Black River Watershed Action Plan

December 30, 2011

Written By:
Christina Znidarsic
Former Black River Watershed Coordinator
Lorain County Community Development Department
(Sections I through- IV)

And

Coldwater Consulting, LLC
With input from Chagrin River Watershed Partners, Inc.
and the Lorain County Community Development Department
(Sections V through IX)

With technical assistance from:
Christopher Alvarado, CCPC
Marty Rowe, Lorain County Auditor's Office
Jim Boddy, LCGHD
Nancy Funni, Lorain SWCD
Ryan Kemper, NRCS
Karl Schneider, NRCS
Tom Holmes, ODNR
Matt Adkins, ODNR OCM
Brian George, ODNR OCM
Steve Lewis, ODNR OCM
Ted Conlin, Ohio EPA
Bill Zawiski, Ohio EPA
Liz Mather, WRLC

Special Thanks to:
Joe Reitz, Avon Lake Engineering Dept.
Mike McNutt, Columbus Board of Health
Betty Blair, Lorain County Commissioner
Col. Matthew Nahorn, New Indian Ridge Museum
Cheryl Wolfe, Oberlin College
Greg Nageotte, ODNR
Rosa Garcia-Gee, Sheffield Lake SUAB

Black River Watershed Action Plan Community Endorsement

We support and agree to pursue implementation of this plan and agree to seek the necessary resources to improve and protect the water quality of the Black River.

Amherst Township, Lorain County	***LaGrange Township, Lorain County***
Brighton Township, Lorain County	***Litchfield Township, Medina County***
Camden Township, Lorain County	***Liverpool Township, Medina County***
Carlisle Township, Lorain County	***New London Township, Huron County***
Chatham Township, Medina County	***New Russia Township, Lorain County***
City of Avon, Lorain County	***Olmsted Township, Cuyahoga County***
City of Elyria, Lorain County	***Penfield Township, Lorain County***
City of Lorain, Lorain County	***Pittsfield Township, Lorain County***
City of North Olmsted, Cuyahoga County	***Rochester Township, Lorain County***

City of North Ridgeville, Lorain County

City of Oberlin, Lorain County

City of Westlake, Cuyahoga County

Clarksfield Township, Huron County

Columbia Township, Lorain County

Eaton Township, Lorain County

Elyria Township, Lorain County

Grafton Township, Lorain County

Harrisville Township, Medina County

Homer Township, Medina County

Sheffield Township, Lorain County

Sheffield Village, Lorain County

Spencer Township, Medina County

Sullivan Township, Ashland County

Troy Township, Ashland County

Village of Grafton, Lorain County

Village of LaGrange, Lorain County

Village of Lodi, Medina County

Village of Rochester, Lorain County

Village of Spencer, Medina County

Huntington Township, Lorain County

Village of Wellington, Lorain County

Lafayette Township, Medina County

Wellington Township, Lorain County

Table of Contents

I. Black River Watershed Characteristics 13

A. Defining the Watershed 13

1. Location and Description 13

2. Communities 14

3. Special Districts 15

4. Special Designations 17

5. NPDES Phase II Storm Water Communities 17

B. Demographics 19

C. Geographic Locators 23

D. General Watershed Information 24

1. Previous and Current Watershed Protection and Management 24

II. Watershed Plan Development 27

A. Introduction 27

1. Development of Watershed Group 28

2. Recommendations 30

B. Watershed Partners 30

C. Mission Statement 31

D. Organizational Structure 31

E. General Plan Contents 31

1. Plan Outline 31

2. Endorsement of Plan by Key Watershed Partners 32

3. Endorsement of Plan by Local Units of Government 32

4. Information/Education Component 32

III. Watershed Inventory 33

A. Description of the Watershed 33

1. Geology 33

B. Biological Features 37

1. Rare, Threatened, and Endangered Species 37

2. Invasive Species and Their Effects on the Watershed 40

C. Water Resources 41

1. Climate and Precipitation 41
2. Surface Water 42
3. Ground Water Resources 47
D. Land Use 50
1. Impervious Cover 52
2. Impacts from Steel Manufacturing 53
3. Home Sewage Treatment Systems (HSTS) 55
4. Agricultural Data 57
5. Protected Lands and Managed Areas 61
6. Land Use Status and Trends 62
E. Cultural Resources 64
F. Previous and Current Complementary Efforts 66
G. Physical Attributes of Streams and Floodplain Areas 67
1. Early Settlement Conditions 67
2. Channel and Floodplain Conditions 69
3. Riparian Corridor Assessment 74
4. Permanently Protected Streams 77
5. Natural and Modified Channels 78
6. Dams 79
7. Unrestricted Livestock Access 82
8. Eroding Banks 82
9. Status and Trends 86
H. Water Resource Quality 87
1. Attainment Status 87
2. Use Designations 91
3. Locationally-Referenced Use Designations 92
4. Lakes Quality 96
5. Wetlands Quality 96
6. Groundwater Quality 100
I. Causes and Sources of Impairment/Threats 100
1. Point Sources 101
2. Discharges (NPDES Permitted) 102

3. Spills and Illicit Discharges 105
J. Non-Point Sources 105
1. Headwaters Quality 107
2. HSTS Inventory and Projected Failed Systems 107
3. Number of New Homes Being Built 112
4. Number and Size of Animal Feeding Operations 113
5. Acres of Highly Erodible Land and Potential Soil Loss 113
6. Culverting of Streams 115
7. Channelization of Streams 116
8. Levied Streams and Dikes 117
9. Streams Exhibiting Little Human Impact 117
10. Stream Effluent Volume 118
11. Impounded Streams 119
12. Petition Ditches 121
13. Status and Trends 122
IV. Watershed Impairments 123
A. Watershed Stressors 123
1. Siltation/Sedimentation 123
2. Habitat Loss 124
3. Nutrients 124
4. Bacteria 124
B. Load Reduction Targets from the Black River TMDL 125
1. Fecal Coliform 125
2. Nutrients and Sediment 126
C. Black River RAP AOC Beneficial Use Impairments Delisting 127
1. Beneficial Use Impairments 127
V. Problem Statements, Goals, Objectives, and Actions 134
A. Wellington Creek 041100010503 134
B. French Creek 041100010601 142
C. Lower West Branch 041100010506 149
D. Black River Mainstem 041100010602 157
E. Charlemont Creek 041100010501 166

F. Middle West Branch 041100010504 173
G. Plum Creek 041100010505 180
H. Willow Creek 041100010403 190
I. Upper West Branch 041100010502 199
J. Linking Sources and Causes in the Black River Watershed 208
VI. Implementation Management Practices 211
A. Riparian Setbacks/Buffers 211
B. Stream, Wetland, and Floodplain Restoration 213
C. Home Sewage Treatment System (HSTS) Removal or Repair 213
D. Point Source Controls 215
E. Preservation of Natural Areas 215
F. Storm Water Management/Green Infrastructure 216
G. Agricultural Best Management Practices 217
VII. Implementation of Coastal Non-Point Control Measures 219
VIII. Evaluation 242
IX. Plan Update and Revision 243

List of Figures

Figure 1: Mouth of the Black River at the City of Lorain (Tim Kiser). 13
Figure 2: French Creek Rapidly Developing Watershed. 18
Figure 3: Conventional development (left) vs. conservation development (right). North Olmsted Master Plan, 2005. 26
Figure 4: Falls at Cascade Park (Ted Conlin). 36
Figure 5: Multiflora Rose 40
Figure 6: The Hydrologic Cycle (Tom Schultz). 42
Figure 7: Elmwood Wetland Preserve. 44
Figure 8: Black River Flow. 48
Figure 9: Land Use by HUC-10 51
Figure 10: Land use by HUC-12. 52
Figure 11: Stream Quality vs. Watershed Impervious Cover. 53
Figure 12: Black River Restoration Site, City of Lorain (Christina Znidarsic). 55
Figure 13: Roofed animal waste storage structure, installed near Squire's Ditch in the Plum Creek sub-watershed (Christina Znidarsic). 59
Figure 14: Drainage tiles emptying into a ditch (Randy Schaetzl, Michigan State University). 61
Figure 15: Natural shale cliffs along the Black River Main-stem in the Black River Reservation, Lorain County Metroparks (Tim Kiser). 62
Figure 16: West Falls at Cascade Park, Elyria (Christina Znidarsic). 65
Figure 17: Straightened stream behind residential properties, Avon Lake (Joe Reitz). 71

Figure 18: Avon and North Ridgeville Floodplain. Watershed boundaries are in green; city boundaries are in light blue. 72
Figure 19: How Not to be the Solution to Storm Water Pollution. This house is not located within the Black River watershed. (Christopher Alvarado) 74
Figure 20: Riparian corridor and floodplain along the Black River, City of Lorain. (Christina Znidarsic) 75
Figure 21: Lowhead dam, West Branch Black River near Oberlin Reservoir. (Christina Znidarsic) 82
Figure 22: Heavily-scoured banks in the Middle West Branch sub-watershed. (Christina Znidarsic) 85
Figure 23: French Creek Attainment from RMs 0-6.9. 89
Figure 24: French Creek Attainment for RMs 6.9+. 90
Figure 25: French Creek QHEI by River Mile. 91
Figure 26: Principal Stream Attainment Percentages. 93
Figure 27: Tributary Stream Attainment Percentages. 94
Figure 28: Sample Impact Threat Assessment, Charlemont Creek 041100010501. Note that nearly all secondary tributaries and headwater streams to Charlemont Creek are potentially impacted or threatened by agricultural land use. 95
Figure 29: Managed vs. Non-Managed Wetlands (>5 acres) by HUC-12. 98
Figure 30: Non-Managed Wetlands by Type and HUC-12 (>5 acres). 99
Figure 31: Sampling locations for the Upper Black River Watershed Project. 109
Figure 32: Culverted stream, Draper Ditch. (Christina Znidarsic) 116
Figure 33: Unnamed tributary to Guthrie Ditch, Middle West Branch. (Christina Znidarsic) 118
Figure 34: Percentage contribution from Municipal and Industrial Dischargers. 119
Figure 35: Filter strip installation, Draper Ditch. (Christina Znidarsic) 122

List of Tables

Table 1: Watershed Special Districts by County. 16
Table 2: Phase II Storm Water Communities. 17
Table 3: Demographic Data. 19
Table 4: USGS Hydrologic Unit Codes (HUCs). 23
Table 5: Soils in the Black River Watershed. 34
Table 6: Rare Plant Species. 38
Table 7: Rare Animal Species. 38
Table 8: Invasive Species. 40
Table 9: Black River Climate Statistics. 41
Table 10: Stream Statistics. 44
Table 11: Lakes and Reservoirs. 45
Table 12: Aquifer Data. 47
Table 13: General Land Use for the Watershed. 50
Table 14: Impervious percent cover. 53
Table 15: Crop Data. 57
Table 16: Livestock Inventory. 58
Table 17: Fertilizer Use. 59
Table 18: Developed Land Analysis. 63
Table 19: Riparian Corridor Statistics by HUC-12. 76
Table 20: Miles of Protected Stream by HUC-12. 77
Table 21: Unmodified Miles by HUC-12. 78
Table 22: Public Dams. 79
Table 23: Miles of Eroding Banks by HUC-12. 83

Table 24: Road and Highway Projects, 2010-2011. 86
Table 25: General Attainment Scores. 87
Table 26: Average QHEI Scores by HUC-12. 88
Table 27: Potentially Impacted Stream Miles by HUC-12. 95
Table 28: Section 303(d) listings for the Black River (Black River TMDL, 2008). 100
Table 29: Individual NPDES Permitted Dischargers. 103
Table 30: Summary of Samples Taken, Upper Black River Watershed Project. 110
Table 31: Number of Samples Exceeding Standards, Upper Black River Watershed Project. 110
Table 32: Number of Sample Locations Exceeding Standards, Upper Black River Watershed Project. ... 110
Table 33: HSTS Load Estimates by HUC-12. 111
Table 34: Number of New Homes in 2009 by HUC-12. 112
Table 35: Acres of Highly Erodible Land by HUC-12. 113
Table 36: Major Permitted Dischargers in the Black River. 118
Table 37: Impoundments and Miles of Impounded Stream by HUC-12. 119
Table 38: Target Values for Sediment and Nutrients, Black River TMDL. 124
Table 39: Bacterial Standards for the state of Ohio. 125
Table 40: Black River TMDL Percent Load Reductions for Fecal Coliform. 125
Table 41: Black River TMDL Percent Load Reductions for Phosphorous, Nitrate, and Suspended Solids. 126
Table 42: Beneficial Use Impairment Status for the Black River. 127
Table 43: Average QHEI Scores for Black River Tributaries (Black River RAP 2009 Annual Report). 133
Table 44: Sources and Causes of Water Quality Impairments. 209
Table 45: Attainment Status Summary 210
Table 46: Recommended Riparian Setback/Buffer Widths 212
Table 47: Coastal Non-Point Strategic Plan 231

List of Acronyms and Abbreviations

AOC	Area of Concern
AU	Assessment Unit
AWS	Agricultural Water Supply
BMP	Best Management Practice
BOD	Biological Oxygen Demand
BR	Black River
BRWP	Black River Watershed Partners
BUI	Beneficial Use Impairment
CCPC	Cuyahoga County Planning Commission
cfs	Cubic Feet Per Second
cfu	Colony Forming Unit
CMM	Coastal Management Measure
CNPCP	Coastal Non-Point Pollution Control Program
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CRWP	Chagrin River Watershed Partners
CSO	Combined Sewer Overflow
CWA	Clean Water Act
CWH	Cold Water Habitat
CZMA	Coastal Zone Management Act

DEFA	Division of Environmental and Financial Assistance
DO	Dissolved Oxygen
DRP	Dissolved Reactive Phosphorus
DSW	Division of Surface Water
EB	East Branch
EFEB	East Fork of East Branch
EOLP	Erie-Ontario Lake Plain
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESP	Environmental Strategic Plan
EWH	Exceptional Warmwater Habitat
FC	Fecal Coliform
FCr	French Creek
ft^3/sec	Cubic feet per second
GIS	Geographic Information Systems
Gpd	Gallons per day
HPA	High Priority Areas
HSTS	Home Sewage Treatment System
HUC	Hydrologic Unit Code
HRU	Hydrologic Response Unit
IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index
IWS	Industrial Water Supply
kg/day	Kilograms per day
LA	Load Allocation
lb/yr	Pounds per year
LCCDD	Lorain County Community Development Department
LCGHD	Lorain County General Health District
LDC	Load Duration Curve
LEED	Leadership in Energy and Environmental Design
LORCO	Lorain County Rural Wastewater Authority
MCM	Minimum Control Measure
Mg/L	milligrams per liter
MGD	million gallons per day
MIwb	Modified Index of Well-Being
mi^2	square mile
ml	milliliter
MOS	Margin of Safety
MS4	Municipal Separate Storm Sewer System
MUSLE	Modified Universal Soil Loss Equation
MWH	Modified Warmwater Habitat
NEORSD	Northeast Ohio Regional Sewer District
NO_3	Nitrate
NOAA	National Oceanic and Atmospheric Administration
NOACA	Northeast Ohio Areawide Coordinating Agency
NPDES	National Pollutant Discharge Elimination System
NPS	Non-Point Source
NRCS	Natural Resource Conservation Service

OAC	Ohio Administrative Code
OCM	Office of Coastal Management
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
Ohio EPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
OSDS	On Site Disposal System
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyls
PCR	Primary Contact Recreation
PET	Potential Evapotranspiration
PIPE	Public Information and Public Education
QHEI	Qualitative Habitat Evaluative Index
RAP	Remedial Action Plan
RM	River Mile
SSH	Seasonal Salmonid Habitat
SUAB	Stormwater Utilities Appeal's Board
SWAT	Soil and Water Assessment Tool
SWCD	Soil and Water Conservation District
SWIF	Surface Water Improvement Fund
SWP3	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
tons/yr	Tons Per Year
TP	Total Phosphorous
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geologic Survey
VRT	Variable Rate Technology
WAP	Watershed Action Plan
WLA	Waste Load Allocations
WPCLF	Water Pollution Control Loan Fund
WQS	Water Quality Standards
WRLC	Western Reserve Land Conservancy
WR RC&D	Western Reserve Resource Conservation and Development
WRRSP	Water Resource Restoration Sponsor Program
WWH	Warm Water Habitat
WWTP	Wastewater Treatment Plant

Appendices

Appendix A: Watershed Maps
Appendix B: Land Use/Land Change by HUC-12
Appendix C: Known HSTS Location Maps
Appendix D: Table of Links
Appendix E: Riparian Legislation Listing
Appendix F: Goals, Objectives, and Actions

I. Black River Watershed Characteristics

A. Defining the Watershed

Figure 1: Mouth of the Black River at the City of Lorain (Tim Kiser).

