goose, can now be found there again.

The Ohio Department of Natural Resources' Division of Natural Areas and Preserves maintains records of plant and animal species in the state that are of special significance for one or more reasons. Known as the National Heritage Data Base Record, this body of information makes possible the identification of such species for particular geographic area. In the Grand Lake watershed, ODNR's 1997 records show the following:

- High Quality Plant Communities
  - Oak-hickory Forest
  - Mixed emergent marsh
  - Maple-oak-ash swamp

- Significant Natural Features
  - Great Blue Heron colonies (2)
  - Turkey Vulture roost

- Special Interest Species
  - Sharp-shinned hawk

- Potentially Threatened Plant Species
  - Swamp cottonwood
  - Prairie wake robin

- Threatened Plant Species
  - Southern wapato
  - Grove Sandwort

- Endangered Species
  - Bald eagle (recently removed from list)
  - Indiana Bat (range of)

Significant Natural Features are areas that should not be destroyed for a particular reason; in this case, habitat for herons and turkey vultures. Special Interest Species are those that might become threatened under continued or increased stress or for which there is concern but insufficient information for an adequate status evaluation. Potentially Threatened Plant Species applies to 1) plants that do not qualify in Ohio but are proposed federal threatened or endangered species; 2) imperiled plants that could become threatened in the foreseeable future; and/or 3) plants believed to be declining at a significant rate throughout all or large portions of the state. Threatened Species are those whose survival is not in immediate jeopardy, but which will become threatened with extirpation or total disappearance from Ohio.

Aquatic

One of the most frequently cited reports on Grand Lake, Lake St Marys and its Management provides a detailed and fascinating historical look at the Lake's plants, fishes and other aquatic life. Regarding aquatic vegetation, author Clarence Clark first addresses phytoplankton summarizing the results of survey work by Lee S. Roach in the mid-1930s. The 1981 Corps of Engineers Survey Report states "Algal densities for the period 1932-1936 averaged 4.5 blue-greens per milliliter, 15.9 greens per milliliter, and 129 diatoms per milliliter. The most productive year was 1935, when algal densities were at least five times those of other years."

There appears to have been little, if any, additional research on lake vegetation until the mid-1970s. In the spring, summer, and fall of 1973, as a part of the National Eutrophication Survey, samples were taken from Grand Lake. Phytoplankton/algal densities were measured in May, August, and October, and the Lake was found to be eutrophic, i. e., rich in dissolved nutrient, at that time. The report says, "It ranked seventh in overall trophic quality when the 20 Ohio lakes were compared…Survey limnologists reported heavy algal blooms…in May." In 1975, the U. S. Geological Survey (U.S.G.S.) again studied phytoplankton in the Lake. In samplings in May and August, blue-green algae were predominant. The Corps of Engineers report brings the results of all these efforts together in this statement: "Since Roach's studies in the 1930s phytoplankton density has increased by three to four orders of magnitude in Grand Lake St Marys, and the taxonomic composition has changed from diatom to a blue-green algae dominated community, indicative of eutrophication."

Following the oil-producing period in its history, Grand Lake began to emerge as a recreational center, a trend that gained momentum with it 1949 designation as a state park and continues at a rapid pace today. Sport fishing was among the earliest and most popular recreational activities. Clark documents in great detail the composition of the fish population taken by test netting in each of fifteen years between 1932-1955. A total f 19 species were taken, with the major 15 species being black crappie, white crappie, channel catfish, shad, carp, quill back, bullhead, bluegill, largemouth bass, white sucker, pumpkinseed sunfish, yellow perch, goldfish, golden shiner, and northern pike. In most years, the take of black and white crappies made up – often by far – the largest percentage of total species collected, a circumstance substantiated by creek

surveys from 1946 through 1955, when they composed from 58% to more that 80% of the total catch, which also included channel cat, bullheads, bluegills, carp, and largemouth bass.

The Clark report provides significant detail on the various species found in the Lake such as age, length, weight, growth rates, fluctuations in populations, and other characteristics, as well as information on fish parasites, fish kills, competition among fish populations, and management factors such as stocking, regulations, rough fish removal, and habitat improvement. The focus of the entire study is to recommend how best to manage the Lake and its resources to maximize sport fishing.

The character of the Grand Lake watershed has changed dramatically in the 150-odd years since the work of constructing it as a feeder lake for the Miami-Erie Canal was underway. From the sparsely populated area of deep forests and wet prairie land of those days, the watershed and it environs have been transformed into an agriculturally and industrially productive region accented by lively communities and centered on one of Ohio's most popular water-based recreational areas. As the foregoing paragraphs show, however, the viability and appeal of the Grand Lake area's natural environment are still enriched today by its abundant plant and animal life—life that depends for its continued existence on protecting the area's water resources.

*** Note: It was suggested by reviewers that <u>Cottontail Rabbit</u> and <u>Wild Turkey</u> be added to the list of species found in Auglaize and Mercer counties, as they were absent from the list provided by Rick Jasper.**

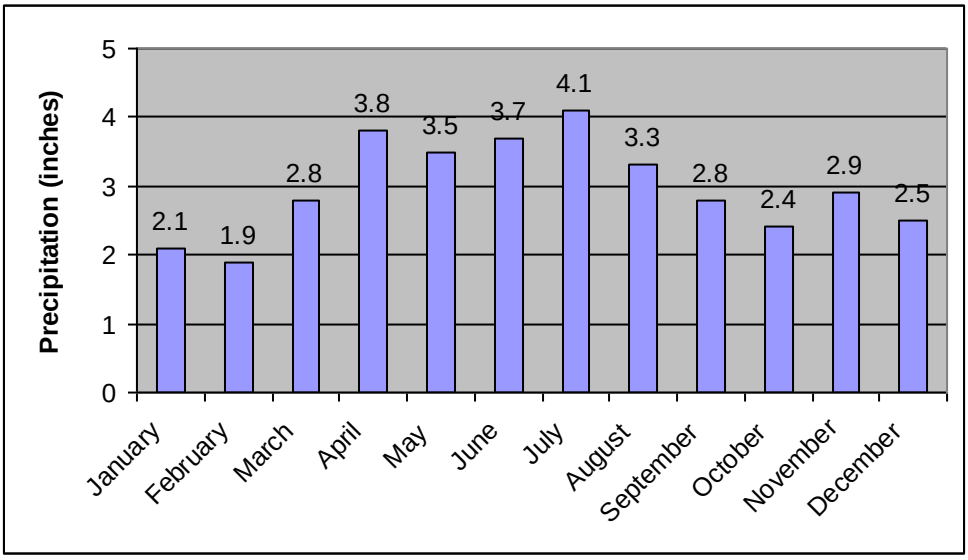
3.5 Water Resources

The following sections will provide general information regarding the water resources of the Mercer, Darke and Auglaize county area. More detailed information such as use designations, drainage areas, riparian corridor status, operations, etc. can be found in the individual subwatershed sections.

3.5.1 Climate and Precipitation

Climate for the Grand Lake/Wabash River watershed is typical for the area. An average of 35.8 inches of precipitation falls per year, with nearly 60% falling between the months of April and September. The average seasonal snowfall is 36 inches, and the average 24-hour temperature for the years 1961 to 1990 is 51.1 °F. Most climate information for counties in Ohio can be obtained via World Climate (www.worldclimate.com). Weather Station Celina 3 NE, Mercer County, Greenville Water Treatment Plant, Darke County and St Marys 3 W, Auglaize County can be obtained. The chart below indicates the average monthly precipitation levels for the years 1956 – 1995 utilizing data collected from the Mercer County weather station.

Figure 4: Average monthly precipitation 1956 – 1995



3.5.2 Surface Water

3.5.2.1 Wetlands

The map on the following page shows areas considered to be suitable for wetlands based on presence of hydric soils. Both forested and non-forested wetlands account for approximately 1,436 acres or 2.24 square miles of the entire watershed. This constitutes a total of 0.7% of the watershed. Local interest groups within Auglaize, Darke and Mercer counties are continuously putting forth efforts to protect, restore, and/or create wetlands. To name a few, they include local chapters of Pheasants Forever, Ducks Unlimited, and numerous Sportsman's Associations. Ohio EPA Section 319 Grant Funds have also been expended to help restore and create wetlands associated with wildlife attraction, wetland ecosystem awareness and education, and water treatment.

The data for this map was gathered from several sources, primarily from the Ohio Department of Natural Resources – Geographic Information Management Systems website, located at www.dnr.state.oh.us/gims. This site also provides valuable information, in downloadable format, regarding oil and gas well locations, floodplains, land cover and watersheds for each county in Ohio.

MAP 14
Wetland Locations


N
W
E
S


Legend
Open Water
Grand Lake/Wabash Watershed
Wetlands
Upland Areas
Woods-Hydric
Open Water
Shallow Marsh
Shrub Wetland
Wet Meadow
Farmed Wetland

3.5.2.2 Streams

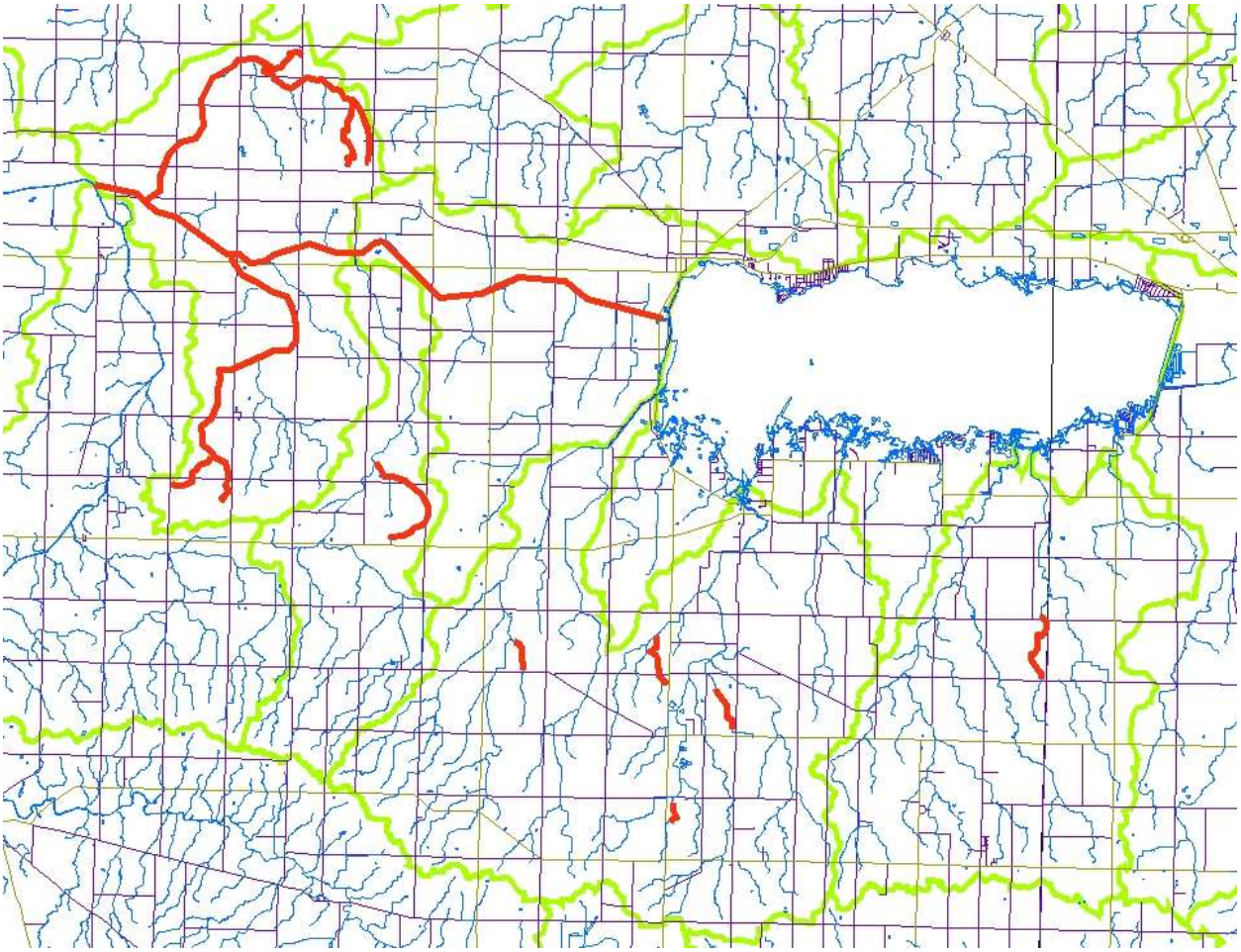
Grand Lake St. Marys is primarily fed by eight named streams. These streams are 1) Coldwater Creek; 2) Beaver Creek; 3) Chickasaw Creek; 4) Barnes Creek; 5) Little Chickasaw Creek; 6) Prairie Creek; 7) Grassy Creek; and 8) Monroe Creek. There is also a small amount of overland drainage from the northern area of the lake. The Wabash River is fed by these primary tributary streams: 1) Bear Creek; 2) Beaver Creek; 3) Crab Branch; 4) Fort Creek; 5) Little Beaver Creek; 6) Scherman Ditch; 7) Stony Creek; 8) Threemile Creek; 9) Toti Creek; 10) Twomile Creek; and 11) Ward Ditch. Each of these creeks/areas corresponds with the subwatersheds of the Grand Lake/Wabash Watershed and will be discussed in greater detail in their respective sections of this action plan.