1. Location and Description

Location: 41.38°N 82.05°W

The Black River watershed contains approximately 1240 stream miles, drains 470 mi^2 into Lake Erie's Central Basin and is characterized by flat, gently rolling terrain formed during the retreat of the Wisconsin glacier 14,000-9,500 years ago.

The Black River main-stem has its headwaters in Medina County near Lodi, where the West Fork joins the East Fork of the East Branch and flows northward through Spencer, LaGrange, and Grafton. The West Branch begins in northern Ashland County and flows northward into Lorain County through Rochester, Wellington, and Oberlin before meeting the East Branch to form the Black River main-stem at the confluence in Elyria. The Black River main-stem then flows northward and meets French Creek, a

major tributary to the east, near Sheffield Village, then flows into Lake Erie at its mouth in the City of Lorain. Other major tributaries of the Black River are Plum Creek which flows west to east through Oberlin and meets the West Branch, Charlemont Creek which flows south to north between Rochester and Wellington to meet the West Branch in northern Wellington Township, and Wellington Creek which flows south to north through Wellington to meet the West Branch on the border of Pittsfield and LaGrange Townships. The slope of the Black River ranges from about 0.8 feet/mile at the French Creek confluence to 29.8 feet/mile at Charlemont Creek in the upper reaches of the watershed, with an average slope of 7.6 feet/mile.

The Black River watershed is located primarily within Lorain and Medina Counties, with small portions extending into Cuyahoga, Ashland, and Huron Counties. It is comprised of four 10-digit AU (Assessment Unit) watersheds: the Headwaters East Branch, the East Branch, the West Branch, and the Black River Main-stem. These are further broken down into sixteen sub-watersheds. The West Branch, Black River Main-stem, and a little more than half of the East Branch are located almost entirely within Lorain County; the Headwaters East Branch is mainly within Medina County. One sub-watershed, the 12-digit HUC (Hydrologic Unit Code) of Heider Ditch-Frontal Lake Erie (041100010603), is hydrologically unconnected to the Black River and is composed of small coastal tributaries that have direct drainage to Lake Erie. For the purposes of this plan, data and information on the Heider Ditch-Frontal Lake Erie sub-watershed is included where available and is noted as such.

2. Communities

Five counties, twenty-eight unincorporated communities, and fourteen incorporated communities are found entirely or partially within the watershed's boundaries.

<u>Lorain County</u>
Incorporated: City of Lorain, City of Elyria, City of Sheffield Lake, Sheffield Village, City of Avon, City of Avon Lake, City of North Ridgeville, City of Oberlin, Grafton Village, LaGrange Village, Wellington Village, Rochester Village.
Unincorporated: Huntington Township, Sheffield Township, Elyria Township, New Russia Township, Carlisle Township, Eaton Township, Camden Township, Pittsfield Township, LaGrange Township, Grafton Township, Brighton Township, Wellington Township, Penfield Township, Rochester Township, small portions of Amherst, Henrietta, and Columbia Townships.

<u>Medina County</u>
Incorporated: Lodi Village, Spencer Village.
Unincorporated: Chatham Township, Homer Township, Harrisville Township, Spencer Township, Litchfield Township, small portions of Liverpool and Lafayette Township.

<u>Cuyahoga County</u>
Incorporated: City of North Olmsted, City of Westlake.
Unincorporated: Olmsted Township.

<u>Ashland County</u>
Incorporated: None
Unincorporated: Sullivan Township, small portions of Troy and Ruggles Townships.

Huron County
Incorporated: None
Unincorporated: small portions of New London and Clarksfield Townships.

Map 1: Map of Watershed Communities (See Appendix A).

3. Special Districts

Various community websites and administrative offices between the five counties were contacted to obtain information regarding special districts. Most counties have a planning commission, sewer or wastewater district, and a County Soil and Water Conservation District (SWCD). The Northeast Ohio Areawide Coordinating Agency (NOACA) operates within the Lorain, Medina, and Cuyahoga County portions of the watershed. Ohio Department of Transportation (ODOT) District 3 manages maintenance, upgrades, and engineering studies within the majority of the Black River watershed; ODOT District 12 manages the portions within Cuyahoga County.

The Northeast Ohio Regional Sewer District (NEORSD) service area covers portions of the Black River's Willow Creek subwatershed in Columbia Township in Lorain County and the French Creek subwatershed in Olmsted Township in Cuyahoga County. The Lorain County Rural Wastewater District (LORCO) is a non-profit collaboration of Townships and Villages that provides central waste-water treatment and seeks to extend service to unsewered sections of Lorain County. Communities within the Black River watershed that participate in LORCO include the Village of Rochester and the Townships of New Russia, Amherst, Henrietta, Carlisle, Eaton, Camden, Pittsfield, LaGrange, Grafton, Wellington, Rochester, and Huntington. A LORCO district map can be found here (http://www.lorco.org/Membermap.htm). With the exception of the Village of Rochester, all municipalities within the Black River Watershed have their own municipal sewer and sanitary departments, while the Lorain County Sanitary Engineer manages unincorporated areas within Lorain County and administer the county-wide Storm Water Utility.

The Lorain County Storm Water District was formed in early 2010. It is a county-wide utility that currently extends only to the unincorporated communities and was developed to comply with US EPA water quality regulations and begin to more effectively manage storm water drainage and flooding issues throughout Lorain County. All property owners (residents, schools, churches, businesses, industries, and governments) within the unincorporated areas are assessed a fee based on their amount of impervious surface. Residential properties are assessed a flat rate calculated from an average amount of impervious surface; non-residential properties are assessed based upon their actual measured impervious surface. There is a credits system in place for non-residential properties. Implementation of best management practices for storm water can be used by non-residential properties to decrease their fee by varying percentages depending on the amount of storm water mitigated. Increased storm water management practices will improve the water quality in and around the Black River watershed, creating a better environment for local wildlife and providing future generations with the opportunity to enjoy local waterways while managing the effects of growing development.

The Lorain County General Health District (LCGHD) provides health services to all of Lorain County within the watershed with the exception of the cities of Elyria, Lorain, and Avon Lake, which have their own Health Departments or Districts. The Cuyahoga County Board of Health (CCBH) and the Medina County

Health Department (MCHD) provide health services to the portions of the watershed within Cuyahoga County and Medina County, respectively.

The Cleveland Metroparks, Lorain County Metroparks, and Medina County Park District Ohio Department of Natural Resources (ODNR) all have conserved land within the watershed's boundaries. See Protected Lands and Managed Areas section of this plan.

Table 1: Watershed Special Districts by County.

County	Park Districts	School Districts	Sewer and Septic	Soil and Water	Higher Education	Regional Planning
Lorain	Lorain County Metroparks	Thirteen school districts	LORCO	Lorain SWCD	LCCC	Lorain County Planning Commission
			City of Elyria Sewer		Oberlin College	
			City of Lorain Sewer		Ohio Business College	
			Lorain County Sanitary Engineers		Lorain County JVS	
			NEORSD			
Medina	Medina County Park District	Three school districts	Medina County Sanitary Engineers	Medina SWCD	N/A	Medina County Planning Commission
Cuyahoga	Cleveland Metroparks	Four school districts	Cuyahoga County Sanitary Engineers	Cuyahoga SWCD	N/A	Cuyahoga County Planning Commission
			City of North Olmsted Storm Sewer Dept.			
			City of Westlake Water and Sewer			
			NEORSD			
Ashland	N/A	Two school districts	Ashland County Board of Health	Ashland SWCD	N/A	Ashland County Planning Dept.

Huron	N/A	Three school districts	Northern Ohio Rural Water	Huron SWCD	N/A	Huron County Planning Commission

A comprehensive list of all current Special District URLs can be found in Appendix E.

4. Special Designations

There are currently no National, State Wild, or Scenic Rivers designated within the Black River Watershed. In 1997 a study was completed for evaluation of the Black River for inclusion into Ohio's Scenic Rivers Program. It was determined that the West Branch and Main-stem were not recommended for inclusion. The East Branch met minimal requirements and may be eligible for inclusion in the future with continued habitat improvements, but at the time was considered a marginal stream system compared to other statewide high-quality streams.

5. NPDES Phase II Storm Water Communities

Communities marked with an * indicate Rapidly Developing Watershed (RDW) communities.

Table 2: Phase II Storm Water Communities.

County	Incorporated Community	Unincorporated Community
Lorain	City of Lorain Sheffield Lake Sheffield Village* City of Avon* City of North Ridgeville* City of Elyria* City of Oberlin Grafton Village City of Avon Lake*	Sheffield Township Elyria Township Carlisle Township Eaton Township Columbia Township Grafton Township
Cuyahoga	City of North Olmsted* City of Westlake*	Olmsted Township*
Medina	N/A	N/A
Ashland	N/A	N/A
Huron	N/A	N/A

Phase II storm water regulations pertain to storm water runoff of Municipal Separate Storm Sewer Systems (MS4s) that service populations less than 100,000 and are located partially or fully within urbanized areas as determined by the U.S. Census Bureau. They also cover on a case-by-case basis small MS4s located outside urbanized areas that Ohio EPA designates into the program.

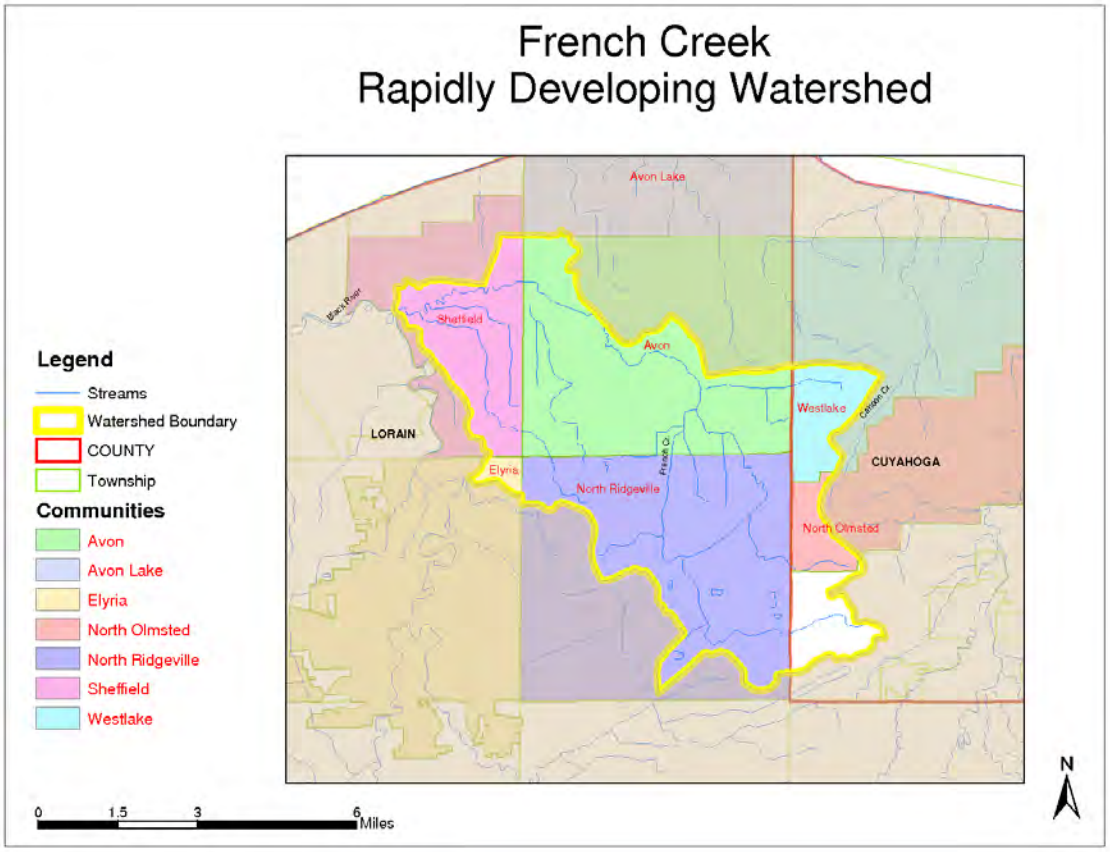


Figure 2: French Creek Rapidly Developing Watershed.

Source: Ohio EPA's MS4 site (http://epa.ohio.gov/dsw/storm/ms4_index.aspx).

The French Creek sub-watershed was one of 12 Ohio watersheds designated a Rapidly Developing Watershed (RDW) by the Ohio EPA. RDWs exhibit some or several of the following attributes:

- A significant portion of the stream still in attainment or partial attainment of aquatic life use designation.
- Evidence of increasing stress on water quality, habitat and aquatic life caused by land surface disturbances such as construction activity and impervious surfaces.
- High rates of forecasted population growth and a strong probability of high-density development occurring within a significant portion of the watershed over the next several years.

Local communities located within RDWs were required to obtain Ohio EPA's Alternative General Permit for MS4s Located within Rapidly Developing Watersheds in 2003 (http://epa.ohio.gov/dsw/permits/gpfact.aspx#currently%20available). In the Black River watershed this included the MS4 communities of Avon, Avon Lake, Elyria, North Olmsted, Olmsted Township, Westlake, Sheffield, and North Ridgeville. This alternative permit required RDW communities to meet the Construction and Post-Construction minimum control measures within 3 years as opposed to 5 years. The RDW designation is no longer used, but it highlights the need for action within this particularly sensitive sub-watershed.

Medina, Ashland, and Huron County currently have no Phase II communities within the Black River Watershed.

B. Demographics

Demographic datasets were obtained from the US Census Bureau and the Ohio Department of Development. Watershed characteristics were estimated on a county-wide basis for Lorain County and on either a community-by-community or census block basis for Cuyahoga, Medina, Ashland, and Huron Counties. Demographic categories from the various counties, communities, and census blocks were then synthesized where possible to form a general watershed profile.

Table 3: Demographic Data.

Source: US Census Bureau, 2000 Summary Files SF1 and SF3

2000 US Census Results

Black River Watershed	**Total**	**Percent**
Population Characteristics		
Total Population	398,343	100
Male	194,966	48.9
Female	203,377	51.1
Under 5 years	26,190	6.6
5 to 9 years	29,295	7.4
10 to 14 years	29,573	7.4
15 to 19 years	28,221	7.1
20 to 24 years	22,001	5.5
25 to 34 years	49,044	12.3
35 to 44 years	65,790	16.5
45 to 54 years	58,500	14.7
55 to 59 years	20,773	5.2
60 to 64 years	16,478	4.1
65 to 74 years	27,388	6.9
75 to 84 years	18,916	4.7
85 years and over	6,174	1.5

Median age (years)	37.4	
18 years and over	295,653	74.2
Male	142,406	35.7
Female	153,247	38.5
21 years and over	280,199	70.3
62 years and over	61,915	15.5
65 years and over	52,478	13.2
Male	21,709	5.4
Female	30,769	7.7
White	351,812	88.3
African American	25,199	6.3
American Indian/Alaska Native	944	0.2
Asian	4,169	1.0
Native Hawaiian and Other Pacific Islander	91	0.0
Some other race	8,559	2.1
Hispanic or Latino	21,093	5.3

Family Characteristics

Total families	106,931	71.6
Married-couple family	84,764	56.8
Single mothers	16,395	11.0

Housing Characteristics

Total Households	149,314	100
Owner-occupied housing units	117,016	78.4
Renter-occupied housing units	33,218	22.2
Householder living alone	35,964	24.1
People over 65 years living alone	14,191	9.5
Average household size	2.60	
Average family size	3.09	
Average household size of owner-occupied unit	2.69	
Average household size of renter-occupied unit	2.29	

Education Characteristics

School Enrollment

Population *(3+ Years)*	103,815	100
Nursery school, preschool	7,716	7.4
Kindergarten	6,046	5.8

Elementary school *(grades 1-8)*	48,383	46.6
High school *(grades 9-12)*	23,232	22.4
College or graduate school	18,438	17.8
Educational Attainment		
Population *(25+ Years)*	263,686	100
Less than 9th grade	10,086	3.8
9th to 12th grade, no diploma	31,117	11.8
High school graduate *(includes equivalency)*	94,517	35.8
Some college, no degree	58,328	22.1
Associate degree	17,422	6.6
Bachelor's degree	33,977	12.9
Graduate or professional degree	18,239	6.9
High school graduate or higher		84.2
Bachelor's degree or higher		19.4

Income and Employment Characteristics

Per capita money income, 1999	$21,903	
Percent of persons below poverty level, 2008	7.98%	
Household Income		
Households	107,543	100
Less than $10,000	9,178	8.5
$10,000 to $14,999	10,046	9.3
$15,000 to $24,999	17,754	16.5
$25,000 to $34,999	20,950	19.5
$35,000 to $49,999	28,507	26.5
$50,000 to $74,999	30,013	27.9
$75,000 to $99,999	16,718	15.5
$100,000 to $149,999	8,970	8.3
$150,000 to $199,999	3,372	3.1
$200,000 or more	1,611	1.5
Median household income, 2000	$47,896	
Workforce		
Civilian Labor Force, 2007	201,298	
Employed	192,892	
Unemployed	8,406	
Unemployment Rate	4.11%	
Occupation		
Management, professional, and related occupations	58,149	30.1
Service occupations	26,535	13.8
Sales and office occupations	50,287	26.1
Farming, fishing, and forestry occupations	873	0.5

Construction, extraction, and maintenance occupations	19,568	10.1
Production, transportation, and material moving occupations	37,407	19.4
Industry		
Agriculture, forestry, fishing and hunting, and mining	1,672	0.9
Construction	13,165	6.8
Manufacturing	43,156	22.4
Wholesale trade	6,291	3.3
Retail trade	22,441	11.6
Transportation and warehousing, and utilities	9,175	4.8
Information	4,798	2.5
Finance, insurance, real estate, and rental and leasing	11,399	5.9
Professional, scientific, management, administrative, and waste management services	14,967	7.8
Educational, health and social services	36,548	18.9
Arts, entertainment, recreation, accommodation and food services	13,485	7.0
Other services (except public administration)	8,403	4.4
Public administration	7,319	3.8
Class of Worker		
Private wage and salary workers	162,075	84.0
Government workers	20,815	10.8
Self-employed workers in own not incorporated business	9,364	4.9
Unpaid family workers	565	0.3
Miscellaneous Characteristics		
House Heating Fuel Types		
Utility gas	111,289	74.5
Bottled, tank, or LP gas	8,177	5.5
Electricity	22,579	15.1
Fuel oil, kerosene, etc.	4,074	2.7
Coal, coke or wood	1,740	1.2
Solar energy or other fuel	1,239	0.8
No fuel used	361	0.2

Population and housing within the watershed are heavily distributed towards the north in Lorain, North Ridgeville, Avon, Avon Lake, Sheffield, Elyria, Sheffield Lake, Westlake, and North Olmsted. The watershed is home to nearly 400,000 residents but about 43 percent of the population lives in either Elyria or Lorain. . In Lorain County, the northern communities make up one-third of the land area of the county but contain nearly 78% of the county's total population.

This difference in population density between the north and south is becoming more pronounced as a result of recent development trends. Unlike the "urban flight" experienced in most major metropolitan areas within Northeast Ohio where a shift towards exurban and suburban growth occurs, the population density in the watershed's northern communities is actually increasing. Between 2000 and 2010 in Lorain County the northern communities accounted for approximately 87% of new housing development.

A majority of the land area of the watershed is rural, but a majority of the population base is urban. This is primarily related to public utilities. Areas within the watershed that have utility services tend to grow at a faster rate and a higher density. In particular, areas without sewer lines are limited in their density by the structural demands of on-lot home sewage treatment systems (HSTS). Improved access to sewer lines coupled with encroaching development from the northern communities will create a need within unincorporated areas in the central areas of the watershed to better manage the resulting pressures from land use change.

C. Geographic Locators

The Black River watershed 8-digit HUC is broken down into four 10-digit and sixteen 12-digit HUC sub-watersheds.

Table 4: USGS Hydrologic Unit Codes (HUCs).

Source: Ohio Department of Natural Resources

Black River Hydrologic Unit Codes	
Description	**HUC**
Black-Rocky River	**04110001**
Headwaters East Branch Black River	**0411000103**
East Fork of East Branch Black River	041100010301
Headwaters West Fork East Branch Black River	041100010302
Coon Creek-East Branch Black River	041100010303
East Branch Black River	**0411000104**
Town of Litchfield-East Branch Black River	041100010401
Salt Creek-East Branch Black River	041100010402
Willow Creek	041100010403
Jackson Ditch-East Branch Black River	041100010404
West Branch Black River	**0411000105**
Charlemont Creek	041100010501
Upper West Branch Black River	041100010502
Wellington Creek	041100010503
Middle West Branch Black River	041100010504
Plum Creek	041100010505
Lower West Branch Black River	041100010506
Black River	**0411000106**
French Creek	041100010601
Black River	041100010602
Heider Ditch-Frontal Lake Erie	041100010603

Map 2: Black River Watershed and Sub-watershed Hydrologic Unit Codes (see Appendix A).

D. General Watershed Information

1. Previous and Current Watershed Protection and Management

Every community has local zoning regulations, and many communities have adopted Master or Comprehensive Plans. A listing of known plans either under development or in-place follows: codes

Lorain County

Lorain County Comprehensive Land Use Plan: adopted in 2000 to promote a rational development strategy to accommodate increasing land use pressures but also enhance the rural, natural, and agricultural heritage of the county. The Plan delineated "Priority Development" and "Priority Conservation" areas within the County; however, a detailed analysis of environmental factors was not performed. This Plan recommended the creation of a specific Environmental Strategic Plan.

Lorain County Environmental Strategic Plan: prepared in 2006 to address sanitary, storm water, and brownfield issues and promote ecological good stewardship within Lorain County. This Plan encouraged the formation of a County-wide Storm Water Utility, the establishment of a stream corridor protection zone, enforcement of setbacks, and the creation of a comprehensive inventory of both developable and environmentally sensitive lands. Each municipality and township was encouraged to create its own Land Use Plan and enact zoning resolutions to identify and manage Environmentally Sensitive Areas (ESAs) within their jurisdictions. The County-wide Storm Water Utility is currently under implementation in unincorporated areas. The rest of the LCESP exists as a resource and recommendation to communities within Lorain County seeking to develop their own environmental plans.

Individual watershed communities who have Comprehensive or Master Plans in place include the cities of Avon Lake, Avon, Sheffield Lake, and North Ridgeville. The city of Lorain has adopted seven urban renewal plans that address issues such as brownfield remediation and recommend implementing conservation development and naturalized drainage systems in redevelopment projects. In 2001 and 2002 New Russia and Pittsfield Townships, respectively, adopted Comprehensive Plans that stress the importance of improving the environmental quality of the Black River through use of wetlands, riparian corridors, stream and floodplain setbacks that act as natural filters for pollutants and eliminate detrimental siltation.

In 1999 LaGrange Township developed a draft Land Use Plan that recommended management of land use and development in the Township to protect surface water resources (streams, ponds, flood zones, and wetlands) from pollution, sedimentation, excessive increases in storm water runoff, and unnecessary alteration of their natural state and function. Carlisle Township developed a

Comprehensive Land Use Plan in 2000 that focuses on improving the ecological health of the Black River and takes a watershed-based approach to future community development.

The City of Oberlin updated their existing Comprehensive Plan in 2004 (http://www.cityofoberlin.com/Files/Planning/TEXT%20Plan%20Update%202004.pdf) that focuses on the environmental issues in the Plum Creek sub-watershed and has implemented a land use planning process in which setbacks are specified for riparian zones and conservation easements are set.

As of October 2010, Eaton Township has a Comprehensive Land Use Plan in review which discusses the need for riparian setbacks and other environmentally sound practices in future land use and development.

Ashland County

Ashland County Comprehensive Land Use Plan: Approved in February 2000 and found here; stresses the importance of instituting appropriate measures to protect the natural landscape and maintain the ecological health of Ashland County. This Plan recommends preserving natural corridors through implementing practices such as conservation easements, conservation development, and redevelopment/reuse of brownfield sites.

Ashland County specified in their Plan that groundwater has become polluted because of inappropriate land uses and surface water has become polluted and lost quality because of development encroaching into riparian corridors, causing the transformation of natural waterways into "sterile drainage ditches" which flood more frequently due to increasing volumes of runoff and the speed of water moving across impermeable surfaces.

The preservation and restoration of riparian corridors along the Black River and its tributaries are a primary goal of the Black River Watershed Action Plan.

Medina County

Per communication with the Medina County Department of Planning Services (MCDPS): Litchfield Township, Chatham Township, Homer Township, Harrisville Township, Liverpool Township, and the Village of Spencer all have Comprehensive or Land Use Plans completed and adopted. Lafayette Township currently has a Plan under development with the assistance of the MCDPS. Some plans can be located through the Planning Service's website, found here. While the degree of environmental involvement varies with each plan, the general concept of preservation of natural areas and the importance of maintaining ecological health is stressed.

Huron County

Huron County has a Comprehensive Land Use Plan, updated in 2007, which could not be located online but the Environmental Planning Standards set in their 2008 Subdivision Regulations, found here, are directly referenced from the Comprehensive Plan. These regulations include recommendations such as prohibiting development within wetlands, conservation easement acquisition, no channelization of streams, and encouraging development of riparian buffers along all streams and tributaries following guidelines of the U.S. Natural Resource Conservation Service (NRCS). The Huron County Planning Commission is staffed by the Huron County Soil and Water Conservation District.

Cuyahoga County

The Cuyahoga County Planning Commission (CCPC) contracts with communities within Cuyahoga County who wish to develop their own Comprehensive Plan. Out of the communities within the Black River watershed, the city of North Olmsted has its own Master Plan, updated in 2005 and found here. This Plan primarily recommends conservation development, as over 90% of the city is developed and the majority of open greenspace, like Bradley Woods Reservation, is already maintained and managed by Cleveland Metroparks.

Conventional subdivision and zoning regulations allow an alternative arrangement of building lots while preserving a significant amount (40%) as permanent open space. Generally, these regulations allow all but the "unbuildable" portions of the property such as 100-year floodplains, wetlands, steep slopes, and stormwater management areas to be developed.

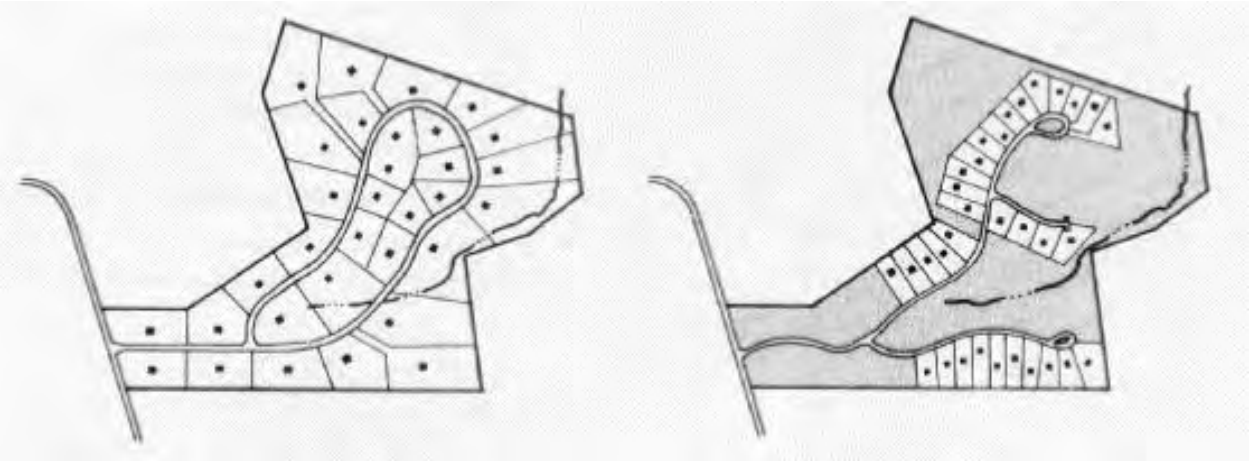


Figure 3: Conventional development (left) vs. conservation development (right). North Olmsted Master Plan, 2005.

Conservation subdivisions can also be part of an overall plan to develop a greenway system through a community. In Figure 3, the illustration on the left shows traditional residential subdivision development. The illustration on the right shows how the same number of lots can be accommodated on the site while preserving environmental features and maximizing open space.
Conservation design takes into account the unique natural features of a site and provides for their permanent preservation. Such features could include wetlands, floodplains, significant wildlife habitats, woodlands, historic sites, and scenic views. Conservation subdivision designs offer several advantages over conventional layouts. Economic advantages include lower costs of infrastructure and design, faster appreciation in value, reduced demand for new open spaces and parks, and environmentally oriented marketing and sales strategies. The environmental and ecological advantages of conservation design include the reduction of storm water runoff, pollutant filtering, protection of natural buffers along wetlands, and maintenance of wildlife corridors.

Conservation development is preferred to preserve the natural ecology in the area and to take into account unique natural and geological features. In the Black River watershed, the opportunity for conservation design will become more prevalent as more and more of the communities within the watershed urbanize and connect to sewage lines. The lot space requirements of home sewage treatment systems hindered conservation design in older communities, but current and future development projects can take advantage of the environmental and economic benefits conservation design and Low Impact Development (LID) has to offer.

The regional planning agency NOACA works with Lorain, Medina, and Cuyahoga County to update their 208 Water Quality Plan for the management of point source and nonpoint source water pollution; Ashland and Huron County's 208 Plan is maintained by the State of Ohio in association with Ohio EPA's Division of Surface Water.

Eleven communities within the Black River watershed already have some form of riparian, watercourse, and/or wetland regulations in place as of November 2010: the City of Lorain, the City of Elyria, the City of Sheffield Lake, Sheffield Village, the City of Avon, the City of Avon Lake, the City of North Ridgeville, the City of Oberlin, Pittsfield Township, the City of North Olmsted, and the City of Westlake. A detailed summary of their codes and resolutions can be found in Appendix E.

In addition, Ohio EPA NPDES Phase II Stormwater Regulations require the development and implementation of stormwater management plans for MS4 communities. MS4 communities in the Black River watershed have completed these plans and are in the process of mapping stormwater management systems, adopting local zoning regulations, and investigating illicit discharges to fulfill further compliance measures.

II. Watershed Plan Development

A. Introduction

The role of the Black River Watershed Coordinator is unique in that the Lorain County Community Development Department provides the local match for the Watershed Coordinator grant from the Ohio Department of Natural Resources. This arrangement permits the Black River Watershed Coordinator a closer connection to County decision-makers than coordinators from other watersheds are oftentimes afforded. Additionally, by housing the Watershed Coordinator with Community Development, the opportunity exists to influence land use and economic development policies in ways to prioritize watershed health.

Direct access to the resources of county government is a valuable asset that can be used to complement local public support. The challenges of watershed management are pervasive enough to require long-term commitments and broad support that come from organized and engaged local participation. Broad stakeholder participation is especially important for the Black River watershed which is characterized by diverse land uses including heavy industry, dense urban areas, large-tract exurban development, a wide variety of agricultural uses, and parkland and conservation areas. Additionally, the citizens who live and work in the watershed represent as wide a variety of interests, socio-economic backgrounds, and other demographic characteristics as can be found in Ohio. Lastly, the sheer size of the watershed itself and the many units of government with jurisdiction over the area necessitates monitoring, asset mapping, and implementation activities from as large a set of stakeholders as can be reasonably managed.

Local, regional, and state watershed professionals are engaged in a continual process to identify, monitor, and map the pollutants, pollution sources, and hydrological impairments that threaten watershed health. The formation of an active and sustainable watershed organization with stakeholder

volunteers who have a vested interest in the health of the areas in which they work, play, and live is the way for engaged citizens to educate their neighbors about the importance of preservation and restoration of water resources within the Black River watershed while using technical, educational, and funding assistance to implement projects that benefits the communities of the watershed.

1. Development of Watershed Group

The building of public support has been initiated through the Watershed Coordinator's engagement at over forty community events and agency meetings through the year 2010. These meetings involved citizens who are committed to the health of the watershed as well as professional and representative stakeholders whose roles make them crucial to the development of a watershed organization that combines professional expertise with informed community leadership.

The recruitment of key stakeholders and other potential partners, especially property owners, has been taking place throughout the past year. Given that half of the East and West Branch sub-watersheds consist of cultivated land, outreach to agricultural agencies such as the North Coast Farm Bureau of Erie, Huron, and Lorain Counties and similar organizations are necessary in order to bring the perspective of agricultural interests to bear on addressing water quality issues. In a state-wide study of runoff (nonpoint source pollution) conducted by Ohio EPA, one stretch of the West Branch was found to be "the most severe case of agricultural nonpoint source pollution ever recorded in Ohio."