Many of these creeks fit the category of channelized agricultural drainage. These drainage areas have been created to handle water from tile and ditch projects. The projects have been developed to produce land which will be profitable for the farmer. The projects have been designed to move water from the fields quickly to allow the fields to dry and crops to flourish. This practice is important for the farmers to make a profit.

A second important practice for farming is pest control. Many of the agricultural ditches and streams have some form of weed control. This may be done by spraying or by mowing. This practice is important for the farmer to have a successful crop. Over 90 percent of the combined watershed is agricultural land predominately maintained by farmers.

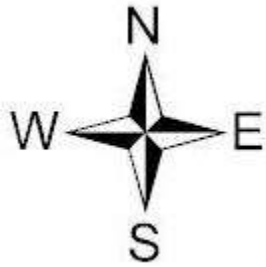
A small percentage of the ditch projects in the watershed are a part of Mercer County Ditch Maintenance. According to the Mercer County Engineer's Office, the ditches have typically been sprayed annually. This practice was not done in 2007 and will not be continued in the future due to the cost. If necessary, the ditches will be dipped out, however, this has not been done on a regular basis. The ditches will be dipped only if they fill with sediment in the future. If ditch maintenance continues on this track, the banks will begin to grow woody vegetation which will provide cover to cool the water. This vegetation will also provide bank stability. The location of ditches on county maintenance can be seen on the following page.

MAP 15
Ditch Maintenance Locations



Legend

Ditch Maintenance
Grand Lake/Wabash Watershed



Auglaize County maintains only one side ditch in the watershed at this time. This ditch was constructed through the ditch petition program and is located in St. Marys Township. The 2007 inventory of Auglaize County Ditches can be found in Appendix I. Ditches in or adjacent to the watershed are highlighted in green, the only ditch on county maintenance is mentioned above.

Darke County does not do any ditch maintenance in the watershed. Any maintenance done in Darke County is completed by the Wabash River Conservancy District. This group works on problems along the Wabash River Main Stem as they see fit. The Conservancy works to prevent erosion of banks and promote functioning waterways. They also maintain several dry dams and water control structures. Pictures of these sites can be seen in Appendix J.

Stream channel, floodplain connectivity, and riparian corridor status have been investigated and mapped so as to guide efforts in restoration and protection of the streams and creeks draining to Grand Lake St. Marys and the Wabash River. The riparian corridor maps of each subwatershed in section 4.0 indicate areas of stream segments where there are less than 10 feet, 10 to 40 feet and more than 40 feet of vegetation on the streambanks.

An info-graphic was produced by Ohio EPA to depict results from the 1999 sampling season. This can be found in Appendix E. Items such as lake condition, stream health, chemical water quality and biological integrity are described or graphed within this document.

The topic of redirecting agriculture ditches is not well received in the Grand Lake/Wabash River watersheds. The land is predominately agriculture and farming along curves or using farm land for riparian areas or two stage ditches is not considered economical by landowners. There is, however, one particular township that has started to purchase and preserve farmland.

Franklin Township in Mercer County has returned a tiled farm field to a wetland area and is working on several other property purchases and restoration projects. They are working with Pheasants Forever, GLWWA, Mercer County Soil and Water Conservation District and local businesses on their projects. They are also forming a greenspace management group and have partnered with the GLWWA on a Litter grant. One of their projects includes a piece of property that contains a channelized agricultural ditch, which has the potential for stream restoration. The Franklin Township Trustees agree this would be a good project, and if funding can be procured, this property will be a demonstration site for the ideal stream restoration and wetland habitat project. The site will have public access and is adjacent to properties where the public can view channelized agriculture ditches and manmade lake channels to compare to the restored stream.

As this project progresses there will be times for the public to see the water quality and habitat improvement of stream restoration. These events may be combined with a county wide tour or field day to observe best management practices.

3.5.2.3 Drinking Water Source Assessment

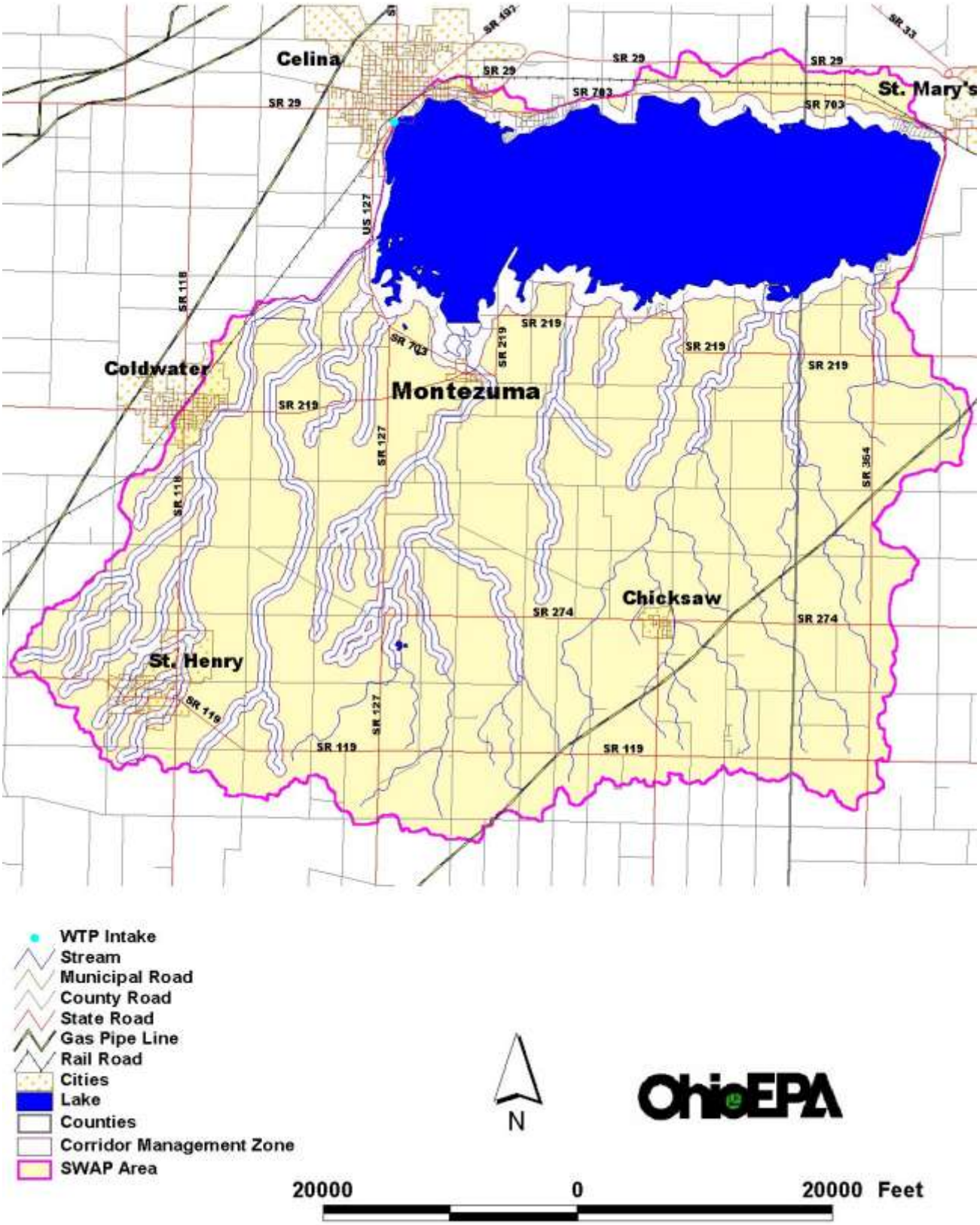
The Drinking Water Source Assessment for the City of Celina was drafted in July of 2003 by Dana Martin-Hayden and Janet Hageman, Ohio EPA Division of Surface water and Amy Klei, Ohio EPA, Division of Drinking and Ground Waters, Central Office. According to this report, "Several pesticides (alachlor, atrazine, metolochlor, simazine, and cyanazine) and nitrates have been detected in the finished water indicating an impact from land use activities within the Grand Lake watershed". It also mentions that the City of Celina is having difficulties complying with maximum contaminant levels of Total Trihalomethanes (TTHMs) which is a byproduct of chlorine disinfection. This by-product of water treatment (TTHMs) is of a carcinogenic nature (cancer causing). This difficulty has been attributed to the high levels of total organic carbon present in the lake.

The City of Celina's drinking water source has been shown to be susceptible to pollution from sources such as "agricultural runoff, industrial and commercial sources, home construction runoff, oil and gas production activities, unsewered areas, waste water treatment plant discharges, combined sewer overflows, airports and landfills". Further protection may be accomplished by Education and outreach, coordination with existing activities, zoning ordinances, water quality monitoring and emergency response planning.