In contrast, nearly 60% of the lower watershed (north of Rt. 20) has been developed. The constituency in this part of the Black River watershed will be more focused on issues related to brownfields redevelopment, rapid suburban development, and implementing programs that can be effective without using large amounts of property. This includes citizen volunteers who represent community organizations and homeowner associations as well as business sector supporters.

To elicit further support and elevate watershed health issues into the mainstream, the Watershed Coordinator has been and will continue to provide educational speaking engagements and will seek opportunities to partner with community, educational, business, and trade organizations which can help the broader Black River watershed community make the connection between environmental, economic, and community health.

The task of educating the public and garnering support cannot fall on the shoulders of a single person, nor can it become the task of agency personnel. In order to create positive and lasting change in the Black River watershed, the community needs to be organized either through an existing non-profit entity or the creation of a new 501c3 non-profit organization. This entity or organization would be tasked with giving direction to the Watershed Coordinator. The coordinator would continue to be housed at the Lorain County Community Development Department and would report to the Director of Community Development, especially since Lorain County Commissioners have been providing the local match to the ODNR grant. However, for the following reasons, a separate group of advisors to the Watershed Coordinator is needed to provide guidance as an independent entity from Lorain County Community Development:

- Although the Black River watershed encompasses much of Lorain County, it extends into Medina, Ashland, Cuyahoga, and Huron Counties. Independent direction would permit the addressing of issues that extend beyond county boundaries.
- An advisory group can assist the Watershed Coordinator, especially with fundraising, community outreach, monitoring and data collection, project implementation, and other areas where committee members can work on multiple tasks in a coordinated fashion.
- An advisory group can make independent policy decisions based solely on the needs of the Black River watershed and provide perspectives that are not based on any one particular government or non-profit entity's own mission.

The three options for the formation of this independent advisory group are as follows:

1. Continue with the present ad-hoc committee of advisors: The advantage to this strategy is that the structure is already in place. The ties between the individuals forming this ad-hoc committee can be strengthened through a Memorandum of Understanding that describes the responsibilities and expectations of each member. However, the responsibility for raising funds, gathering resources, and implementing the Watershed Action Plan would reside exclusively with the Watershed Coordinator and Lorain County Community Development. Opportunities for raising funds through foundation grants would be limited by the absence of a non-profit organization structure to accept funding.
2. Develop a Watershed Action Plan Advisory Committee that is a subcommittee of an existing Non-Profit Organization: An existing organization can take on the responsibility of providing oversight to a Black River watershed group which would effectively become a subcommittee to the existing organization's board of directors, provided that the mission of the parent organization is compatible with the roles and responsibilities of the Black River watershed group and that the board of directors agrees to such an arrangement. The advantage of this strategy is that it would provide immediate support to the watershed group by serving as the group's fiscal agent while providing technical expertise and immediate credibility. Furthermore, the parent organization's 501(c)(3) status would allow the watershed organization to immediately be eligible for funding that is not available to local government entities. However, this path of action has two possible disadvantages: it relies on the constancy of the parent organization to be able to support the mission of the watershed group on a long-term basis and over the tenures of various boards of directors, and it opens up the possibility that the goals and/or actions of the parent organization may be at odds with those of Lorain County Community Development.
3. Create a new Black River watershed Organization: While this option would take the most time and effort to organize, the advantage of creating a new non-profit organization is that it would provide the independent authority and focus needed to address the multiple issues besetting the Black River watershed. A new 501(c)(3) would be eligible for funding opportunities that Lorain County Community Development cannot apply for. It would be able to exclusively educate the public and gather funds and in-kind resources devoted to the Black River. One danger is that there may be the perception that the goals of a new Black River watershed

organization would have too much in common with an existing organization such as the Black River Remedial Action Plan. Discussions with the Black River RAP should take place to see whether having a separate organization would create redundancies, and if it doesn't, how this new organization would collaborate with the Black River RAP.

2. Recommendations

The current group of Black River watershed stakeholders should be convened as a working group to explore the above three options. If needed, this working group should augment its capabilities and scope by recruiting members who would provide the group with the necessary geographic diversity, citizen involvement, and skills that mirror the diverse circumstances present in the watershed. This group would consult with Lorain County Community Development, the Black River RAP, ODNR, NOACA, Ohio EPA, and other key stakeholders to identify the key parts of the Watershed Action Plan to focus on, and to determine the organizational structure that would best support the goals of the Watershed Action Plan.

Regardless of the organizational structure chosen and initiated by the working group, the following principles should be followed:

- It should be an independent group that provides oversight and support to the Watershed Coordinator
- It should include representation from throughout the watershed as well as professional and citizen representation that reflects the land use issues of the watershed
- It should have the capacity to raise funds, provide educational outreach, act as a liaison between the group and community, government, environmental, educational, and business entities, and provide data and scientific support.
- The group should have a president, treasurer, and secretary, take regular minutes, be open to and actively engage with the general public, and be governed by consensus.
- The group should provide significant support to the Watershed Action Plan, including the refinement of the plan, the implementation of its recommendations, and the eventual evaluation and updating of the plan.

B. Watershed Partners

1. Watershed Residents, Landowners
2. Local businesses/industries, regulated community: Petitti, Spitzer, Filtrexx, Ford, etc.
3. Local and state government agencies: ODNR, Ohio EPA, NOACA, NRCS, SWCD, County Commissioners, Municipal Governments (City Engineers, City Service Directors, Mayors), regional Storm Water Utility, regional WWTPs, County Metroparks, County and City Health Departments
4. Nongovernmental organizations: Izaak Walton League, Black River RAP, WRLC, Audubon Society, FOWL (Friends of Wetlands)
5. Community organizations: Black River and Lorain County Historical Societies, Rotarians, etc.
6. Educational institutions or educators: Oberlin College, Lorain County Community College

7. Others (LCPIPE, SUAB, NEOPIPE, New Agrarian Center/George Jones Farm, etc.)

C. Mission Statement

As a part of its formation, the future Black River watershed group should craft and adopt its own mission statement. Until such an entity is formed, a suggested mission statement is as follows:

> *To restore and protect the environmental resources of the Black River watershed through a collaborative and science-based approach that improves the ecological, economic, and community health of all of its present and future inhabitants.*

D. Organizational Structure

The ultimate organizational structure of the group will be determined by the members themselves. However, the structure will take into account and delineate these factors:

1. Legal Status
2. Partner Roles/Responsibilities
3. Operational Procedures and Bylaws
4. Group Decision-Making Process

Contact Information
Watershed Coordinator
Lorain County Community Development Department
226 Middle Avenue, 5th Floor
Elyria, Ohio 44035
440-328-2336

E. General Plan Contents

1. Plan Outline

The Black River Watershed Action Plan utilizes ODNR Appendix 8 guidelines and the existing Black River 2008 TMDL to discuss watershed impairment problems and focus on realistic problem solving strategies for implementing projects to restore habitat, stream function, and water quality to the watershed. These implementation projects will also employ an aggressive educational campaign to promote a watershed-based approach to local decision-making processes. Environmental concerns are no longer a stand-alone issue; watershed health needs to be integrated with community health.

The plan includes a comprehensive inventory of the Black River watershed and (Section III), with a discussion of specific impairments to water quality within the watershed (Section VI). The watershed inventory includes all fifteen 12-digit subwatersheds in the Black River watershed as well as some

discussion of certain near-shore tributaries of Lake Erie. Detailed problem statements and long-term goals for each subwatershed follows (Section V). Action items and short-term goals for implementation are included (Section VI) for the nine subwatersheds within which water quality impairments are the eight subwatersheds that highest (See Table 46; Page 159).include all subwatersheds within the West Branch Black River, Willow Creek, French Creek, and the Black River mainstem. Implementation of Coastal Non-Point Control Measures is discussed in Section VII. Plan evaluation is discussed in Section VIII and plan updates and revision is described in Section IX.

2. Endorsement of Plan by Key Watershed Partners

Key watershed partners are identified in this plan as ODNR, Ohio EPA, SWCDs located within the watershed, land conservancy groups, non-profit organizations, and potential other sources of funding for implementation of the goals and strategies set forth within the Watershed Action Plan.

3. Endorsement of Plan by Local Units of Government

Endorsement of the plan will be sought by the governing bodies of all partner jurisdictions. This plan will be presented in its entirety to local governments after review by the Ohio EPA and ODNR; however, local officials are already being included in the initial development and feedback process. The Black River Watershed Action Plan will be a framework to accelerate the need to integrate environmental health and community health into future decision making processes.

4. Information/Education Component

Communication and education outreach is an ongoing action through the planning and implementation process. The watershed coordinator is already active in both local and regional Public Involvement Public Education (PIPE) groups operating within the Black River watershed, and assists MS4 communities with their PIPE requirements. A series of public education banners were developed for the Black River watershed to inform local citizens of measures they can take around their homes and in their communities to maintain water quality. The watershed coordinator has prepared and distributed fact sheets to both elected officials and the general public, with content ranging from the current status of the Black River watershed to the importance of mitigating stormwater in both urban and rural environments. An email newsletter has been developed to keep interested parties informed of the state of the watershed and the planning process, and a Facebook and web site are maintained by the watershed coordinator which aid in fostering a sense of community and interaction among stakeholders. In addition, the coordinator has spoken at and will continue to speak at local and regional events regarding the water quality issues at play within the watershed and what actions can be taken to solve those issues.

As the action items are being developed, members of the community are being invited to review and provide valuable feedback. Future watershed meetings will be held to focus on the concerns of specific groups, such as developers, businesses, the agricultural community, and the general public; thus the finalized plan will be able to provide well-rounded and comprehensive strategies that all levels of stakeholder can be invested in.

The formation of a watershed partnership will be one of the final results of this planning process. The partnership will contain stakeholders from all levels of community within the watershed and will be kept apprised of new developments within the watershed. The partnership will be involved and help involve others in watershed actions and activities such as stream cleanups, watershed festivals, and education of the general public in watershed health.

III. Watershed Inventory

A. Description of the Watershed

1. Geology

Topography and Geological Features
The Black River watershed exhibits flat to gently-rolling topography. The highest point in the basin is in Lodi at 1,138 feet above sea level, and slopes downward 500 feet in elevation to the mouth in Lorain located 572 feet above sea level. The maximum slope of the Black River is about 29.8 feet/mile at Charlemont Creek. The average gradient of the watershed ranges from approximately 9.5 feet/mile in the East and West Branches to 7.6 feet/mile in the lower French Creek and Main-stem sub-basins. There are some steep valleys located along streambanks, old beach ridges, and a natural waterfall at the East/West Branch confluence in Elyria, but as Map 3 shows the relief of the region is generally low. The flatness of the topography limits the overland transport of water and encourages the formation of flooded zones and wetlands in low-lying areas.

Map 3: Elevation and Shaded Relief (See Appendix A).

Ecoregions

From EPA's Ecoregions site:

According to Omernik's (1987) ecoregion designations, the majority of the watershed is located within the Erie-Ontario Lake Plain (EOLP) ecoregion. A small portion of the West Branch sub-watershed is located within the Eastern Corn Belt Plains (Clayey, High Lime Till Plains). The EOLP is a Level III designation, one of five in Ohio. It is further broken down within the watershed into two Level IV ecoregions, the Erie Lake Plain in the northern, lower reaches of the watershed and the Low Lime Drift Plain in the southern, upper reaches of the watershed.

Map 4: Ecoregions (See Appendix A).

The Erie Lake Plains feature very low-relief (10') surficial remnants of ancestral Lake Erie shorelines running west to east inland of the present Lake Erie, with lower-lying areas in between. The low-lying areas to the west by Sandusky were once the eastern extent of the Great Black Swamp, a large wetland complex approximately the size of Connecticut that covered most of the coastal central and northwestern Ohio and extended as far west as Detroit. The ancestral shorelines, or beach ridges, were used as transit routes through the wetlands by Native Americans and early settlers. The wetland areas

were later drained beginning in the late 1800s to provide arable land and support increased agriculture, as the unique lake-modified climate extends the growing season several weeks longer than that of inland regions. Common industries in this region are fruit and vegetable farms, nurseries, and factories.

The southern portion of the watershed consists of the Low Lime Drift Plain, characterized by a low, rolling landscape punctuated by glacial features like end moraines and kettle lakes. Its soils are less fertile and need to be drained in order to be agriculturally viable. Dairy, livestock, corn, and soybean farms are common, and the growing season is shorter than that of the Erie Lake Plain.

Sections of the watershed are underlain by the Berea Sandstone, whose resistance to erosion created features on the landscape known as "whalebacks:" poorly-drained low-relief (10-20') sandstone rises approximately 0.5-2.5 miles long and 20-60' high.

Soils

Table 5: Soils in the Black River Watershed.

Source: USDASCS/ODNR General Soil Map of Lorain County, Ohio 1972 compilation

Soil Association	Description
Mahoning-Trumbull-Ellsworth	Deep, nearly level to moderately steep, mainly somewhat poorly drained soils on the till plain.
Orrvile-Lobdell-Chagrin	Deep, nearly level, somewhat poorly drained to well drained soils on bottom lands.
Fitchville-Luray-Sebring	Deep, nearly level, somewhat poorly drained to very poorly drained soils on the lake plain.
Allis-Mitiwanga-Miner	Shale substratum, association: Moderately deep and deep, nearly level to gently sloping, somewhat poorly drained to very poorly drained soils underlain by bedrock at a depth of 2-5 feet on uplands.
Haskins-Jimtown-Oshtemo	Deep, somewhat poorly drained and well drained, nearly level to gently sloping soils on beach ridges, outwash plains, and stream terraces.
Mahoning-Miner	Deep, nearly level to gently sloping, somewhat poorly drained and very poorly drained soils on the till plain and the lake plain.

Mahoning-Trumbull-Ellsworth silt loam soil associations represent just over 60% of the soils within the

Low Lime Drift Plain eco-region of the watershed. Mahoning and Ellsworth soils are glacial till in origin, classified as poorly to somewhat poorly draining soils. Generally these are comprised of medium to fine textured silt loams or silty-clay loams. Such soils are typical of the low-relief, gently rolling landscapes found within the upper headwaters region of the watershed and are classified as highly erodible.

Map 5: Hydric Soil Distribution (See Appendix A).

Hydric Soils

Hydric soils are poorly and very poorly drained soils that formed in low-lying or restricted drainage areas and are formed over long time periods by standing water and/or saturated soils. They tend to be associated with wetlands but are generally more extensive. Many hydric soils are seasonally inundated in the early spring and have saturated soils for only a portion of the growing season. This is sufficient for the soils to develop hydric characteristics, such as anaerobic conditions in the upper parts, and support hydrophytic vegetation. In Lorain County, approximately 70,000 acres are classified as hydric soils, and another 192,000 acres contain non-hydric soils with hydric inclusions.

The Trumbull soil association is hydric in nature, and occurs in geographic depressions and other drainage areas within the upper two-thirds of the watershed. It is naturally poorly to very poorly draining and characteristic of wetland areas. In many areas within the Black River watershed, Trumbull soils have effectively lost their wetland characteristics as a result of agricultural activities and active artificial drainage such as tiled fields.

Miner and Lorain soils are also associated with Mahoning and Ellsworth silt loams. These soils have seasonally high water tables, low permeability and are hydric in nature. As a result, these soils present severe limitations for HSTS and are a cause of wet basements for many homeowners.

Within the Lake Plain portion of the watershed, the Haskins-Jimtown-Oshtemo soil associations are characteristic of the beach ridges, outwash plains and stream terrace areas. They are deep soils, somewhat poorly to very poorly drained and flat to low-relief. These soils are found only in the northern parts of the watershed, and are primarily used for horticultural cultivation and residential development.

Also associated with the Lake Plain are extensive swales of poorly to very poorly drained hydric soils. Such swales are found between the ancient beach ridges formed by lakes ancestral to present day Lake Erie. Historically, these flat areas have been extensively drained and used for agricultural production. Within the past decade much of this area, located primarily in the Black River (041100010602), French Creek (041100010601) and Heider Ditch-Frontal Lake Erie (041100010603) 12-digit HUCs, has been and continues to be converted to extensive residential, commercial and industrial uses. The increased impervious surfaces coupled with the already poorly-draining hydric soils cause serious flooding problems for the communities in this area.