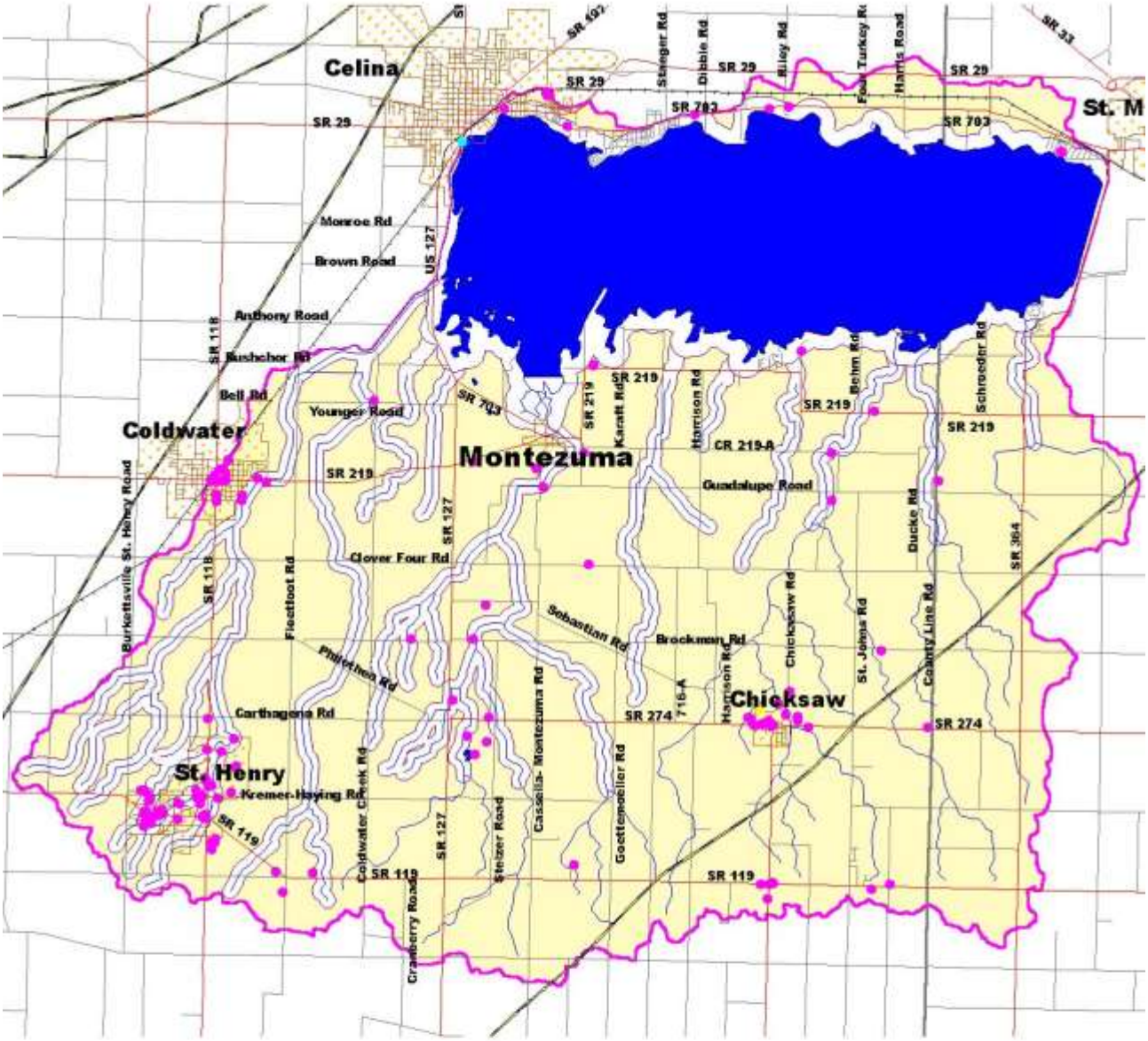
According to the assessment, "Source water protection efforts for the City of Celina should focus on controlling agricultural runoff and runoff from cattle grazing pastures; with particular attention to sources of pesticides, nitrates, phosphorus, and microorganisms such as fecal coliform bacteria".

The entire document can be obtained from the Grand Lake/Wabash Watershed Alliance or the Mercer Soil and Water Conservation District office. In the legend portion of all maps, the abbreviation WTP indicates the Water Treatment Plant intake pipe and the Corridor Management Zone is defined as: "an area along streams and tributaries within the source water assessment area that warrants delineation, inventory, and management. Typically, this zone runs a total of ten miles upstream from the intake, and includes the tributaries that drain into it. The zone is 1,000 feet wide on each side of the Grand Lake mainstem and 500 feet wide on each side of any tributaries."The City of Celina is continuing to make improvements on its water treatment system. In 2008, they installed an activated granulated carbon system. This has lowered their TTHM level to a point of attainment. They have continued to look for innovative ways to improve their drinking water source. One of these ideas include having a dredge line pumping over 3 miles to dewatering lagoons and eventually building islands across the lake with dredge material. They are looking for federal funding for this project.

MAP 16
City of Celina Drinking Water Source Protection (SWAP) Area
and Corridor Management Zone


Celina
St. Mary's
Coldwater
Montezuma
Chicksaw
St. Henry
SR 29
SR 703
SR 219
SR 274
SR 119
SR 118
US 127
SR 127
SR 354
SR 33
WTP Intake
Stream
Municipal Road
County Road
State Road
Gas Pipe Line
Rail Road
Cities
Lake
Counties
Corridor Management Zone
SWAP Area
N
OhioEPA
20000
0
20000 Feet

MAP 17
Potential Contaminant Sources in the City of Celina Corridor Management Zone (Full View)



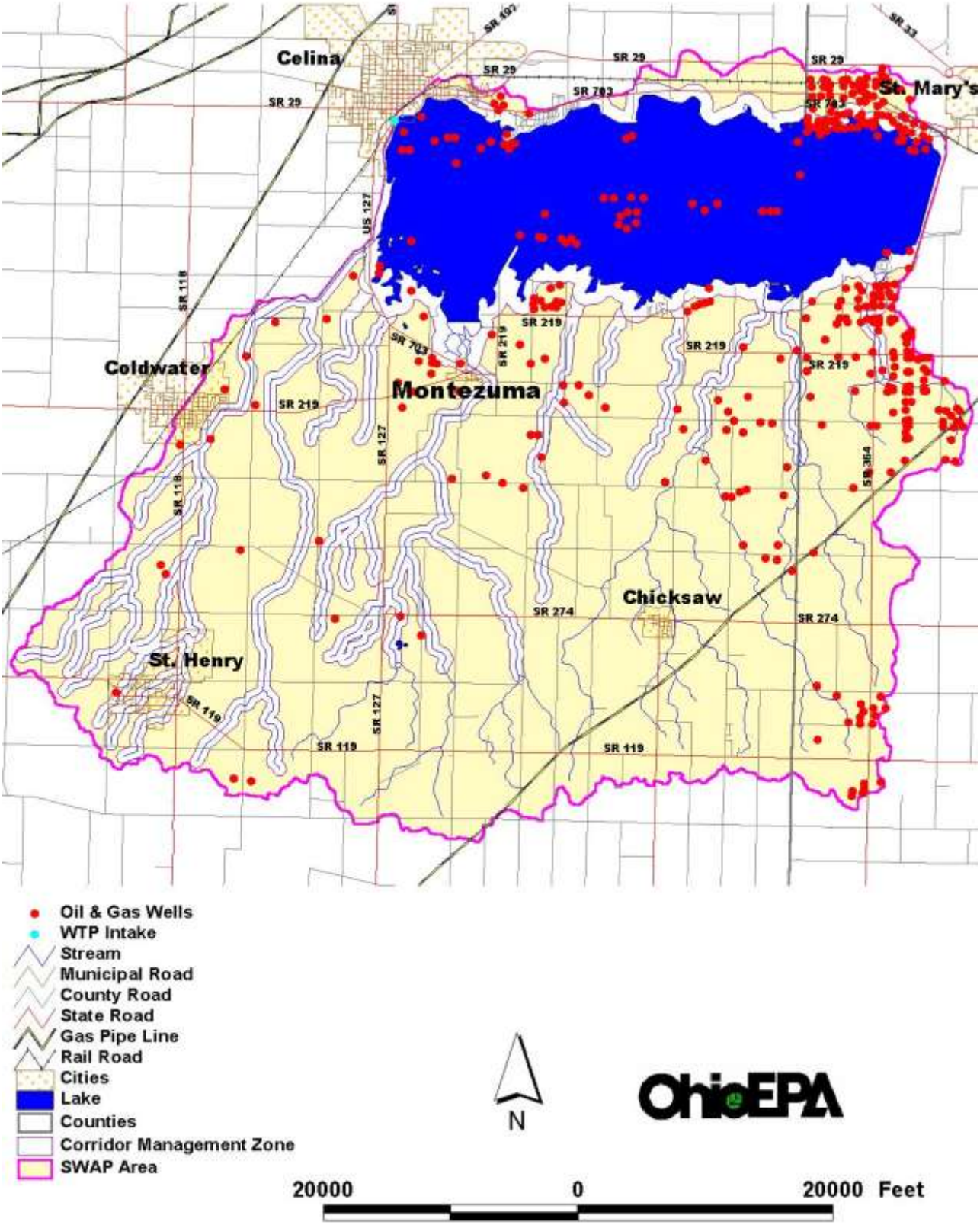
- Potential Contaminant Source
- WTP Intake
- Stream
- Municipal Road
- County Road
- State Road
- Gas Pipe Line
- Rail Road
- Lake
- Counties
- Corridor Management Zone
- SWAP Area

N

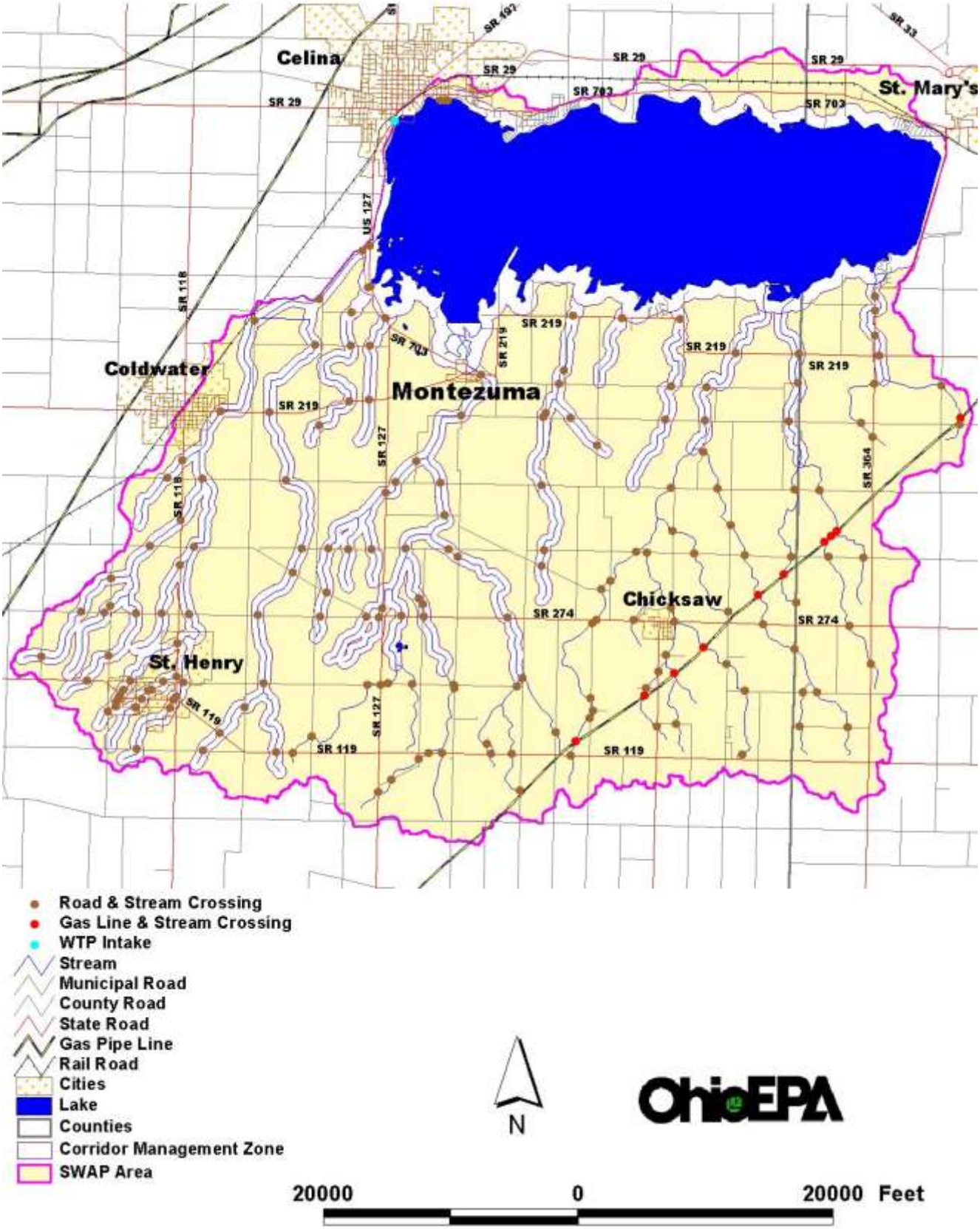
OhioEPA

20000 0 20000 Feet

MAP 18
Oil and Gas Wells in the City of Celina Drinking Water Source Protection (SWAP) Area