Directly south of the City of Lodi and the glacial end moraines that surround the community park is a large expanse of land known as “muckland.” This muckland is a product of geology and glaciation. The glaciers created the terminal moraines evident in Lodi. The hillier terrain created by these moraines surrounded lower elevation areas. Here, water would tend to drain off of the moraines and become trapped in large expanses called “mucklands,” which attracted species typically encountered in bogs or prairie kettles. Peat moss would grow in these wet conditions. The thick root masses in peat moss

accumulate and decompose slowly, eventually creating a thick, springy mat of sphagnum moss. Other sedges and aquatic grasses emerge in these saturated open conditions, as well as swamp forest species such as elm, ash, or pin oak. The organic matter from these plants shedding their leaves or dying off accumulates in the waterlogged soils. Because decomposition of organic matter requires oxygen-rich conditions, this material would decompose very slowly, eventually creating a thick boggy mat.

As areas in the southern watershed were drained for agriculture, the water table descended rapidly, exposing large stretches of very black, organic-rich soils, 20-30 feet thick in some areas. If drained, the rich organic content creates a friable, loose soil rich in nutrients that can be ideal for crop growth. Mucklands define large expanses that contain highly organic soils. The central part of the Black River watershed contains remnant bogs or kettle holes that are defined by similar organic soils. One such bog, Camden Bog, lies about 10 miles west of Oberlin. Owned by Oberlin College, Camden Bog was created when a large hole formed in the ground and filled with glacial ice. As the glaciers expanded, the ice would be driven downward, expanding the hole. As the glaciers melted, these holes would fill with water and create a boggy environment much like those encountered in the mucklands, but on a smaller scale. Bogs are not encountered in Lake Plain soils north of Oberlin;the wave action of the ancestral lakes that preceded Lake Erie sorted sand and clay materials which eventually filled in the topography in that region.

Bedrock and Glacial Geology

Map 6: Bedrock Geology (See Appendix A).

The oldest visible bedrock in the watershed is the Ohio Shale, a brittle shale formed approximately 360 million years ago during a late Devonian marine transgression and composed of black clays and silt particles carried from the ancestral Appalachian mountains to the East. Only about a hundred feet of the Ohio Shale is exposed within the Black River watershed.

The three major bedrock exposures within the watershed are the Mississippian-age Bedford Shale, Berea Sandstone, and Cuyahoga Formation. They were formed 320-345 million years ago as the deeper, offshore waters of the Devonian period regressed to a nearshore deltaic environment. Evidence of bioturbation and wave ripples can be seen in the rock facies and larger sand particles predominate over fine clays and silts.

The oldest Mississippian exposure is the Bedford Shale, directly overlying the Ohio Shale. It is a soft, reddish-colored formation that can be seen exposed downstream from the sandstone falls at Cascade Park in Elyria.

Overlying the Bedford Shale is the Berea Sandstone, a porous but durable quartz sandstone that ranges in color from gray to buff and has been utilized as a building material not only in Lorain County but throughout the United States. It resists erosion and can be found naturally exposed as escarpments in the falls at Cascade Park, as “whaleback” ridges in the northern portions of the watershed, and artificially exposed in the many sandstone quarries that remain from Lorain County’s historic sandstone industry. Ancient wave ripples from the nearshore

Figure 4: Falls at Cascade Park (Ted Conlin).

Mississippian seas can be seen within the Berea Sandstone, and it is found across Northeast Ohio in varying thicknesses (10-200').

The Cuyahoga Formation consists of blue-gray shales and is found primarily exposed in the southern headwaters portion of the watershed. It can be fossiliferous in places and can also contain fine-grained sandstone banding.

Map 7: Primary Lithology (See Appendix A).

About 2 million years ago during the Pleistocene, a series of glacial advancements and retreats known as the Wisconsin Glacial Episode repeatedly covered nearly two-thirds of Ohio under thick sheets of ice. The last of these glacial advancements, the Tioga, reached its maximum extent approximately 21,000 years ago. These glacial ice sheets were very powerful, scouring and leveling the landscape that had formed during the 300 million years since the end of the Mississippian period. Ancient hills and valleys that had existed for millions of years were flattened and filled with glacial debris. As the glaciers advanced and retreated, they left behind primary deposits of this debris, an unsorted, usually unconsolidated mixture of sediments that range in grain size from silt to boulders, known as glacial till. This till forms a substantial layer over most of the Black River watershed, averaging 50 feet thick in most areas.

The Wisconsin ice sheet left large quantities of till behind as it receded from the region. Where the glacial retreats slowed, thicker deposits of till were deposited. These deposits are now seen in the form of low ridges called moraines. The rolling hills in the more southerly, upper reaches of the watershed are representative of this geologic feature. There are two terminal or end moraines found here, known as the Defiance and Spencer Moraines, which mark the southernmost extent of the Wisconsin advance.

B. Biological Features

The Black River basin is home to at least 37 species of mammals, 7 species of turtles, 10 species of snakes, and 17 species of frogs, toads, and salamanders. It supports a wide variety of breeding and migratory birds, with at least 106 species of birds observed within the watershed to date. Riparian corridors along the river are favorite nesting locations for many bird species; for example, the main-stem portion of the Black River near the City of Lorain and sections of the East Branch support habitat for several blue heron rookeries.

1. Rare, Threatened, and Endangered Species

Rare and threatened species for the Black River watershed were identified through a request to the ODNR's Division of Natural Areas and Preserves Natural Heritage Database on May 5, 2010. Arc shapefiles showing locations of sensitive species, species assemblages, and important bird areas were obtained from DNAP and the Audubon Society and combined with data-layers obtained through ODNR's Office of Coastal Management's GIMS department and the Lorain County Auditor's GIS department to create a Sensitive Species and Conservation Area map.

Map 8: Sensitive Species and Conservation Areas (See Appendix A).

Table 6: Rare Plant Species.

Source: ODNR DNAP Natural Heritage Database, 2010-2011 Rare Native Ohio Plants List

Rare Plant Species in the Black River Watershed

Species Name	Type	Status
Phegopteris connectilis (Long Beech Fern)	Vascular	P
Castanea dentata (American Chestnut)	Vascular	P
Carex louisianica (Louisiana Sedge)	Vascular	E
Shepherdia canadensis (Canada buffalo-berry)	Vascular	P
Thuja occidentalis (Arbor Vitae)	Vascular	P
Poa paludigena (Marsh Spear Grass)	Vascular	P
Carex bushii (Bush's Sedge)	Vascular	T
Glyceria acutiflora (Sharp-glumed Manna Grass)	Vascular	T
Cornus rugosa (Round-leaved Dogwood)	Vascular	P
Carex cephaloidea (Thin-leaved Sedge)	Vascular	P
Woodwardia areolata (Netted Chain Fern)	Vascular	P
Plagiothecium latebricola (Lurking Leskea)	Nonvascular	T

Key: P=Potentially Threatened, T=Threatened, E=Endangered.

Table 7: Rare Animal Species.

Source: ODNR DNAP database, US Fish and Wildlife Service Data (September 2009)

Rare Animal Species in the Black River Watershed

Species Name	Type	Status
Myotis sodalis (Indiana Bat)	Mammal	FE
Charadrius melodus (Piping Plover)	Avian	FE
Sistrurus catenatus (Eastern Massasauga)	Reptile	CS
Oxyura jamaicensis (Ruddy Duck)	Avian	SI
Notropis heterolepis (Blacknose ShinerBlacknose Shiner)	Fish	E
Notropis dorsalis (Bigmouth Shiner)	Fish	T

Cistothorus platensis (Sedge Wren)	Avian	E

Key: P=Potentially Threatened, T=Threatened, E=Endangered, SI=Special Interest, FT=Federally Threatened, FE=Federally Endangered, CS=Candidate Species.

Rare and threatened animal species are not as well-documented as plant species within the watershed. DNAP data described two species: the ruddy duck (*Oxyura jamaicensis*) and the blacknose shiner (*Notropis heterolepis*).

The ruddy duck is designated a Special Interest species and the blacknose shiner is designated an Endangered species. The most recent ruddy duck sighting in the DNAP Heritage Database was at the Sandy Ridge Reservation, located in the Black River Main-stem (041100010602) in 1999. The blacknose shiner was last documented in an approximately 2-mile long segment of reach in the Coon Creek (041100010303) sub-watershed located within the headwaters region of the East Branch back in 1977. DNAP sensitive species and habitats data also described several great blue heron rookery locations along the Black River main-stem and the East Branch sub-watersheds.

Since the 1980's, the number of active blue heron nesting sites along the main-stem of the Black River has been increasing. In the early 1990's, a major rookery was identified on the property of the then USS/KOBE steel company along the main-stem of the Black River. Increased sightings of herons have been reported in places where nesting and foraging does not typically take place (such as urban settings or industrial sites). Nonetheless, the location of a heron rookery on the steel plant property indicates improvements in water quality conditions, as herons. Herons require sizable fish populations to support their feeding habits.

In addition to herons, several great egrets have also been observed. Similar to the heron in stature and physique, these large, white-feathered birds feature straight yellow beaks and black legs and feet. USS/KOBE has been providing annual updates on blue heron rookery populations nearof its facility along the Black River main-stem.

Records from 1994 describe an endangered bird, the sedge wren (*Cistothorus platensis*), nesting along Charlemont Creek, but no recent sightings have been reported. River otter tracks were identified during a 1993 wildlife census, but there are no documented sightings of river otters within the watershed. A federally endangered mammal and a candidate species reptile, the Indiana bat (*Myotis sodalis*) and the the eastern massasauga (*Sistrurus catenatus*) respectively, have ranges throughout the state of Ohio including the Black River watershedWatershed.

A population of bigmouth shiners (*Notropis dorsalis*) has been identified in the West Branch subwatershed of the Black River. There are currently only two rivers in Ohio that are known to have native bigmouth shiner populations, the Black and the Rocky. It is therefore critical to the future of these native fish populations that water quality and habitat be improved within the West Branch subwatershed.

A 1998 ODNR study examined changes in fish populations in the Black River between 1992 and 1994 and concluded that the probable cause of fish community losses was excess turbidity resulting from siltation. The "lost" species were all classified as silt-sensitive, with silt-tolerant species such as creek chubs,

common shiners, white suckers, green sunfish, and blacknose dace dominating the local populations. Sediment control is integral to the restoration of healthy fish populations within the Black River.

2. Invasive Species and Their Effects on the Watershed

Table 8: Invasive Species.

Source: The Nature Conservancy's Targeted Invasive Species List

Targeted Invasive Species – Ohio	
Common Name	**Scientific Name**
Autumn olive	*Elaeagnus umbellata*
Glossy buckthorn	*Rhamnus frangula*
European buckthorn	*Rhamnus cathartica*
Reed grass*	*Phragmites australis*
Garlic mustard	*Alliaria petiolata*
Amur honeysuckle**	*Lonicera maackii*
Japanese honeysuckle	*Lonicera japonica*
Morrow honeysuckle	*Lonicera morrowii*
Tatarian honeysuckle	*Lonicera tatarica*
Japanese knotweed	*Polygonum cuspidatum*
Multiflora rose	*Rosa multiflora*
Purple loosestrife	*Lythrum salicaria*
Reed canary grass*	*Phalaris arundinacea*

**These species may have native and non-native strains. **As of 2004, this species has not been found in Lorain County.*

Figure 5: Multiflora Rose.

These species are designated "targeted" by ODNR and Ohio EPA out of the approximately 100 invasive species in Ohio, meaning they are the most difficult to control and are highly invasive in Ohio's natural areas. Invasive and nuisance species within the Black River watershed include foxtail grasses, cocklebur, colt's foot, flag grass, multiflora rose, phragmites, and garlic mustard. The multiflora rose has become particularly troublesome because it can colonize fallow fields and render them unsuitable for grazing.

Poor management of land within the watershed places stress

upon the native flora and fauna and leaves them vulnerable to invasive species. Removal of these invasive plants is time-consuming and costly to landowners. Implementation of best agricultural management practices for both remedial and preventative purposes will go a long way towards protecting, restoring and maintaining the natural ecology of the riparian areas and waters of the Black River.

Encouraging the initial planting and long-term maintenance of native species wherever possible, from small home garden projects to large-scale road construction and subdivision development, would be an effective preventative measure to curb the likelihood of invasive species taking hold in potentially vulnerable areas.

C. Water Resources

1. Climate and Precipitation

The climate of the area is classified under the Köppen-Geiger system as Dfa, or "Hot summer subtype." It is characterized by average temperatures of 79-86 degrees F during the mid-late summer months and about 26.6 degrees F (or colder) during the winter months, and predominantly humid with very few arid days. There are distinct seasons (warm-hot summers and cold winters), frequent precipitation, and rapid variability of different weather systems. These features are indicative of a zone of conflict between polar and tropical air masses.

The proximity of Lake Erie also has an influence on the region's climate, most notably in the "lake effect" snowfall experienced by areas closest to the lake during the winter months. In addition, the lake acts as a sort of temperature buffer, keeping temperatures relatively stable during the various seasons. For example, the winter months can get very cold but rarely do the temperatures reach subzero conditions. Precipitation in the area can vary but is generally well-distributed throughout the year.

Table 9: Black River Climate Statistics.

Source: ELYRIA 3 E, LORAIN COUNTY data derived from NCDC TD 9641 Clim 81 1961-1990 Normals.

Black River Basin Average Monthly Precipitation and Temperature

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Yearly
Average Rainfall (inches)	2	2	2.8	3	3.6	3.8	3.3	3.4	3.2	2.5	3.2	3.1	35.9
Max Avg Temp (°F)	34.2	37	48.7	61.2	72.3	81.5	84.9	82.9	77	65.3	51.8	38.8	61.3
Min Avg Temp (°F)	18	19.4	28.9	37.9	47.8	57.2	61.3	60.3	54.1	43.3	35.1	24.4	40.6

Map 9: Average Precipitation (See Appendix A).

On average, the Black River watershed experiences about 36 inches of rain and 43 inches of snow a year. The majority of the rain, approximately 68%, is absorbed into the ground through infiltration. About

26% becomes run-off immediately into surface-water. Of that 68%, the majority enters the soil and is later returned to the atmosphere through evapotranspiration. The rest (about 6 inches) goes initially into the groundwater supply, but a percentage of that eventually enters surface-water bodies as groundwater discharge. What remains goes either into the air by evapotranspiration or is used to supply water needs (Brown, 1990).

The hydrologic cycle, when functioning properly, is an essential balance in the interactions between the air, the ground, the biota, and surface water. This balance of interactions is disrupted by anthropogenic stresses on the environment, such as increases in impervious surface from rapid urbanization. Less water is then absorbed into the ground and instead is diverted through storm sewers to the nearest available surface-water body at an unnatural volume and velocity, leading to issues like flashy flooding and untreated pollutants entering the system. An understanding of the need for proper functioning of the hydrologic cycle is essential in order to make good decisions for the protection and long-term use of the Black River's water resources.

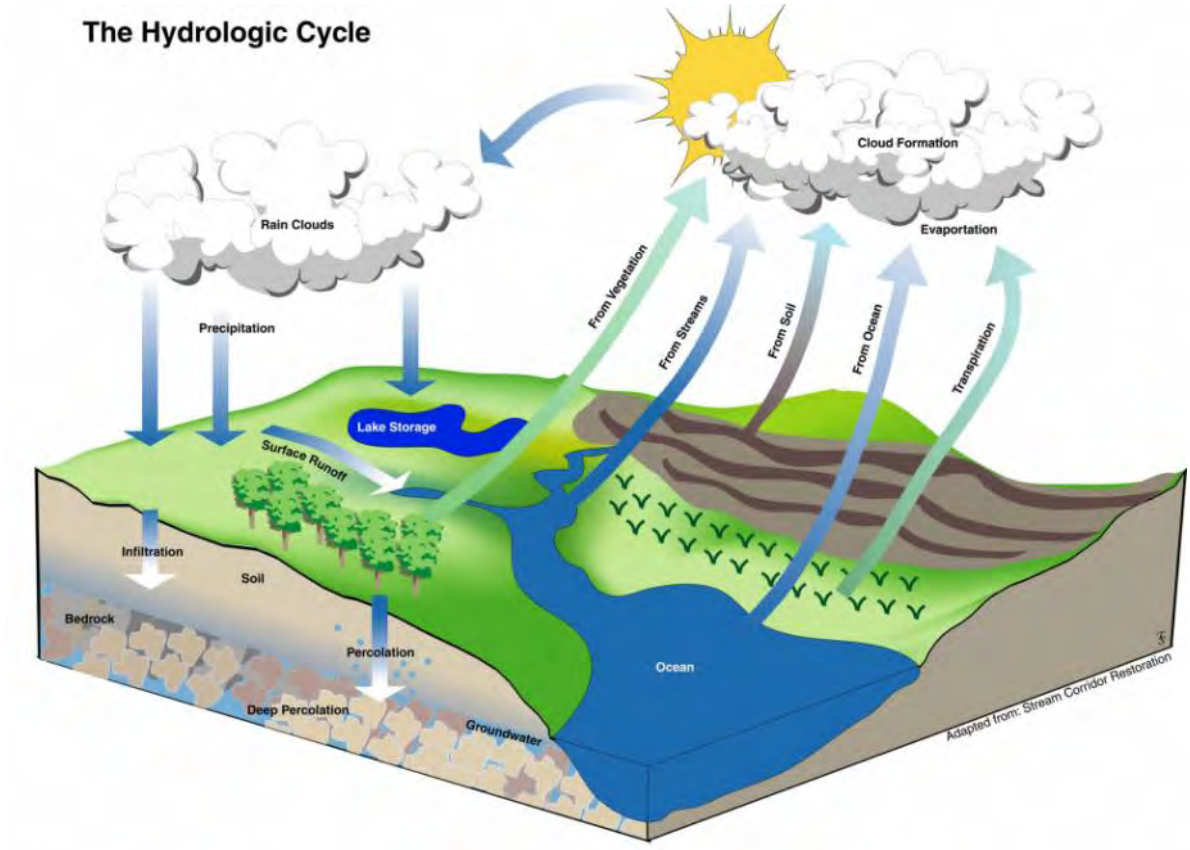


Figure 6: The Hydrologic Cycle (Tom Schultz).

(http://www.buffer.forestry.iastate.edu/Photogallery/illustrations/illustrations-1.htm)

2. Surface Water

Sources of surface water pollution in the Black River basin include sediment runoff from residential development, construction sites, and agricultural lands. All of these activities are considered non-point

sources of pollution; that is, sources where the definitive origin is not easily identified. Point sources of pollution, on the other hand, are pollution sources with easily identifiable origins. Many of the streams within the watershed have been dredged and channeled over a period of many years to drain adjacent wetlands and to make the rich alluvial soils suitable for farming.

Sanitary wastes, if not properly controlled, threaten both groundwater supplies and the "primary contact recreation" designation of streams. The ecological impacts of sanitary treatment using on-site septic systems tend to worsen with an increasing populace and with a greater occurrence of poorly maintained systems. Properly sited and maintained systems can treat water effectively and not significantly threaten water quality. However, septic tank effectiveness strongly depends on site conditions and regular inspection and maintenance.

Wetlands

Wetlands serve a vital role in regional hydrology by acting as the detention and filtration points to eliminate toxins and contaminants from entering waterways. Ohio has lost nearly 90% of its wetlands since the 1780's; one of the highest loss rates in the United States. What remains, with the exception of a few large tracts of marshland in Ottawa, Sandusky, Lucas, Ashtabula, Geauga and Trumbull Counties, is fragmented and scattered in small, typically wooded tracts. Analysis of the Ohio Wetland Inventory indicates that Ashtabula, Geauga, Lorain, Portage and Trumbull counties have the largest acreage of wetland area, which given that only about 8.6% of Lorain County is classified as wetland is a strong reminder of just how much wetland Ohio has lost. Effective preservation of what little wetlands we do have left and proper restoration or mitigation of critical sites is essential to the health of the Black River.

Estimates based off of National Wetland Inventory data indicate that there are approximately 10,259.6 acres of wetlands remaining in the Black River watershed. A comprehensive listing of wetlands by quality does not exist for the watershed; however, about 405 separate sites exist that are 5 acres in size or more for a total of 5,780 acres. Of those 5,780 acres, 992.4 are already under managed or protected land. The remaining 4,787.6 acres should be assessed and prioritized for future conservation.

Map 10: Wetlands (See Appendix A).

The Black River watershed has lost a substantial portion of its natural wetlands, and preservation of whatever original wetland remains is an obvious and ideal first choice. We can, however, also view the current situation as a tremendous potential for wetland restoration and recovery. Ohio's "no net loss" wetland policy often results in the removal of a wetland in one area and "restoring" it in an area that is sufficiently far away as to completely eliminate any functional ecological benefit for the original location. While it is true that the new location may be a viable place to sustain a wetland ecosystem, the old location will now suffer the loss of an area that served a vital role in preserving water quality and controlling water quantity.

Of particular concern are those portions of the Black River watershed that are rapidly developing as they already experience problems relating to loss of detention and retention areas and are incapable of handling large storm water events without experiencing flooding. Wetlands also serve as sediment sinks to trap and hold excessive sediment before it enters the waterways. Restoration of riparian wetland areas in key locations around the watershed floodplain would solve many of the attainment problems encountered within the Black River watershed.

Wetland Mitigation Banks

The Sandy Ridge Mitigation Bank and the Wellington Reservoir Mitigation Bank are Ohio EPA-listed mitigation banks within the Black River watershed. The Sandy Ridge site has sold all of the available credits as of October 2010 and is listed as inactive, but the 50-credit total Wellington Reservoir is still active and services mitigation from the Black-Rocky, Huron-Vermilion, and Cuyahoga River watersheds. Outside of the watershed, the 85-credit total Edison Woods bank in Erie County services mitigation from the Black River.

The 105-acre Elmwood Wetland Preserve in the City of Lorain preserves existing wetlands and offers a potential mitigation site for additional wetland restoration. The City of Lorain hopes to use the preserve to generate revenue by selling wetlands credits to developers; the market price per credit was estimated at $20,000.

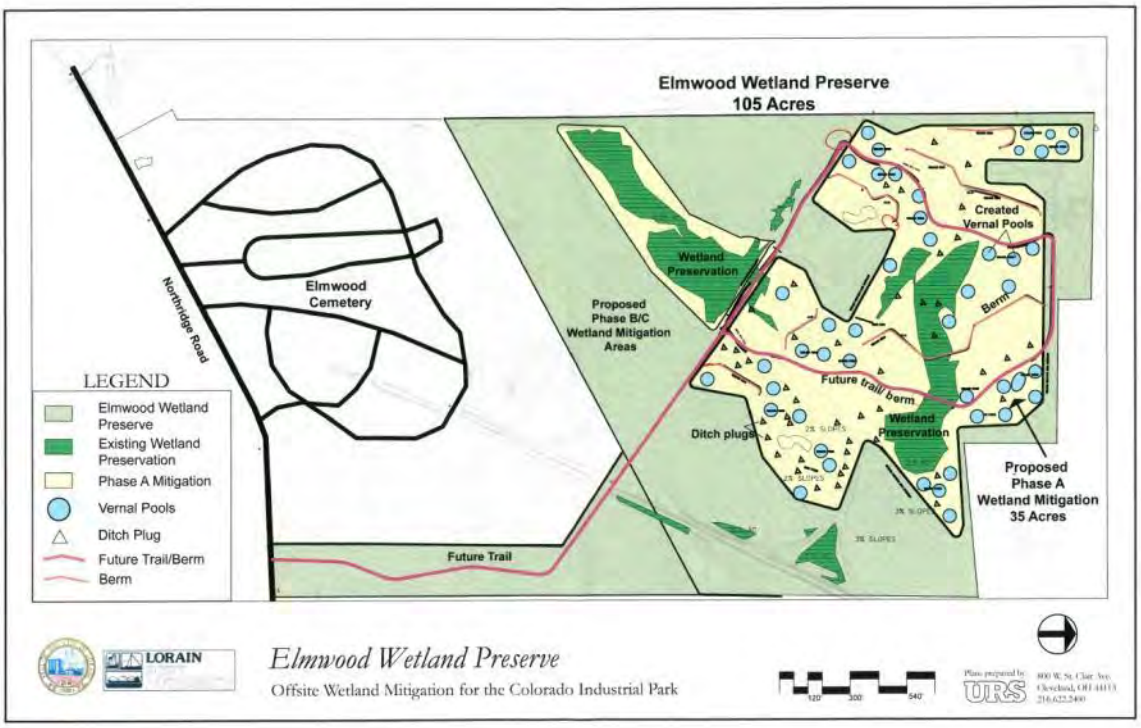


Figure 7: Elmwood Wetland Preserve.

Streams and Tributaries

The West and East Branches join to form the Main-stem at their confluence at Cascade Park in the City of Elyria. Ohio EPA designated Principal Streams (draining >50 mi^2 but less than 500 mi^2) are the Black River, the West Branch Black River, and the East Branch Black River. Major tributaries of the Black River are French Creek, Wellington Creek, Charlemont Creek, Plum Creek, and Buck Creek. Minor tributaries include Salt Creek, Crow Creek, Coon Creek, and Jackson Ditch. A considerable network of headwater streams (draining < 1 mi^2) are located in the upper reaches of the watershed, primarily in the southern Headwaters East Branch (0411000103) and West Branch (0411000105) sub-watersheds.

Table 10: Stream Statistics.

Source: Streamstats (http://streamstats.usgs.gov), ODNR DSW's WAU Summaries, and the Gazetteer of Ohio Streams.

Stream Statistics for the Black River and Major Tributaries

Name	Stream Code	Flows Into	Designated Use	Length (miles)	Average Fall (ft/mi)	Drainage (mi^2)	Mean Annual Flow (cfs)	10 Year Peak Flow (cfs)
Black River	136	Lake Erie	WWH	73	7.6	470	446	14900
East Branch Black River (w/ W. Fork)	136.02	Black River	WWH	56.7	9	222	305	8950
West Branch Black River	136.03	Black River	WWH	37.8	9.9	174	163	6930
French Creek	136.01	Black River	WWH	15.8	13.1	38.8	51.9	1990
Plum Creek	136.0301	West Branch	WWH	7.3	14.7	13.6	11.8	1160
Wellington Creek	136.0303	West Branch	WWH	17.6	21.6	29.7	27.5	2150
Charlemont Creek	136.0304	West Branch	WWH	11.5	29.8	25.9	24.1	2090
Buck Creek	136.0305	West Branch	WWH	7.5	22.9	8	7.41	1060

Lakes and Reservoirs

There are no natural lakes greater than five acres within the Black River watershed. A list of public-access lakes was obtained from Ohio EPA's Ohio Water Resource Inventory as well as the FindLakes database. Where possible, estimates of detention times were calculated by dividing storage by discharge.

Table 11: Lakes and Reservoirs.

Source: Ohio Water Resource Inventory, Vol.3: Ohio's Public Lakes, Ponds & Reservoirs, 1996; FindLakes.com Database

Black River Public Lakes and Reservoirs with Surface Area > 5 Acres

Name	Surface Area (acres)	Lake Use[1]	HUC Sub-watershed	Detention Time (hours)	Lake Type[2]	Max Storage (acre-feet)	Max Discharge (ft^3/s)

Wellington Upground Reservoir	160	WS	041100010503 Wellington Creek	N/A	UP	4632	N/A
Sandy Ridge Wetland Dam	93.6	WM	041100010602 Black River	10.02	DPI	268.4	324
Findley Lake	83	R	041100010503 Wellington Creek	1.85	DPI	2480	16212
Oberlin Reservoir	56	WS	041100010506 Lower West Branch	N/A	UP	1070	N/A
Spencer Lake	51	R	041100010401 Litchfield - East Branch, 041100010303 Coon Ck. - East Branch	31.68	DPI	487	186
East Branch Black River Dam No. 2	22	R	041100010404 Jackson Ditch - East Branch	1.01	DPI	88.2	1052
Wellington Reservoir	21	WS, R	041100010501 Charlemont Creek	15.85	DPI	275	210
Oberlin Old Upground Reservoir	10	WS	041100010505 Plum Creek	N/A	UP	92.2	N/A
Caley Woods Wildlife Lake	8	R	041100010503 Wellington Creek	2.14	DPI	87.8	497
Spencer Reservoir	8	WS	041100010303 Coon Creek - East Branch	N/A	DPI	N/A	N/A
Grafton Upground Reservoir	7	WS	041100010404 Jackson Ditch - East Branch	N/A	UP	N/A	N/A

LaGrange Water Works Lake	6	WS	041100010404 Jackson Ditch - East Branch	N/A	DO	N/A	N/A

[1] *Lake Use: WS- Water Supply, R - Recreation, FC - Flood Control, WM - Wetland Mitigation.*
[2] *Lake Type: DO - Dugout, DPI - Dammed Impoundment, NL - Natural Lake, UP - Upground Reservoir.*

3. Ground Water Resources

Aquifers
Map 11: Glacial Aquifer Distribution (See Appendix A).
Groundwater resources are limited within the Black River basin, generally yielding only 5-25 gpm from sandstone, shale bedrock, and glacial end moraines. The exceptions to this are in the extreme southeast near Lodi where the Killbuck Buried Valley Aquifer yields 100-500 gpm and at the mouth of the Black River, where clay and silt deposits yield less than 5 gpm. Very little of the Black River's water comes from groundwater owing to the low permeability of the clay soils and the shale bedrock that dominate the underlying geology. There is little opportunity for surface water to percolate into the aquifers. The vast majority of its water comes from storm runoff, which leaves the river naturally susceptible to wide fluctuations in stream flow throughout the year. Increasing urban development, particularly in the northern areas of the watershed, exacerbates these fluctuations by increasing impervious surface and the subsequent volume of water rapidly entering the Black River during storm events.

Table 12: Aquifer Data.

Source: ODNR Office of Coastal Management GIMS Dept.

Black River Aquifers by Setting, Yield, and Thickness

Name	Setting	Yield (gpm)	Thickness (ft)
Black River Alluvial Aquifer	Alluvial	5-25	>25-100
Black River Buried Valley Aquifer	Buried Valley	5-25	25->100
Black River Complex Aquifer	Complex	5-25	>100
Galion Buried Valley Aquifer	Buried Valley	5-25	25->100
Galion Complex Aquifer	Complex	5-25	> 100
Galion End Moraine Aquifer	End Moraine	5-25	25-100
Galion Ground Moraine Aquifer	Ground Moraine	5-25	25-100
Galion Thin Upland Aquifer	Thin Upland	<5, 5-25	<25, 25-100
Killbuck Buried Valley Aquifer	Buried Valley	25-500	>100
Lake Maumee Beach Ridge Aquifer	Beach Ridge	5-25	<25, 25-100
Lake Maumee Lacustrine Aquifer	Lacustrine	<5, 5-25	<25, 25-100
Lorain Beach Ridge Aquifer	Beach Ridge	5-25	25 - 100

Lorain Ground Moraine Aquifer	Ground Moraine	5-25	25 - 100
Lorain Thin Upland Aquifer	Thin Upland	<5	<25
Medina End Moraine Aquifer	End Moraine	5-25	25-100
Medina Thin Upland Aquifer	Thin Upland	<5, 5-25	<25, 25-100

Flow Regime

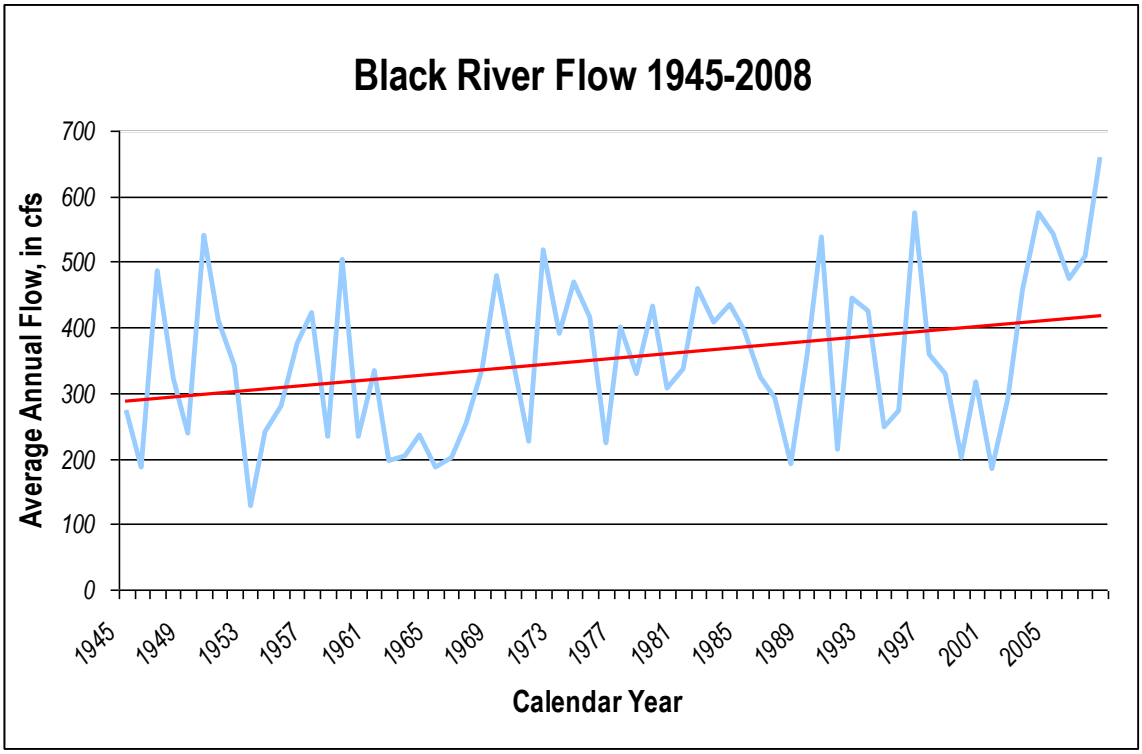


Figure 8: Black River Flow.