Celina
St. Mary's
Coldwater
Montezuma
Chicksaw
St. Henry
SR 29
SR 703
SR 219
SR 274
SR 119
SR 127
US 127
SR 118
SR 354
SR 33
SR 492
Oil & Gas Wells
WTP Intake
Stream
Municipal Road
County Road
State Road
Gas Pipe Line
Rail Road
Cities
Lake
Counties
Corridor Management Zone
SWAP Area
N
OhioEPA
20000
0
20000 Feet

MAP 19
Road and Gas Line Stream Crossings


Celina
St. Mary's
Coldwater
Montezuma
Chicksaw
St. Henry
SR 29
SR 703
SR 219
SR 118
US 127
SR 127
SR 274
SR 119
SR 364
SR 33
SR 492
Road & Stream Crossing
Gas Line & Stream Crossing
WTP Intake
Stream
Municipal Road
County Road
State Road
Gas Pipe Line
Rail Road
Cities
Lake
Counties
Corridor Management Zone
SWAP Area
N
OhioEPA
20000
0
20000 Feet

3.5.3 Groundwater

3.5.3.1 Aquifers

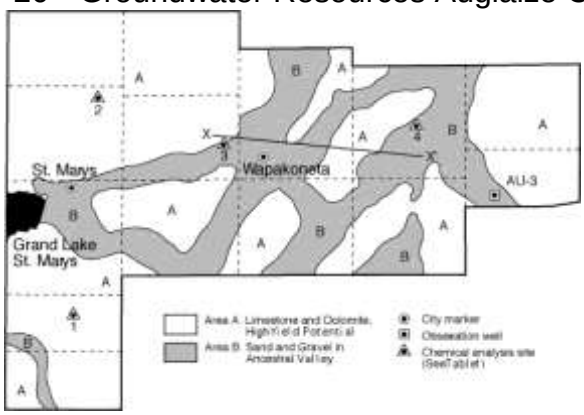
An aquifer is best described as an underground reservoir that is capable of providing enough water to support a well, also having the ability to transmit, store, and receive water. Auglaize, Darke and Mercer Counties are atop several layers of dolomite and limestone creating a vast carbonate aquifer. These formations can be as old as 450 million years and are covered by a glacial till layer which may date back 20,000 years.

All three counties have an extensive reach of the ancestral Teays Valley, a pre-glaciation drainage pattern cut into the underlying limestone. Screened wells in these areas can produce a sufficient domestic water supply of 10-25 gallons per minute (gpm).

Yields in the limestone and dolomite areas can produce water supplies well over 400 gpm at depths ranging below 300 ft. At depths of 150 ft and above adequate supplies for farm and domestic use can be obtained.

The Ohio Department of Natural Resources, Division of Water monitors one well in each county. The figures below depict the locations and specific information for each of those wells.

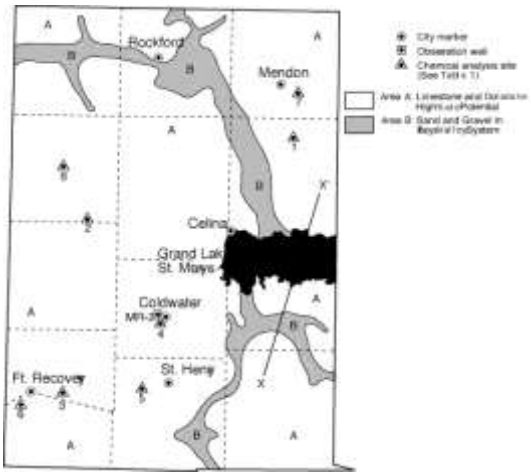
MAP 20 Groundwater Resources Auglaize County, Ohio



- Observation Well AU-3
- Constructed in limestone/dolomite
- Depth = 380 ft
- Depth to bedrock = 52
- Lowest recorded level: 11.9 ft below surface in February 1977
- Highest recorded level: 4.3 ft below surface in April 1991

(modified from J.J.Schmidt, ODNR Division of Water, by R.A. Roberts).

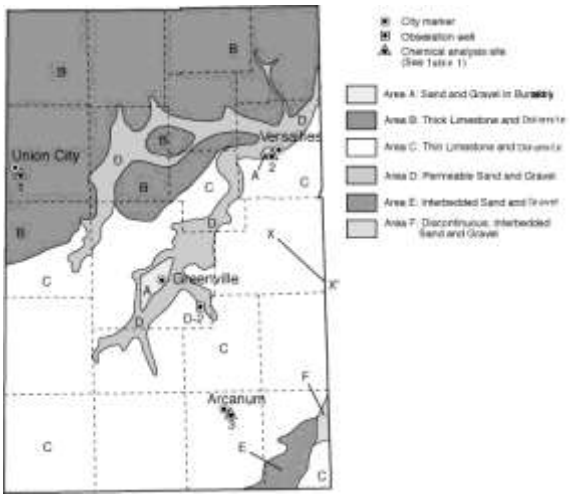
MAP 21 Groundwater Resources Mercer County, Ohio



- Observation Well MR-2
- Constructed in limestone/dolomite
- Depth = 253 ft
- Depth to limestone = 37 ft
- Lowest recorded level: 81.6 ft below surface in September 1988
- Highest recorded level: 60.1 ft below surface in February 1967

(modified from K.S. Crowell, ODNR Division of Water, by R.A. Roberts

MAP 22 Groundwater Resources Darke County, Ohio



- Observation well D-2
- Constructed in sand and gravel
- Depth = 70 ft
- Depth to limestone = 110 ft
- Lowest recorded level: 20.9 ft below surface in April 1992
- Highest recorded level: 16.7 ft below surface in March 1991

(modified from J.M Raab, ODNR Division of Water, by J. Humphreys).

3.5.3.2 Groundwater pollution potential

In recent times, it has become more and more apparent that the local water resources are in great need of both management, such as withdrawal limits, and well placement, but also protection from pollutants and contamination. For this reason, the Ohio Department of Natural Resources, Division of Water, was given the task of creating an evaluation/ranking system to determine the potential for pollutants to reach the groundwater in each of the counties in Ohio. Following this, color coded maps were created, also showing the potential for groundwater pollution. The intent for these maps and evaluation systems is that they be used by local planners or managers to better site locations of businesses, homes, or other operations so as to reduce the potential of contamination.

The Grand Lake/Wabash River watershed consists of three ranges in similar proportions. The south shoreline of Grand Lake St Marys can be categorized in the "moderately high" (140-159 range); the north shoreline of Grand Lake St Marys, the area encompassing Montezuma, Carthagena, and Chickasaw and southeastern Mercer County and northeastern Darke County lie in the region evaluated as "moderate" (120-139); and the southwestern section of the watershed lie in the "moderately low" (100-119) range. The full Groundwater Pollution Potential maps for Auglaize, Darke and Mercer counties can be obtained by contacting the Mercer Soil and Water Conservation District.

3.5.4 Public Wastewater Treatment Systems

There are 12 Ohio EPA permitted wastewater treatment plants (WWTP), within the boundaries of the Grand Lake/Wabash River watershed. They include the following: (1) the Celina WWTP, discharging to Beaver Creek; (2) the Chapel Hill Subdivision WWTP, discharging to Chickasaw Creek; (3) the Village of Chickasaw WWTP, discharging to Chickasaw Creek; (4) the Coldwater WWTP, discharging to Hardin Creek; (5) the Fort Recovery WWTP, discharging to the Wabash River; (6) the Marion Local Schools WWTP, discharging to Chickasaw Creek; (7) the Mercer Co. Comm. Wagner WWTP, discharging to Hardin Creek; (8) the Mercer Co. Home WWTP, discharging to Beaver Creek; (9) the Montezuma Club Island WWTP, discharging to Beaver Creek; (10) the Northwood WWTP, discharging to an unnamed tributary of Grand Lake; (11) the Philothea SD WWTP, discharging to Little Beaver Creek; and (12) the St. Henry WWTP, discharging to Coldwater Creek. Intermittent discharges occur from these facilities which utilize a system of facultative lagoons for treatment of the wastewaters.

3.5.4.1 NPDES Permit Discharges

There are 12 additional individual NPDES permits on file with Ohio EPA, according to their April 2005 list. Seven of those 12 are industrial discharge permits, three are indirect discharge permits and one is a public discharge. The industrial discharges include: (1) BP Amoco Oil Corp Bulk; (2) CW Services Bulk Plant; (3) Celina Landfill, Inc.; (4) Chickasaw WTP; (5) Fort Recovery Industries, Inc.; (6) Pax Machine Works, Inc.; and (7) Stoneco, Inc. Karch Quarry. The three indirect discharge permits include: (1) Celina Aluminum Precision Technology, Inc.; (2) Cooper Farms Processing; and (3) Qualitec Metal Finishers. The public discharge is the Elks Club #2170 South. In addition, there are approximately 37 general NPDES permits issued within the Grand Lake/Wabash Watershed on file with Ohio EPA, dated January 2007.

3.5.4.2 Home Sewage Treatment Systems

The significant portion of the population of the Grand Lake/Wabash River watershed relies on a home sewage treatment system (HSTS) for wastewater elimination and treatment. According to the 2000 census data, there are 14,756 housing units in Mercer County, of which approximately 9,884 are served by centralized sewer systems. This leaves an approximate number of 4,872 home sewage treatment systems to be dealt with accordingly.

The predominate form of HSTS in the watershed is a subsurface sand filter system. This system employs a septic tank, in which solids settle out of the effluent, a distribution box directing the liquid into perforated tiles, and a sand “bed” approximately two feet deep. The sand bed is used to allow treatment above the soil, since soils with slow permeability and seasonal saturation in the subsoil dominate the watershed. Beneficial micro-organisms, which further breakdown the wastewater, build up a layer known as a biomat. The sand in the bed clarifies the water as the water passes through, and at the end of the process, the bacteria and suspended solids have been greatly reduced.

The second highest grouping falls in the “pre-regulation” time period. These homes were built long before installation permits and inspections were required. When considering soil types of the watershed and the life-span of the treatment systems, logic can suggest that many of these systems are failing to treat the wastewater effectively. In recent time, however, a significant number of these systems have been upgraded to a more capable treatment system.

The Ohio Department of Health issued new septic system regulations which took effect on January 1, 2007. Under these new rules, all new homes or proposed residential developments will require the following items: (1) a detailed soil profile description; (2) a topographic map with one-foot contour lines; (3) a detailed sewage system design plan; and (4) septic system installers must take a State competency test and acquire continuing education credits. Off-lot discharging sewage systems will be highly restricted, as new lots must be capable of supporting on-lot soil absorption systems. Two feet of separation between the seasonal perched water table and the sewage infiltrative surface will be required. Existing septic systems that are operational will not be required to upgrade their septic systems to the new design requirements; however failing systems will be required to upgrade.

The potential pollution effects of home sewage treatment systems grow as the number of systems in a given area increases, especially in areas that have clusters or groups of 10 or more systems. In the past few years there have been numerous cluster areas that have had centralized sewer systems installed. These areas include: (1) the Village of Chickasaw; (2) Philothea; (3) Burkettsville; and (4) New Weston. The Mercer County Commissioners/Sanitary Department are also in the planning stages of installing five centralized sewer systems in five areas throughout the watershed. These areas include: (1) Maria Stein/St. Johns; (2) East Jefferson Township; (3) Menchhofer Woods and Fleetfoot Road; (4) Wagner subdivision; and (5) South of St. Henry near Burkettsville-St. Henry Road and Lange Road.