Source: http://waterdata.usgs.gov/nwis/uv/?site_no=04200500&agency_cd=USGS

As evidenced by this flow graph from the USGS gauging station in Elyria, the Black River may be in a period of instability. While precipitation rates in the region have remained constant, the flow is increasing. This instability is likely caused by changing land uses. Conversion of fields and open space to developed land creates more impervious surface, which contributes more water volume to the river in a shorter period of time.

The low permeability of the soils means that the streams and rivers within the watershed are heavily affected by overland and effluent-driven flow. This creates "flashy" flow situations where periods of low or moderate flow can rapidly morph into high flow during heavy rain or snowmelt events. Additional volume and velocity contributions from increased urbanization can lead to severe flooding problems during even moderate rain events. Flow instability throws off the natural stream mechanics and can

create downcutting and bank destabilization problems at the source, and excessive sedimentation/deposition further downstream.

Source Water Assessment Plans (SWAP)

Public water systems, or PWS, are regulated by the Ohio EPA's Division of Drinking and Ground Waters (DDAGW). A public water system is defined as a system that provides water for human consumption to at least 15 service connections or serves an average of at least 25 people for at least 60 days each year. This includes water used for drinking, food preparation, bathing, showering, and dishwashing. Public water systems range in size from large municipalities to small churches and restaurants that rely on a single well. Ohio EPA DDAGW recognizes three types of public water systems:

Community water systems serve at least 15 service connections used by year-round residents or regularly serve at least 25 year-round residents, such as cities, villages, or mobile home parks.

Non-transient, non-community systems serve at least 25 of the same people over six months per year, such as schools, hospitals, or factories.

Transient, non-community systems serve at least 25 different people over 60 days per year, such as campgrounds, restaurants, and gas stations.

Ohio EPA prepares Source Water Assessments for each PWS. They delineate the assessment area, conduct an inventory of potential sources of contamination, and determine the susceptibility of the water supply to those contaminant sources. These results can then be used to organize, develop, and implement a Source Water Protection Plan.

As of February 9, 2010, there are no public water systems in the Black River watershed with EPA-endorsed Drinking Water Source Protection Plans. Drinking Water Source Assessments have been prepared for the community systems of Avon Lake, Elyria, Lodi, Lorain, Oberlin, Wellington, and eleven transient non-community systems.

While the municipalities of Medina in Medina County and West Salem in Wayne County are not within the Black River watershed, they purchase a portion of their water from public water supplies that operate within Lorain County. Therefore it is important to not only communities directly within the Black River watershed but also to communities surrounding the watershed that ground and surface water health be maintained in the Black River basin.

A number of communities within Lorain County purchase some of their water supply from New London in Huron County, part of the Vermilion River watershed. A review of the Village of New London compliance monitoring data from 1991-2002 (performed on treated drinking water) revealed that the system had no health based or Maximum Contaminant Level (MCL) violations.

The PWSs of Oberlin and Wellington get their drinking water from tributaries of the Black River. The City of Oberlin's PWS serves approximately 8,600 people through 2,520 service connections. The intake for Oberlin is located in the West Branch through the Parsons Road reservoir. The Village of Wellington's PWS serves approximately 4,600 people through 1,700 service connections and draws its water from Charlemont Creek. Although drinking water throughout the watershed meets federal standards for consumption, there are potential concerns about the future of these two water supplies. Currently, the

policy at both PWS's is to draw water from their respective source streams at times where raw water analysis indicates low levels of TSSsTDS's and nutrients.

Map 12: Intake Locations with CMZs delineated (See Appendix A).

There are several locations along the Black River that have been designated by these reports as Corridor Management Zones, or CMZs. These are areas along streams and tributaries within the assessment area that warrant delineation, inventory, and management in the interest of preserving and maintaining the health of the public drinking water supply. Charlemont Creek, a designated CMZ, is particularly prone to excessive sedimentation. A focus on Charlemont Creek in efforts to curb sediment load may be an efficient option to improve both the status of the public drinking supply and the ecological health of the overall watershed. For more information on SWAPs visit Ohio EPA's SWAP Program.

DRASTIC Groundwater Pollution Potential
Map 13: Black River DRASTIC Map (See Appendix A).

Overall groundwater pollution potential is mid-low within the watershed, with the exception of a small region near Lodi. The low permeability of the clay soils predominant in the region hinders the potential for groundwater contamination; the sandier, more permeable beach ridge regions have a slightly higher potential. Groundwater is not a major source of drinking water within the watershed.

D. Land Use

A land cover map and a land cover change analysis for the Black River watershed was generated in ArcGIS using 2001 and 2006 data-layers obtained from NOAA's Coastal Change Analysis Program (CCAP), provided by ODNR Office of Coastal Management's GIMS department. While land use and land cover data for the watershed as a whole exists, it had yet to be broken down by 12-digit HUC sub-watersheds. This was generated with assistance from OCM's GIMS department. For a complete listing of land change from 2001-2006 within the watershed by 12-digit HUC, see Appendix B.

Table 13: General Land Use for the Watershed.

Land Use/Land Cover Description	Area (acres)	Area (mi^2)	Percent of Watershed
Row Crops	135745.9	212.1	44.2%
Deciduous Forest	76702.3	119.8	25.0%
Residential	48680	76.1	15.8%
Pasture	24850.7	38.8	8.1%
Commercial/Industrial/Transportation	7883.4	12.3	2.6%
Woody Wetlands	7554.9	11.8	2.5%
Open Water	2810.8	4.4	0.9%
Urban/Recreational Grassland	2472.6	3.9	0.8%
Coniferous Forest	535.5	0.8	0.2%
Totals	**307236.4**	**480.1**	**100.0%**

Source: Ohio EPA TMDLs for Black River watershed, 2008

Map 14: Land Use Distribution (See Appendix A).

The Black River watershed is characterized by two very different land-use patterns. The East and West Branch sub-watersheds are predominantly rural and agricultural while the northern Black River main-stem sub-watershed is home to some of the most rapidly-urbanizing land in Northeast Ohio. Hence, land disturbances associated with both high residential growth and intensive agricultural practices are problematic for the Black River watershed. A breakdown of land use for each 10-digit HUC shows this marked difference between the southern and northern basins.

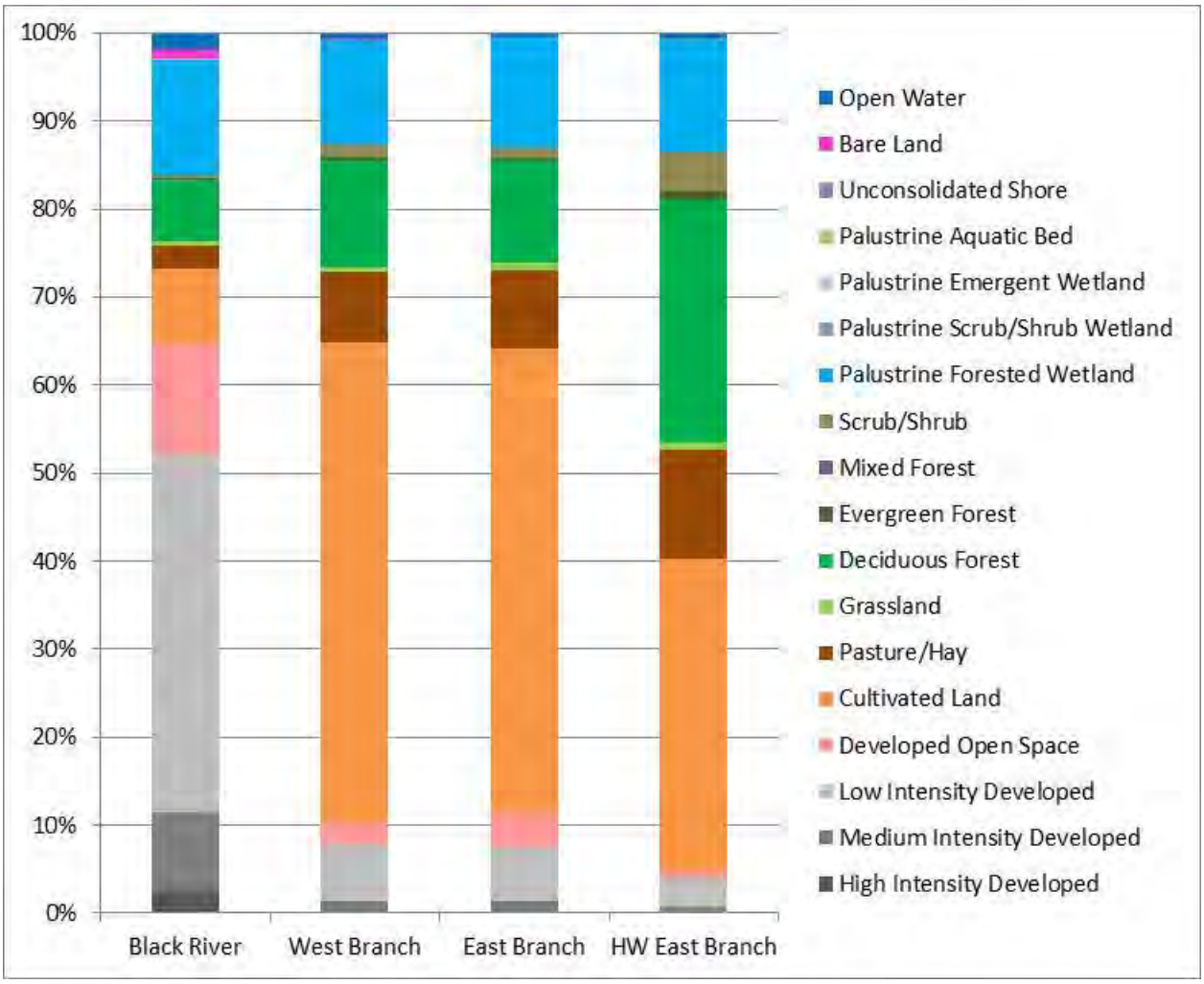


Figure 9: Land Use by HUC-10.

As one moves from the northern downstream regions of the watershed south towards the upper headwaters, one can see that the land uses shift rather dramatically from over 60% developed to less than 10% developed, with the West Branch and East Branch being over 60% agricultural. The Headwaters East Branch has a low level of development almost completely concentrated within the communities of Spencer and Lodi and retains a sizable percentage of deciduous forest and land that is not developed or cultivated land.

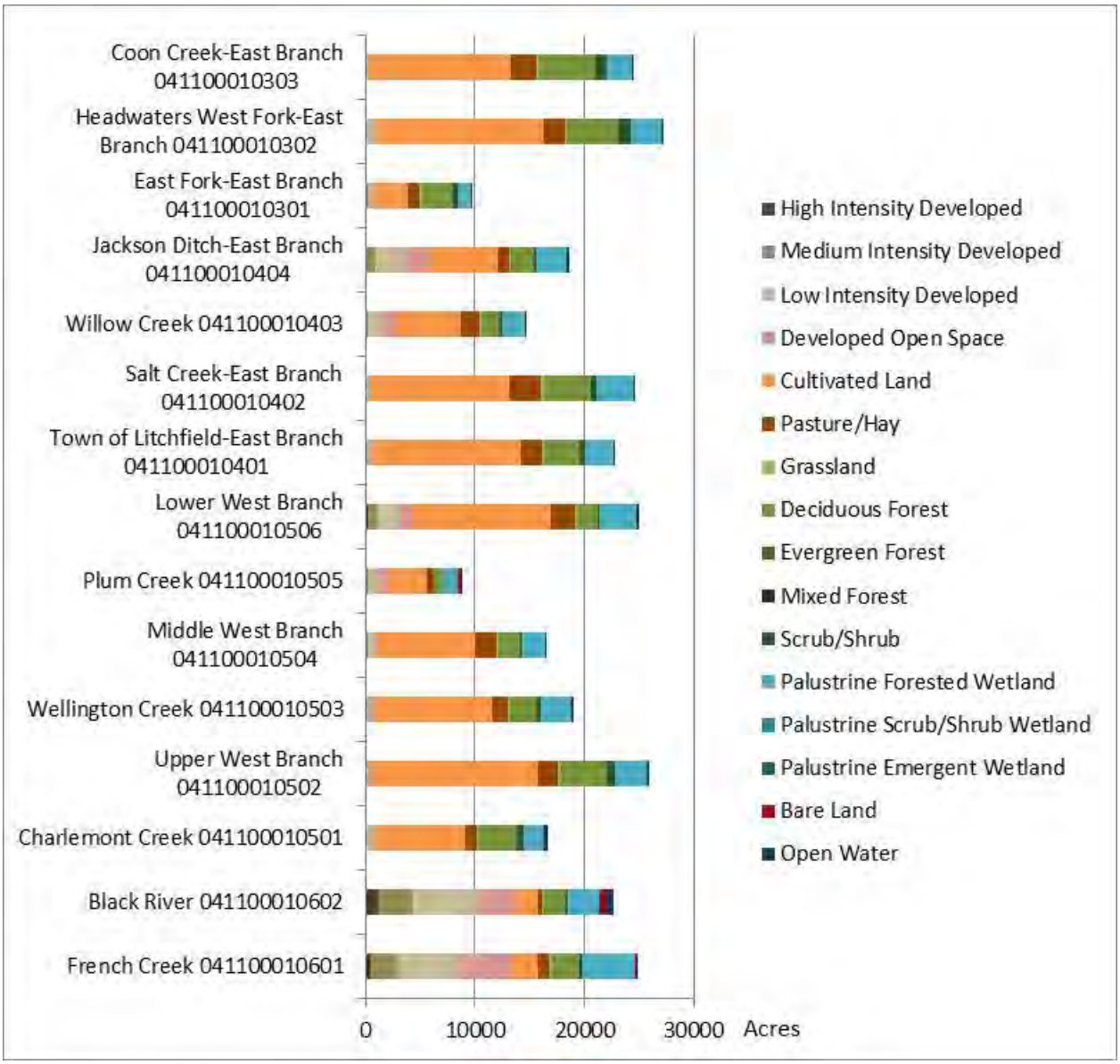


Figure 10: Land use by HUC-12.

Every sub-watershed with the exception of the East Fork East Branch sub-watershed has over 50% of its acreage designated as "human use" (developed or cultivated land). In addition, while the East Branch HUC-10 is generally considered to have good stream quality, sub-watersheds within the lower reaches of the East Branch (Willow Creek, Jackson Ditch-East Branch) have significantly more developed acreage than other HUC-12s within the East Branch. These two sub-watersheds should be focused on and monitored as the resulting loss of stream quality from increasing development may contribute to lower overall stream quality for the East Branch in the future.

1. Impervious Cover

Stream research generally indicates that certain zones of stream quality exist, most notably around 10% impervious cover, where sensitive stream elements are lost from the system (Schueler, 1994). A second

threshold exists at around 25-30% impervious cover, where most indicators of stream quality consistently shift to a "poor" condition and exhibit diminished aquatic diversity, water quality, and habitat scores.