The following table depicts the Ohio EPA Division of Surface Water: Regulated Point Sources, and permit numbers, found in the Grand Lake/Wabash River watershed.

Table 8

Ohio EPA Division of Surface Water: Regulated Point Sources		
Facility Name	Ohio EPA Permit Number	Discharges to
BP Amoco Oil Corp	2IN00180	Wabash River
Celina Aluminum Precision	2DP00007	Grand Lake St. Marys
Celina Landfill, Inc.	2IN00125	Beaver Creek
Celina Municipal WTP	2IW00030	Beaver Creek
Celina WWTP	2PD00033	Beaver Creek
Chapel Hill WWTP	2PG00103	Chickasaw Creek
Chickasaw WTP	2IY00013	Chickasaw Creek
Chickasaw WWTP	2PA00088	Chickasaw Creek
Coldwater WWTP	2PB00013	Hardin Creek
Cooper Farms Processing	2DP00010	Coldwater Creek
CW Services Bulk Plant	2IN00210	Hardin Creek
Elks Club No. 2170 S	2PR00184	Beaver Creek
Ft. Recovery Industries, Inc.	2IC00001	Wabash River
Ft. Recovery WWTP	2PA00030	Wabash River
Marion Local School District	2PT00022	Chickasaw Creek
Mercer Co. Home WWTP	2PG00104	Beaver Creek
Mercer Co. Comm. Wagner WWTP	2PR00101	Hardin Creek
Montezuma Club Island WWTP	2PH00015	Beaver Creek
Northwood WWTP	2PG00106	Unnamed Trib of GLSM
Pax Machine Works, Inc.	2IS00070	Hardin Creek
Philothea SD WWTP	2PG00113	Little Beaver Creek
Qualitec Metal Finishers	2DP00041	Grand Lake St. Marys
St. Henry WWTP	2PB00027	Coldwater Creek
Stoneco, Inc. Karch Quarry	2IJ00017	Little Beaver Creek

3.6 Land Use

As shown by the table below, the three predominant land uses for the Grand Lake/Wabash watershed are 1) cropland; 2) Grand Lake itself; and 3) deciduous forest. The table sorts the data in several capacities such as number of acres per land use, square miles per land use, percent of the total watershed area (including the lake). These numbers are beneficial in determining potential sources of pollutants in the watershed. They are also valuable at targeting education and implementation of various BMPs. This table was based on information provided by ODNR Division of Information Technology, Geographic Information Management Systems data developed in 1994.

3.6.1 Impervious Surfaces

By inferring from the table and the more descriptive listing on the previous page, it can be estimated that nearly the entire watershed has a pervious land cover or land use. The total acreage for cropland, deciduous forest, wetlands, pasture, shrub, brush, orchards and ponds totals nearly 180,235 acres of seemingly pervious surfaces out of a total watershed area of 193,482 acres, including the lake. This equates to 93% pervious surfaces in the Grand Lake/Wabash River watershed.

Table 9

Land Use/Land Cover for Grand Lake/Wabash Watershed

Land Use/Land Cover	Acres	Square Miles	% of Total Watershed
Cropland	155,294	242.65	80.3%
Residential	4,750	7.42	2.5%
Deciduous Forest	9,263	14.47	4.8%
Farmsteads/Confined Feeding Operations	5,114	7.99	2.6%
Other Urban (ind., comm., educ., rel, etc.)	3,262	5.10	1.7%
Brush/Shrub	852	1.33	0.4%
Undeveloped	123	0.19	0.1%
Wetlands (forested & non-forested)	1,436	2.24	0.7%
Grand Lake St. Marys	12,970	20.27	6.7%
Other Water (ponds, rivers, etc.)	420	0.66	0.2%
TOTAL	**193,482**	**302.32**	**100.0%**

ODNR, Raymond M. Lohrer, Mercer County Land Use/Land Cover. 1994 www.dnr.ohio.gov/gims
ODNR, Raymond M. Lohrer, Auglaize County Land Cover. 1994 www.dnr.ohio.gov/gims
ODNR, Raymond M. Lohrer, Darke County Land Cover. 1994 www.dnr.ohio.gov/gims

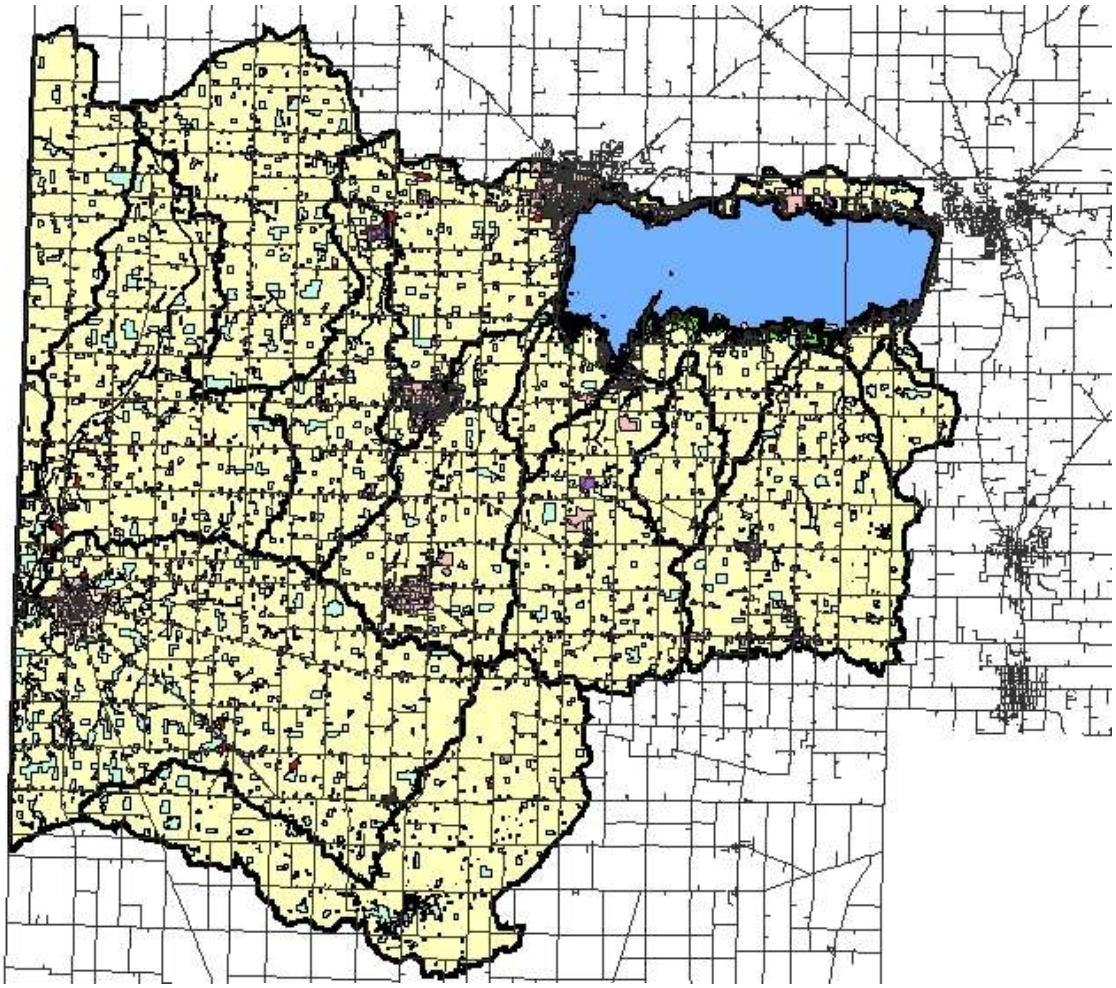
3.6.2 Phase 2 Stormwater Communities

The City of Celina is the only Phase 2 Stormwater Community within the Grand Lake/Wabash watershed. The small municipal separate storm sewer system (MS4) is required to maintain a National Pollutant Discharge Elimination System (NPDES) permit from Ohio EPA. The purpose of the MS4 program is to reduce the amount of pollutants entering storm sewers. The NPDES permit must include best management practices and measurable goals for the MS4. There are also additional restrictions on construction activities including a disturbance area of greater than one (1) acre. All such activities are required to obtain a NPDES permit before any disturbance activities take place. These permits and regulations are important to the Grand Lake/Wabash watershed as sedimentation has been listed as the greatest source of pollution to the lake. An important note to make is that as the soil is eroded and sediment enters the streams and waterways, a form of phosphorus, orthophosphate, is adsorbed to the clay particles in the sediment. It is this orthophosphate that remain available to plants and animals, leading to increased algal growth and eutrophication of the lake (Healthy Water, Healthy People Testing Kit Manual. The Watercourse. Montana State University. Pg 37. 2002.).

A listing of recommendations for the reduction of sedimentation of Grand Lake St. Marys, the Wabash River and their tributary streams can be found in the section titled Watershed Impairments starting on page 274. Please be aware that this is by no means a complete listing and that documents from the Ohio Environmental Protection Agency, and the Auglaize, Darke and Mercer County Engineer's offices should be consulted to obtain site and area specific recommendations for sediment and erosion control.

More information on the stormwater and construction permit requirements can be obtained by visiting www.epa.gov/npdes/stormwater .

MAP 23
Land Use



Legend

Grand Lake/Wabash Watershed

Roadways

Land Use

Cropland

Urban

Farmsteads

Shrub_Brush

Deciduous Forest

Open Water

Wetlands

Barren/Undeveloped

N

W E

S

3.6.3 Agriculture

According to the 2005 Ohio Department of Agriculture/USDA National Agricultural Statistics Service Annual Report, the agricultural sector of Mercer and Darke Counties ranks in the top 10 of 88 counties for nearly all major areas of both grain and livestock production. Auglaize county producers also place in the top 20 of 88 counties for the same considerations. While the watershed does not wholly include both counties, the watershed portion of each county is representative of the remainder of that county's profile.

Table 10

General Farm Structure			
	Auglaize	Darke	Mercer
Number of Farms	1,000	1,740	1,250
Average Farm Size	211 ac	191 ac	211 ac
Total Land in Farms	211,000 ac	333,000 ac	264,000 ac
Commercial Grain Storage	4,751,000 bu	7,857,000 bu	4,425,000 bu

The table below shows each county's rankings in major commodity production and sales for the year 2005.

Table 11

2005 Commodity Production Rankings			
Livestock	Auglaize	Darke	Mercer
All Cattle and Calves	21	5	2
Milk Cows	11	7	2
All Hogs and Pigs	6	2	1
All Sheep and Lambs	25	12	22
Crops			
Corn for Grain	17	1	5
Soybeans	18	1	14
Wheat	9	13	7
Oats	--	--	3
All Hay	39	33	14
Proc. Tomatoes	--	5	--

3.6.4 Water

Water is a major land cover in the Grand Lake/Wabash watershed, as nearly seven percent of the entire watershed consists of Grand Lake St. Marys. A total of 12,970 acres is the lake proper, seven percent of the watershed, while an additional 420 acres, 0.2% of the watershed, are in the category of ponds or wide streams. The watershed also has many intermittent streams and narrow tributaries that add to the total.

3.6.5 Wetlands

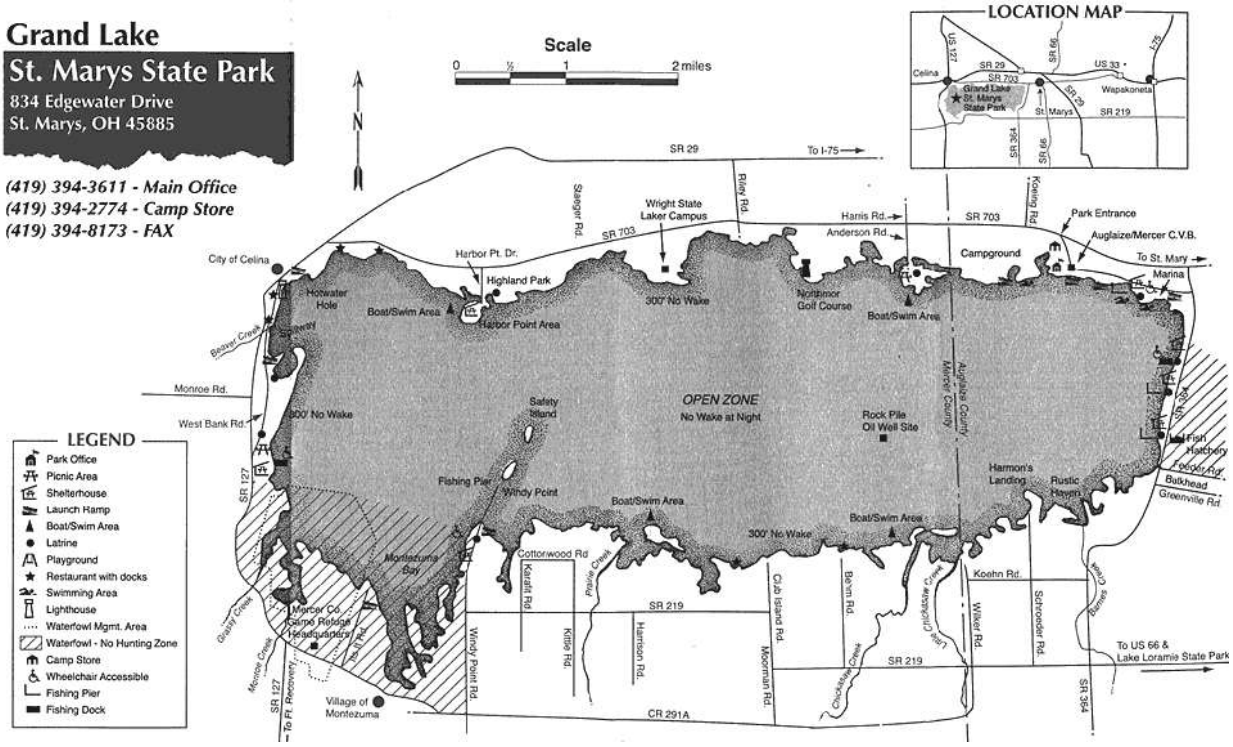
Both forested and non-forested wetlands account for 1,436 acres or 2.24 square miles in the watershed. This constitutes a total of 0.7% of the watershed, not including the acreage occupied by Grand Lake St. Marys. Many local interest groups within Mercer, Darke Auglaize counties are continuously putting efforts into protecting, restoring, and/or creating wetlands. To name a few, they include Pheasants Forever, Ducks Unlimited, Sportsman's Associations, the Lake Improvement Association and the Franklin Township Green Space Committee. Ohio EPA Section 319 Grant Funds have also been expended to help restore and create wetlands associated with wildlife attraction, wetland ecosystem awareness and education, and water treatment. This is an important task as more and more residential development is constructed altering flow to the wetlands, or destroying them with erosion of sediments and construction debris.

3.6.6 Protected Lands

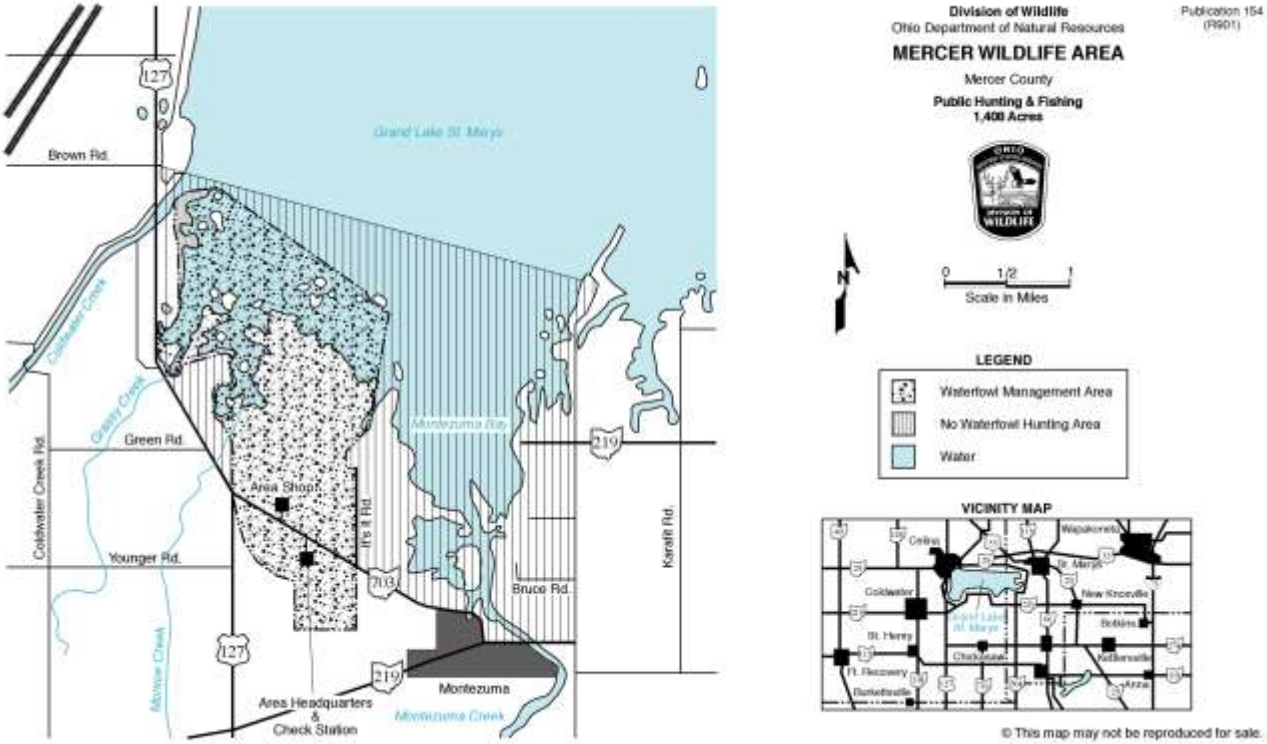
Grand Lake St. Marys State Park

The map found below shows the areas of land surrounding Grand Lake St. Marys that collectively make up the Grand Lake St. Marys State Park. The map is available at the following website:
http://www.dnr.ohio.gov/parks/parkmaps/grandlakestmarys.gif

MAP 24


Grand Lake
St. Marys State Park
834 Edgewater Drive
St. Marys, OH 45885
(419) 394-3611 - Main Office
(419) 394-2774 - Camp Store
(419) 394-8173 - FAX
Scale
0 ½ 1 2 miles
N
LOCATION MAP
Celina
Grand Lake St. Marys State Park
St. Marys
Wapakoneta
US 127
SR 29
SR 703
SR 66
US 33
I-75
SR 219
SR 364
LEGEND
Park Office
Picnic Area
Shelterhouse
Launch Ramp
Boat/Swim Area
Latrine
Playground
Restaurant with docks
Swimming Area
Lighthouse
Waterfowl Mgmt. Area
Waterfowl - No Hunting Zone
Camp Store
Wheelchair Accessible
Fishing Pier
Fishing Dock
SR 29
To I-75
Salesger Rd.
Wright State Laker Campus
Riley Rd.
Harris Rd.
Anderson Rd.
SR 703
Koenig Rd.
Park Entrance
Auglaize/Mercer C.V.B.
To St. Mary
Marina
City of Celina
Harbor Pt. Dr.
Highland Park
Hotwater Hole
Boat/Swim Area
Harbor Point Area
300' No Wake
Northmor Golf Course
Boat/Swim Area
Campground
Beaver Creek
Monroe Rd.
West Bank Rd.
300' No Wake
Safety Island
OPEN ZONE
No Wake at Night
Rock Pile Oil Well Site
Auglaize County
Mercer County
Fish Hatchery
Fergey Rd.
Bulkhead
Greenville Rd.
Harmon's Landing
Rustic Haven
Fishing Pier
Windy Point
Boat/Swim Area
300' No Wake
Boat/Swim Area
Montezuma Bay
Cottonwood Rd
Karafit Rd
Prairie Creek
Kittle Rd.
Harrison Rd.
Club Island Rd.
Moorman Rd.
Baum Rd.
Chickasaw Creek
Koehn Rd.
Wilker Rd.
Schroeder Rd.
Barnes Creek
SR 219
SR 219
To US 66 & Lake Loramie State Park
Grand Creek
Mercer Co. Camp Ridge Headquarters
Monroe Creek
SR 127
To Ft. Recovery
Windy Point Rd.
Village of Montezuma
CR 291A
SR 364

MAP 25



The map of the Mercer Wildlife area can be viewed at the following website: http://www.dnr.ohio.gov/wildlife/pdf/pub154.pdf

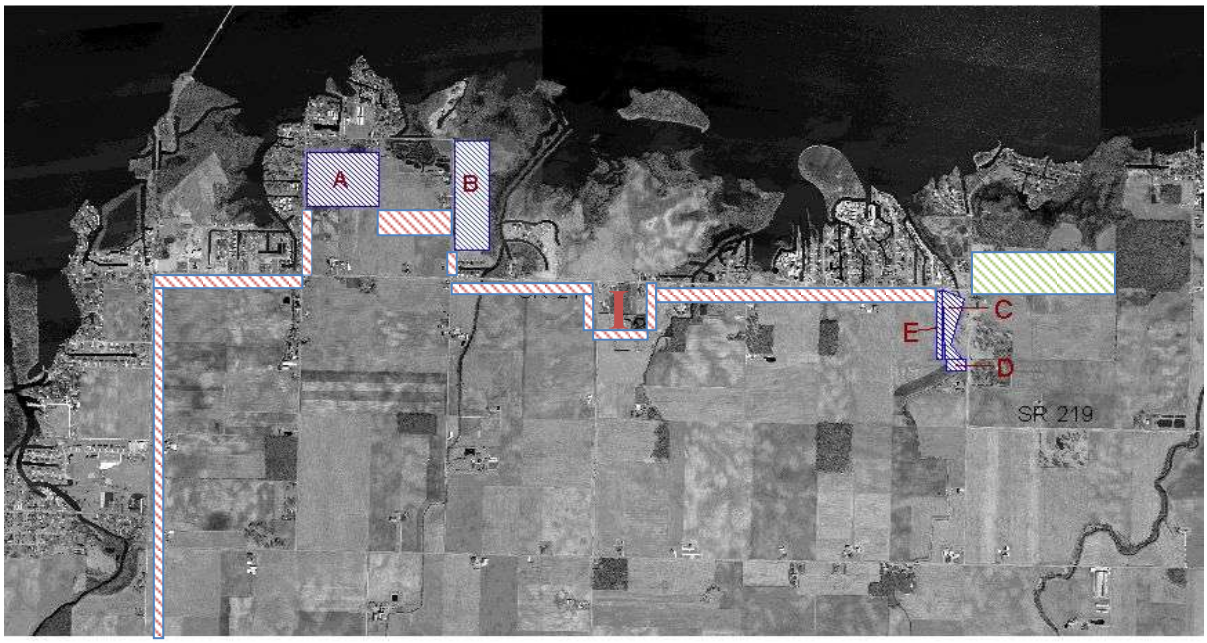
The reverse of the map, publication 154, describes the purpose of the wildlife area:

"The rapid increase in human population and the development of the lake for recreational uses have imposed many restrictions on the wildlife community. The primary purpose of the wildlife area is to act as a refuge, providing resting and feeding areas for local and migrant wildlife. The waterfowl management area provides the largest and one of the few remaining areas around the lake that is free from human disturbance.

The Canada goose management program began in 1956. Nesting and migrant goose populations have increased steadily since that time. Wildlife management activities have included development and management of grain crops and meadow, primarily for nesting and migrant waterfowl. Trees and shrubs have been maintained along the lakeshore to prevent erosion. Seven ponds have been constructed on the area to increase nesting sites and area utilization by waterfowl.

Waterfowl production has been enhanced by the use of several hundred wood duck nest boxes and Canada goose nesting structures on the management area and in shallow waters around Lake St. Marys."

MAP 26
Franklin Township Greenspace Areas



The above map shows the properties in Franklin Township that were purchased by the township trustees. These purchases fall into line with the Franklin Township Community and Land Use Plan that was developed in 2000. The full plan can be viewed at the following website:

www.franklintownship-mercercounty.org

A: The Franklin Township Nature Park: 33.77 acres that consists of a paved trail and plastic/wood trail combination, wetlands, wooded and grass areas. Additional wetlands have been constructed, and there are plans for native grasses and additional trees. This includes a trail through the area and a wildlife viewing area overlooking the wetlands.

B: Prairie Creek Nature Park: 37.098 acres. This area was purchased and used an a dredge material relocation area for the state park. It has been reclaimed and functions as wildlife habitat.

C, D & E: The Strasburg Nature Park: 6.393 acres include a paved trail, and consists of a stream with wooded and grass areas. Additional trees were planted in

2004 and long term plans include the development of grass walkways through the property and additional plantings for water quality and wildlife habitat.

F: Franklin Township Recreational Trail (marked in blue and red stripes): This trail connects Montezuma to the Club Island area by a paved trail. This trail winds throughout many different nature areas, totaling almost 10 miles. Expansion is planned to complete the bicycle trail circumferencing Grand Lake St. Marys.

G: Gilliland Property (green striped area): This nature area has grassed paths throughout the 80.182 acres of wildlife habitat. Shrubs have been planted marking the trails and more plantings are planned. An information kiosk is planned for near the parking area of this land.

H: Recreational Trail Montezuma Extension (to the west of the pictured area):This trail is planned to be extended through Montezuma, past Kozy Campground to the ODNR Nature Preserve. Funds are being researched for wetland restoration, stream restoration and reforestation throughout this area.

I: Gaston Property: A portion of this area has already been purchased. On this area a bicycle path was installed complete with a bridge over Prairie Creek. With this construction some reforestation has been completed and more is planned. This property consists of wetlands, wooded and grass areas. Long term plans will include planting of additional trees and native grasses and the preservation of wildlife habitat.

J: Auglaize County Connection: This section of the recreational trail would complete a bicycle trail around Grand Lake St. Marys. This is planned for east of the pictured area. Funds are being researched, along with potential for stream and wetland restoration in this area.

MAP 27
Baker's Woods, Mercer County, Ohio

The highlighted area is a 47.2 tract of forested area owned by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves. Baker Woods has the potential to be a valuable resource for education and protection efforts. Baker Woods State Nature Preserve is not a site open to the public. If you are interested in visiting the site, a permit application will need to be submitted to the Division. Although permits cannot be processed on-line, an application can be downloaded from (http://www.dnr.state.oh.us/dnap/permits/default.htm) and then mailed or faxed to the division. Please allow at least two weeks for processing.

Further information regarding the site comes from ODNR: Division of Natural Areas and Preserves' Directory of Ohio's State Nature Preserves:

"Although small in size, Baker Woods is a high-quality, old growth forest remnant. The 47-acre site was donated to the division in 1982. Large specimens of oaks, hickories and maples dominate the forest canopy. Much of the woods is wet during the growing season. Two state-listed species occur at Baker Woods. Best time to visit is autumn or early spring-- before the mosquitoes emerge. Located in Butler Township in Mercer County. No facilities."

3.7 Cultural, Historical, and Recreational Resources

There are many cultural, historical and recreational resources located within the boundaries of the Grand Lake/Wabash Watershed. A few of those resources are listed below with descriptions provided by the Visitors Guide entitled "Discover Ohio's Other Great Lake & So Much More" produced by the Auglaize and Mercer Counties Convention and Visitors Bureau.

Fort Recovery State Museum and Monument Park: Museum features Anthony Wayne's legion and the two Indian battles fought there. Also shown is a typical 1790's Native American and one of the largest collections of Indian Artifacts in the state of Ohio. On the grounds are two reconstructed blockhouses, a connecting stockade and the Greenville Treaty Line marker. Fort Recovery is the site of two of the most dramatic Indian battles in American history. The first was the devastating defeat of General Arthur St. Clair in 1791 and the second, the successful defense of the fort by General "Mad" Anthony Wayne in 1794. President William Howard Taft signed a bill in 1908 to authorize a monument in honor of the soldiers who died serving under St. Clair and Anthony Wayne. Congress approved the bill in 1910 and work was begun in 1912. A 103-foot monument stands to remember the 900+ soldiers that died there and an oak tree to remember the Native Americans. The base of the monument holds the bones of the fallen soldiers who died in the battles. The nine-foot tall statue depicts a frontiersman facing west to the beautiful unsettled land into which he triumphed. Other attractions are a log home, blacksmith shop, historical walkway, local walk-by museum and a state park.

Maria Stein Heritage Museum: Located on the second floor of the former convent building, this museum interprets the German settlements of southern Auglaize and Mercer Counties and the history of the Sisters of the Precious Blood.

National Marian Shrine of the Holy Relics: The shrine contains approximately 1,000 relics of the saints and is the second largest collection of its type in the United States. Built in 1890, the shrine and the adjacent former convent were placed on the National Register of Historic Places in 1976.

Land of the Cross Tipped Churches: In July of 1979, over sixty buildings representing the German Catholic settlements of southern Auglaize and Mercer Counties, as well as portions of northern Darke and Shelby Counties, were placed on a National Register of Historic Places. Consisting of churches, schools, rectories, and convents, this grouping is symbolic of the cultural and historical uniqueness of the region. Today, most of these structures remain to remind us of the hard work and dedication of these early settlers as they built the Miami-Erie Canal and forged a new life on the area's rich and productive farmland. A drive along this Ohio Scenic Byway through the rural countryside follows the quaint churches with their cross tipped "spires to heaven" and includes stops at the focal points of the region: the former convent at Maria Stein, St Augustine Church – the original Mother Church of the area at Minster and St Charles center, the magnificent and impressive seminary at Carthagena.

St Charles Center: This magnificent former seminary rests on 500 acres. Begun in 1861 by Missionaries of the Precious Blood, the current structure is a late gothic revival building. The awesome facility features a 370-foot frontage and is topped by a five story octagonal dome.

Wright State University Lake Campus: Located on the north shore of Grand Lake St. Marys, the Lake Campus became a branch of Wright State University, Dayton in June of 1969. The Lake Campus provides pre-baccalaureate and technical education at the associate degree level. Bachelor's degrees in Early Childhood Education and organizational Leadership are available. A BSN completion program is offered for registered nurses. A new weekend MBA program is offered for working professionals. Other master level programs provided include Education and Educational Leadership.

Grand Lake St Marys State Park: The lake itself and much of its perimeter was dedicated as an Ohio State Park in 1949. The park currently provided 210 campsites (135 with electric). A "campers only" swimming beach and boat tie-ups are available within the campground. Horseshoe pits, sand volleyball, basketball, a tennis court, bicycle rentals, a 9 hole putt-putt course and a camp store are available within the campground. The park also has two public swimming beaches as well as swimming areas for boaters. Picnic areas with tables and grills are located in scenic areas around the lake. The East Bank/Villanova area has several shelter houses available on a reservation basis. Boat dock rentals are available through the State Park Office. Hunting is permitted in designated areas. There are seasonal duck blinds available by lottery through ODNR. Constructed as a feeder lake for the Miami-Erie Canal, Grand Lake St Mary, at its completion in 1845 was the largest manmade lake in the world. The feeder reservoir was formed by raising two walls of earth, from ten to twenty-five feet high, called the East and West embankments. These walls formed a high basin to retain water. The reservoir rests on the summit between the Ohio River and Lake Erie. Now Ohio's largest inland lake, Grand Lake St Marys is a primary recreational area offering a variety of activities for the whole family. With over 13,500 acres and 52miles of shoreline (much of it accessible to the public), Ohio's Other Great Lake provides many opportunities for picnicking, swimming, fishing, boating and camping.

Boating: Grand Lake St Marys is open zoned for skiing and has unlimited horsepower for power boating. A 300-foot "no wake" zone provides for safety and shoreline protection. There are five state operated launch ramps providing boaters access to the lake. Private launch ramps are also available at marinas along the shallow shoreline. Sailing and jet skiing are very popular on this grand lake and rentals are available at area marinas.

Fishing: Fishing is a year around affair on Grand Lake St. Marys. Since the lake is shallow (average 6-7 feet depth), it warms quickly in the spring activating largemouth bass and large catches of bluegills and crappies. There are professionally run and organized fishing tournaments held every year. The lake is considered one of the finest "pan fishing" areas in the state, with good populations of crappies and yellow perch. The last few years have shown increases in the perch population and anglers report

record catches. Walleye fry and fingerlings have been stocked and a significant population is developing with good sized walleye reported being caught.

State Fish Hatchery: One of only six hatcheries in the state of Ohio, the St. Marys site is the only one that raises yellow perch and largemouth bass. Other species raised at the St. Marys site include channel catfish, fathead minnows, walleye and saugeye.

Golf Courses: Elks Club – 18 holes, driving range; Northmoor Golf – 18 holes, driving range; Fox's Den – 18 holes, driving range.

Marinas: Bayview Sun & Snow Marina; D&W Marina; Kozy Marina; Ohio Marine Inc.; St. Marys East Bank Marina; Windy Point Marina.

Other local areas of interest near to the watershed and also found in the Visitors Guide include The Miami-Erie Canal Towpath, St. Marys Memorial Park, Celina-Coldwater bike Path, Route 703 Bike Path, Auglaize and Mercer Counties Historical Museums; and many others, too numerous to mention. For more information on any of these sites, please visit the Auglaize and Mercer Counties Convention and Visitors Bureau at www.seemore.org .

3.8 Complementary Efforts for Water Quality Protection

3.8.1 Ohio EPA Section 319 Grant

In 2000, the Grand Lake St. Marys Watershed Project was awarded an Ohio EPA Section 319(h) grant from the Environmental Protection Agency. This grant's primary goal is to provide implementation funding for projects to reduce the amount non-point source pollution entering the waterways in Ohio. Thus, the project goal was simply put, "To improve water resource quality in the Grand Lake St. Marys Watershed by reducing nonpoint source pollution." This grant contained several objectives ranging from educational components (brochures, public events, media releases, etc), construction of wetlands, watershed boundary signs, GPS soil sampling and strip tillage incentive payments. The majority of cost share provided to local stakeholders is only a fraction of the total cost or value of the practice. The participants, on average, provide at least half, if not more, than the cost of the practice. This grant ended in mid-2004.

3.8.2 Watershed Coordinator Grant

Relatively soon after being awarded the 319 grant from Ohio EPA, the Grand Lake St. Marys watershed project was awarded with a Watershed Coordinator Grant from ODNR. This grant provides a great portion of the funding necessary to employ a full-time coordinator to oversee the day-to-day operations of a watershed project. The grant funds decrease by 10% per each of the six years, making the position increasingly dependent on local funding each year. The grant funding began in early 2001 and is set to be completed in late 2006. A similar grant was awarded to the Wabash Watershed Alliance in 2002. In early 2005, the Grand Lake St. Marys watershed project joined with the Wabash Watershed Alliance to form the Grand Lake/Wabash Watershed Alliance under one watershed coordinator. The grant funding was completed at the conclusion of 2008.

In 2008 the watershed coordinator applied for a watershed coordinator implementation grant. This grant will fund the watershed coordinator salary for three years starting in 2009. This grant is from the Ohio Department of Natural Resources and the Ohio EPA through 319 grant funds. The local funding is committed by Mercer County, Darke County, Auglaize County, and the City of Celina. The GLWWA plans to continue the watershed coordinator position as long as there is funding available. The watershed coordinator has plans to meet with all government groups in the watersheds in 2009. The goal of these meetings will be to generate interest in funding the watershed coordinator's position when the grant concludes.

3.8.3 State Pollution Abatement Grant

The Ohio Department of Natural Resources, Division of Soil and Water Conservation awarded $26,356.50 to the Grand Lake St. Marys Watershed Project in April of 2000. These funds were awarded to provide cost share opportunities for the practices of Feedlot Runoff Control, to reduce the volume of lot runoff entering animal waste holding

ponds and lagoons, and Sprayer Upgrade, upgrading spray equipment to low drift technology which reduces aerial movement of sprayed materials by providing a more controlled spray pattern.

Some changes were made in the scope of the grant and the funding was opened up to any practice approved by the Division of Soil and Water Conservation for pollution abatement. Funding from this grant was also utilized to for emergency hauling of animal waste during the July, 2003 flooding. This act prevented thousands of gallons of animal waste from entering the waterways and Grand Lake St. Marys. Other practices that were implemented include the construction of animal waste holding ponds, milkhouse waste filter area, and a mortality composting facility. In 2006, a cover crop demonstration program was implemented with remaining funds in the Grand Lake/Wabash Watershed. Approximately 112 acres of cover crops were planted, including, oilseed radish, annual ryegrass, rye, oats and winter wheat.

3.8.4 Chickasaw Creek Watershed and Nutrient Management Program

The Ohio State University Research Foundation was awarded a Clean Water Act, Section 319 Grant to implement an incentive program to establish 50 acres of filter strips along streams, establish tile line water flow control on 30 acres, eliminate direct discharge of millhouse waste water from three dairy milkhouses, establish four on-farm manure composting facilities, and develop a manure brokerage in the Chickasaw Creek subwatershed of the Grand Lake St. Marys watershed.

Grant accomplishments included installing 55.34 acres of grass filter strips; installing tile risers to prohibit liquid manure from entering Chickasaw Creek; and over 8,690 acres of crop land was soil tested for nutrient analysis.

Total Project Cost:	$201,284.85
Federal :	$106,624.85
State:	$ 58,096.00
Local:	$ 36,564.00

The Auglaize County SWCD was involved in a very similar grant regarding objectives. The budget listing for that grant was as follows:

Total Project Cost:	$ 72,773.56
Federal :	$ 36,648,56
State:	$ 29,955.00
Local:	$ 6,170.00

3.8.5 GLSM Filter Strip/Dredge Material Reuse Project

The Auglaize Soil and Water Conservation District and the Ohio Department of Natural Resources partnered to reduce the sediment entering into Grand Lake St. Marys tributaries by 50,000 tons per year; to determine if dredge sediment can enhance crop production; and to determine if cropland application is a viable alternative for dredge

material reuse. Results of this exact project are not available, but several dredge material relocation areas have been returned to cropland.

Project cost was $40,000 of State (ODNR) funds.

3.8.6 Sediment Trap Construction

In the early fall of 2006, the construction of sediment traps began on the tributaries to Grand Lake St. Marys. The sediment traps are designed to slow the water entering the lake to allow sediment to settle from the water in the trap area. To date, five traps have been constructed. Sediment traps are located on Barnes Creek, Chickasaw Creek, Beaver Creek, Riley Bay Creek and an unnamed tributary near Strasburg Park. These traps were constructed by the Grand Lake St. Marys State Park and will be monitored by the state park with assistance from local volunteers.

So far monitoring results have been across the board. Some traps showed they were continuing to fill, while others actually started to empty. The State Park has decided to continue the monitoring for at least one more year before any decisions are made regarding the success of these sediment traps. The monitoring results can be found in Appendix K.

3.8.7 Conservation Innovation Grant 2007

In 2007 and 2008 the watershed project received a grant from the Natural Resources Conservation Service. This grant was to do an experiment on dewatering manure with geotextile tubes. The objective was to determine if the practice was economical. Tubes were utilized at a swine finishing facility and at a dairy facility. The final report of this grant recommended a full scale experiment needs to be completed before this practice could be relied upon for daily manure management. The report also stated that the practice was sound, the tubes worked as expected. All partners in the project were asked to submit their economic feasibility conclusions. Two partners showed that the geotextile tubes are not economically feasible at this time. The last partner is publishing their report in February 2009. The final watershed project grant report can be viewed by contacting the watershed coordinator.

3.8.8 2007 and 2008 Agriculture Incentive Program

Senator Keith Faber secured $100,000 for agriculture incentives in 2007 and 2008 for the Grand Lake St. Marys watershed. Both years these funds were allocated and a waiting list for funds was created. These funds were used for cost share for agricultural best management practices. The goal of the program was to assist a producer to try a practice for a year or two; then as they saw that the practice worked well for them, they would implement that practice on other fields without any incentive or cost share. These programs helped put in over 2,000 acres of cover crops, over 70 acres of hayland buffers and many other best management practices.

3.8.9 Conservation Innovation Grant 2008

In 2007, the watershed coordinator worked with the Grand Lake St. Marys State Park and submitted a grant application to use geotextile tubes as shoreline protection in Grand Lake St. Marys. The lake is a shallow lake susceptible to wind and current erosion. The grant application was accepted and the project schedule is ready to begin when the weather and water conditions are correct. This grant will help to protect 800 feet of shoreline and a natural wetland near Windy Point, a popular section of the State Park. Matching funds for this grant were provided by a $25,000 capital budget request by Senator Keith Faber, the Mercer County Soil and Water Conservation District, Grand Lake St. Marys State Park and local interest groups.

3.8.10 Environmental Quality Incentive Program Demonstration Project 2008

In 2008, USDA provided a demonstration project administered by NRCS in the Grand Lake St. Marys watershed. This demonstration project provided cost share for 5 manure management structures, over 1,670 acres of cover crops and over 700 acres of hayland buffers. Over 55 producers in Auglaize and Mercer Counties participated in the demonstration project. This project will provide cost share for the cover crops and hayland buffers to be in used for three years.

3.8.11 Other Grants Received

Other miscellaneous grants received include:
ODNR Step Outside grant for conservation camps
ONDR Watershed Education mini-grant for lawn fertilizer workshop and awareness
ODNR Watershed Education mini-grant for storm drain marking
ODNR Watershed Education mini-grant for teacher's workshop

3.9 Total Maximum Daily Load Studies

3.9.1 Wabash River

US EPA finalized the Wabash River Total Maximum Daily Load (TMDL) report in 2004. The study defines the Wabash River watershed as a warmwater habitat (WWH). WWH is the use designation that defines the typical warmwater assemblage of aquatic organisms for Ohio Rivers and streams and represents the principal restoration target for the majority of the water resource management efforts in the state. The TMDL report determined that the watershed does not meet its use designation in any assessment unit. It goes on to state that "The Wabash River is one of the most degraded watersheds in the State. Its priority ranking for TMDL development is high on the 2002 Section 303(d) list."

The data collected during the TMDL process shows that the watershed is impacted by non-point source pollution as well as a minor municipal source. Non point sources listed include: (1) nonirrigated crop production; (2) animal feeding operations; (3) channelization (agriculture); (4) removal of riparian vegetation; and (5) streambank destabilization.

Target levels for nitrate-nitrite, total phosphorus and total suspended solids were developed based on the WWH use designation. The target level for nitrate-nitrite is 1.5 mg/L, the target level for total phosphorus is 0.17 mg/L and the target level for total suspended solids is 32.0 mg/L. Data collected showed that the total phosphorus concentration was routinely exceeded, particularly during the summer months due to low flow conditions and increased sunlight. Data collected also indicated that the nitrate-nitrite levels were occasionally exceeded, again with the highest values occurring during the summer months. Sampling indicated that the total suspended solids target was exceeded during most of the spring, summer and winter.

The Soil Water Assessment Tool was used to allocate loads to determine what implementation measures could be taken to decrease the input levels of sediment and nutrients. The modeling showed that reductions of total phosphorus are needed 10 months out the year and reductions of nitrate-nitrite and total suspended solids are need throughout the year. Specific reductions are outlined in the TMDL report. Implementation procedures are not specifically outlined in the TMDL report; in fact, it states that implementation procedures shall be outlined in this watershed action plan. It also states that efforts to implement best management practices should be continued by the GLWWA.

3.9.2 Grand Lake St. Marys/Beaver Creek

Ohio EPA has finalized the TMDL report for the Grand Lake St. Marys and Beaver Creek watersheds. The final report was released during the fall of 2007. The information described below has been taken from the draft report, which was released to the public on June 15, 2007.

Grand Lake St. Marys itself has been designated as an exceptional warmwater habitat (EEWH). The Grand Lake St. Marys and Beaver Creek watersheds have been designated as a WWH. The EEWH designation for Grand Lake St. Marys has been given due to the Environmental Protection Agency's guidelines that indicate "All public and private lakes, except upground reservoirs, are designated as Exceptional Warmwater habitat…Publicly owned lakes are also designated State Resource Waters (SRW)."

Data shows that the lake is impacted by non-point source pollution, which occurs from direct runoff and via tributary input. Because the predominate land use within the watershed is agricultural, much of the non-point source pollution is attributed to agricultural activities. Some sources listed include: (1) stream channelization; (2) riparian vegetation removal; (3) stream bank destabilization; (4) runoff from animal feeding operations; and (5) unsewered areas and failing septic systems.

TMDL levels and load reductions were determined for many different areas of the watershed under high flow, mid-range flow and low flow conditions. The three parameters identified as pollutants include, total phosphorus, nitrate nitrogen and fecal coliform. The report shows required reductions as high as 100% in some areas. Generally speaking, the required load reductions are higher during high flow conditions, but are still significant during low flow conditions.

The report also outlines specific agricultural best management practices that can assist in the reduction of nutrient loading. It shows an estimated reduction of total suspended solids, total nitrogen, total phosphorus and fecal coliform for each BMP. Both TMDL reports can be viewed at the Grand Lake/Wabash Watershed Alliance office or can be viewed online at http://www.epa.state.oh.us/dsw/tmdl/BeaverCreekWabashTMDL.html.

3.10 Lake Trophic State Index

A frequently used biomass-related trophic state indices is that of Carlson (1977). It is relatively simple to use, requires a minimum of data, and is generally easy to understand, both in theory and use. It is numerical, but the traditional nutrient-related trophic state categories fit into the scheme. It seems to be ideal for use in volunteer programs.

We define trophic state as the total weight of living biological material (*biomass*) in a waterbody at a specific location and time. Time and location-specific measurements can be aggregated to produce waterbody-level estimations of trophic state. Trophic state is understood to be the biological response to forcing factors such as nutrient additions (Naumann, 1919, 1929), but the effect of nutrients can be modified by factors such as season, grazing, mixing depth, etc.

In accordance with the definition of trophic state given above, the trophic state index (TSI) of Carlson (1977) uses algal biomass as the basis for trophic state classification. Three variables, chlorophyll pigments, Secchi depth, and total phosphorus, independently estimate algal biomass.

Carlson, R.E. and J. Simpson. 1996. *A Coordinator's Guide to Volunteer Lake Monitoring Methods*. North American Lake Management Society. 96 pp.