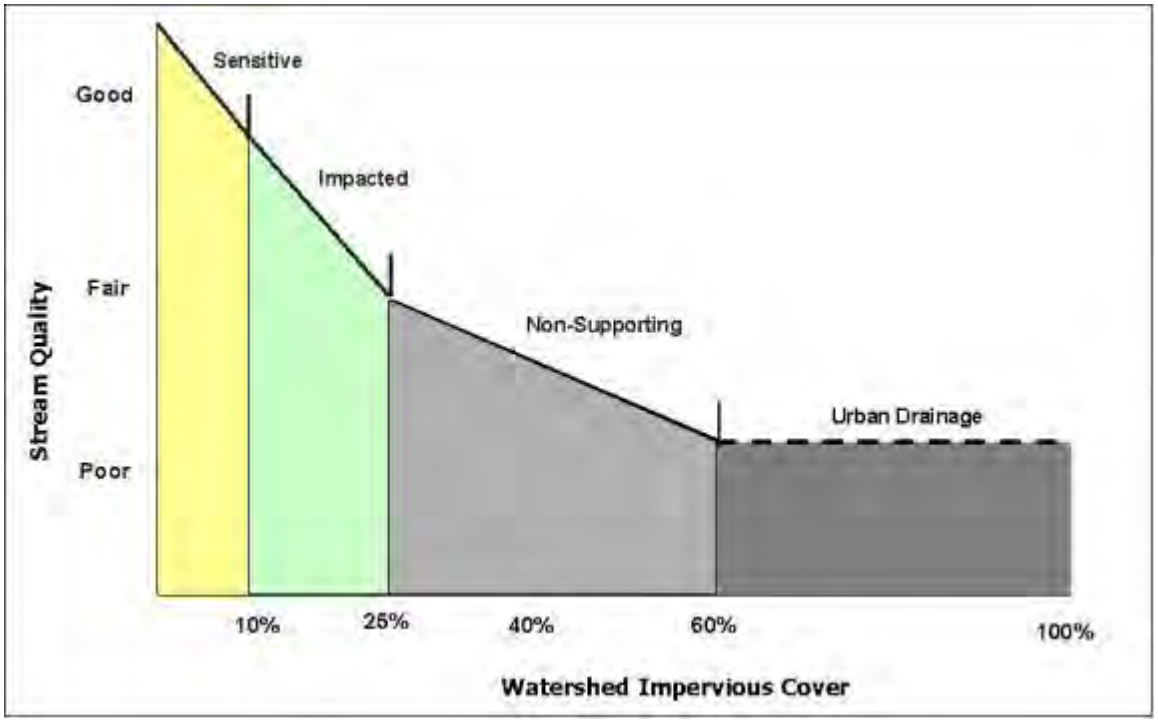


Figure 11: Stream Quality vs. Watershed Impervious Cover.

Source: Center for Watershed Protection http://www.cwp.org/

Impervious Cover	
Sub-Watershed	**% Impervious**
Black River main-stem	20.39%
French Creek	11.47%
West Branch	2.35%
East Branch	2.63%

Table 14: Impervious percent cover.

The Black River and French Creek 12-digit HUCs fall under the category of impacted streams. While the West Branch and East Branch overall are classified as Stressed, the Willow Creek, Plum Creek, Jackson Ditch-East Branch, and Lower West Branch 12-digit HUCs may soon be classified as impacted as they are experiencing a rise in impervious surface from changing land uses.

2. Impacts from Steel Manufacturing

The presence of the steel industry has shaped the history of Lorain, impacting the community, the city, and its local environment in significant ways. Thomas Johnson introduced steel to Lorain in 1894 when

he moved his company to the City of Lorain, where Lake Erie, the Black River, and an accessible railroad system offered access to the ore, coal, coke, and limestone needed for steel processing. Many acres of forest were cleared to make room for the construction of the steel mill, and the City of Lorain straightened, armored, and dredged the Black River to allow for passage of large ore boats.

Land for the mill was cleared in May of 1894. After a year of construction, twenty buildings were built, including power and boiler house facilities, a 38-inch blooming mill, and a rail mill. The blast furnaces began operations in 1895, and three years later, the company was refinanced and its name was changed to Lorain Steel Company. As a result of this financing, the mill doubled in size and three million dollars went into the construction of furnaces and coke ovens.

The arrival of steel in Lorain enabled the city to pull itself from the depression of the 1890's that plagued much of the country. The presence of the mill allowed Lorain to become a major city. The production of steel has had a major impact on environmental quality in the area around Lorain. The environmental effects of steel production was a major factor in the International Joint Commission's listing of the Black River as one of forty-three Areas of Concern in 1987 for pollution in the Great Lakes basin. The earliest effort to reduce environmental pollution by the steel industry occurred in 1971 when the National Tube Company invested $120 million to install two bar mills and a Basic Oxygen Process furnace. The furnace, which blasts pure oxygen into the molten mix, raises productive efficiency while reducing air pollution through more complete combustion. As a result of National Tube's upgrade, twelve open hearths and the last of the Bessemer furnaces were removed. These old furnaces polluted Lorain's air with a thick plume of orange smoke, and installation of the new furnace helped to lift the orange tint that would collect in the area above Lake Erie, obscuring views and filling the air with particulate matter.

In 1983, afish consumption advisory was issued for five miles of the Black River south of its mouth at Lake Erie. The fish, particularly brown bullhead catfish, experienced high incidences of cancerous tumors as a result of exposure to high concentrations of Polycyclic Aromatic Hydrocarbons (PAHs) in river sediment. Tumors and deformities in fish continued to be problematic in the Black River main-stem through 1994. USS/KOBE Steel closed its coking facility in 1983, eliminating the primary source of this pollution. Despite this, tumor rates did not decline until after 1990 when the river bottom was dredged and toxic contaminants were contained in a hazardous waste landfill installed on-site. While PAHs have been reduced, high levels of PCBs, mostly from other industries, remain a major problem. PCBs affect wildlife that consumes fish, mussels, or other bottom feeders, which can accumulate and concentrate the toxins present in the sediments within their bodies. Post-dredging, the water quality around the steel plant has improved significantly, causing the ban on fish consumption to be changed to an advisory to restrict brown bullhead, freshwater drum, and carp consumption.

In 1998, as an acknowledgement of their progress in improving environmental quality through pollution prevention and waste reduction, USS/KOBE steel received an award from the Ohio Environmental Council. Their efforts included improvements in energy use, spent acids, solid waste, oils and lubricants, and volatile organic compounds. Today, the steel plant area is the site for the Black River Restoration Project, currently the largest stream bank restoration project in Ohio.

Figure 12: Black River Restoration Site, City of Lorain (Christina Znidarsic).

3. Home Sewage Treatment Systems (HSTS)

In the non-sewered areas of the watershed, sewage treatment occurs through septic tanks or aeration systems with varying methods of treatment and disposal. A comprehensive inventory of locations of home sewage treatment systems (HSTSs) in the Black River watershed is currently unavailable, especially in the rural sections of the watershed. Many of the systems were installed decades before any kind of regular mapping or initial monitoring was implemented, and so often times a HSTS inspector cannot pinpoint a location until they're called out to fix a failing system. In Lorain County, the General Health District is working in collaboration with the Lorain County Auditor to plot HSTS locations on a site-by-site basis in order to compile a comprehensive GIS database for the future. Detailed HSTS maps have already been generated for the communities of North Ridgeville, Sheffield Township, Sheffield Village, City of Avon, Carlisle Township, Elyria Township, Eaton Township, and Grafton Township, and can be found in Appendix A in the back. MS4 communities are required to provide or create detailed HSTS location maps, and so this information will be updated as more maps become available. Data for non-MS4 areas, however, will likely remain spotty.

Sewage treatment systems are regulated in Ohio through state laws and rules, and by local health districts, which often adopt additional rules for their health jurisdiction. Chapter 3718 of the Ohio Revised Code (ORC) is the section of law that governs sewage treatment systems in Ohio, and Section

3701-29 of the Ohio Administrative Code (OAC) is the section of state rules that govern sewage treatment systems. Recent changes to ORC 3718 (sewage law) became effective on September 17, 2010 under Substitute Senate Bill 110 (SB 110). Many of these changes reflect the recommendations of the Household Sewage and Small Flows on-Site Sewage Treatment System Study Commission provided in 2009. For current Ohio sewage treatment systems laws and rules, see here: http://www.odh.ohio.gov/odhprograms/eh/sewage/sewrules.aspx. SB 110 requires new statewide rules to be adopted by the Ohio Department of Health after January 1, 2012. The local rules and programs established by the local health districts remain in effect until the new state rules are adopted. The new statewide rules may require the following:

- Evaluate sites (e.g., soils, topography, lot size) for a proposed installation of a HSTS.
- Allow for progressive alteration or repair of a failing system.
- Require vertical separation distances or the thickness of soil beneath the soil absorption component (e.g., leaching trench, drip tubing, mound).
- Allow for the local health districts to petition the Ohio Department of Health to approve an increase to the vertical separation distances.
- Establish requirements for maintenance of systems.
- Require statewide bonding for installers, service providers, and septage haulers as a condition of registration, and a cost methodology in rules to set the bond and local registration fee amounts.
- Require standards for inspection of septage hauling tanks.
- Ensure all types of septic and related tanks are structurally sound and watertight.
- Require local boards of health to give notice and opportunity for a hearing regarding board of health actions.

The Lorain County General Health District and other relevant health departments in the watershed already incorporate regulations that require new systems to consider local soil conditions, lot size, and the design and type of system. Local health departments annually perform illicit discharge locating by point source tracking to find the locations of failing systems, sewer connections, and other pollutant-laden discharges. Adoption of statewide standards for on-site disposal systems (OSDSs) will greatly assist to standardize the management of new on-site systems in the Black River watershed. The Black River watershed partners should coordinate with local community engineers, Medina County Health Department, local health departments, Lorain County General Health District, and Ohio EPA on the location and management of any new disposal systems, as well as assist in educating communities and landowners about the need for keeping OSDSs maintained and functioning properly.

The Lorain County General Health District, the Health Departments of Elyria and the City of Lorain, and Medina County Health Department estimate that there are approximately 19,300 HSTSs within the Black River watershed. A more comprehensive breakdown of HSTS loadings by HUC-12 was also estimated from this data and can be found in Section J-2 in the Watershed Inventory. In addition, critical HSTS locations have been identified within the watershed by the Lorain County General Health District.

Wastewater disposal options for unincorporated areas are limited to on-site systems which frequently fail due to the heavy clay soils with high seasonal ground water tables that amplify flooding, erosion, and exacerbate poor water quality issues. A 2001 survey of on-lot HSTSs by the Lorain General Health District and Northeast Ohio Area Wide Coordinating Agency (NOACA) found that as many as one in five on-lot systems are possible pollution sources which pose a threat to public health. The NOACA survey estimated a 16.2% failure rate for all HSTSs in the study area. A more recent study completed by the

Lorain County General Health District revealed a failure rate of over 50% on HSTSs. From a water quality standpoint, management and proper maintenance of these non-point source threats should be a critical component of any attempt at improving water quality within the Black River watershed. A regular inspection program combined with better homeowner education has the potential for improving performance rates for these home systems and the overall ecological health of the watershed.

4. Agricultural Data

Crop Type, Tillage, Rotations

The primary crops within the watershed are corn, soybeans, hay (alfalfa), oats, wheat, and barley. The standard crop rotation among agricultural operators within the watershed is an annual rotation with soybeans and corn. Both conventional and reduced-till methods are used; no-till is widely practiced throughout the watershed for soybeans, but is less prevalent for corn. Alfalfa remains infield for a three-year period.

Table 15: Crop Data.

Typical 2-Year Conservation Tillage Rotation	
20 Apr.	Spring plowing (mixing efficiency 50%)
3-May	Plant corn
3-May	Fertilize (10-28-00)
1-Jul	Fertilize (anhydrous ammonia)
1 Sept.	Harvest corn
1 Mar.	Plant soybeans (no till)
1-Mar	Fertilize (phosphorus)
3 Oct.	Harvest soybeans
10 Oct.	Conservation tillage (mixing efficiency 25%)

Source: Medina Co. SWCD, Black River TMDL 2008

A 1998 study by Matisoff et al. in the nearby Old Woman Creek watershed analyzed the soil erosion losses for conventional versus no-till areas. Each method was analyzed over an average study area of 536 acres. The results showed a clear benefit to no-till methods in managing soil loss within the watershed; the tilled acreages had an erosion rate of 9.8 lbs/acre while the no-till acreages had an erosion rate of only 1.1 lbs/acre. This study can be readily extrapolated to the nearby agricultural communities within the Black River watershed and emphasizes the need for public education on the benefits of no-till or reduced tillage.

Crop rotations, in addition to their traditional use of minimizing soil nutrient depletion, can greatly affect the amount of soil lost from erosion by runoff. In areas that are highly susceptible to erosion, farm management practices such as zero or reduced tillage can be supplemented with specific crop rotation methods to reduce raindrop impact, sediment detachment and transport, surface runoff, and soil loss. Rotation methods that leave the greatest amount of crop stubble on top of the soil provide the best protection against soil loss. Stubble cover minimizes erosion from water by reducing overland flow velocity and stream power, which hinders the ability of the water to detach and transport sediment. Crop rotations also affect the timing and length of when a field is subject to fallow. The seasonal variability of the climate in the Black River region can leave fields open for a significant part of the year. Efficient fallow management is an essential part of reducing erosion in a crop rotation system. Zero

tillage is a fundamental management practice that promotes crop stubble retention under longer unplanned fallows when crops cannot be planted. Such management practices, which succeed in retaining suitable soil cover in areas under fallow, will ultimately reduce soil loss within a watershed.

Livestock

Table 16: Livestock Inventory.

Livestock Inventory

Stock	Quantity
Cattle and calves	11,995
Hogs and pigs	5,417
Layers	2,874
Horses and ponies	1,549
Broilers, other meat-type chickens	1,474

Source: 2007 Census of Agriculture

The primary livestock within the watershed are cattle. Large commercial herds are managed through existing Department of Agriculture programs, but smaller herds are managed almost exclusively through a voluntary approach. Voluntary compliance with sound manure management practices should be encouraged within the watershed.

Figure 13: Roofed animal waste storage structure, installed near Squire's Ditch in the Plum Creek sub-watershed (Christina Znidarsic).

According to Ohio EPA, there are currently no Concentrated Animal Feeding Operations (CAFOs) located within the Black River watershed. CAFOs are required by Ohio EPA to meet NPDES permitting standards. Most livestock operations are small to medium dairy operations with about 25-30 cattle; about a dozen exist with over 100 cattle (pers. comm., Lorain SWCD). Only one large operation with 600 cattle is currently located within the watershed; Dovin Dairy Farms in Pittsfield Township.

Chemical Use Patterns, Irrigation/Water Use

Fertilizer applications typically occur in the spring and are applied to corn and soybeans, and corn is side-dressed with nitrogen in July. Alfalfa fertilizer application occurs in the initial year of planting only. It should be noted that while the fertilizer amounts shown below are identified by Medina County SWCD as typical for the region, fertilizer application may vary widely from field to field.

Table 17: Fertilizer Use.

Typical Fertilizer Application Amounts (lbs/acre)

Crop	N	P_2O_5
Corn	150	75
Soybean	0	40

Alfalfa	15	115

Source: Medina Co. SWCD, Black River TMDL 2008

2,4-D, atrazine, and Roundup are all used on crops within the watershed. 2,4-D and atrazine are used as general broadleaf and grassy herbicides and Roundup is applied to soybeans. Irrigation is not widely practiced within the watershed except in limited specialty situations with fruits and vegetables. Owing to the hydric soils prevalent in the watershed, drainage of fields is much more of a priority than irrigation. The majority of the soils in the region are classed as prime farmland if drained.

Map 15: Prime Farmland (See Appendix A).

Impacts of Tiled Drainage

Lorain SWCD, NRCS, and local landowners note that approximately 20-25% of fields are systematically (completely) tiled and about 80-85% have some form of tile drainage installed. Tiled fields in some form are common throughout the watershed and their effect upon the natural hydrology of the area is significant.

Tiled drainage is an agricultural practice by which subsurface pipes are laid below a farm field in a grid pattern. They function much like the drain holes in a potted plant do by encouraging subsurface water to move out from between waterlogged soil particles and into the tile lines, where the water is rapidly funneled to an available nearby surface water body (river, lake, or stream). This artificially lowers the water table in the field and allows the plant roots to grow deeper and develop a more mature structure, thus increasing crop yields. Older tile lines are composed of ceramic and the water enters through gaps in the piping; newer tile lines are composed of plastic and the water enters through perforations in the plastic pipe. Tiled drainage alters the natural hydrology of the watershed; excess precipitation is directly routed to the streams through the tiles rather than over the land's surface, which results in a shorter travel time and provides less opportunity for pollutants to be naturally filtered through groundwater infiltration. In addition, the increase in volume and velocity of water routed into the waterways through the outflow drainage areas exacerbates bank erosion and incision in those areas, causing large amounts of downstream sediment transport.

Figure 14: Drainage tiles emptying into a ditch (Randy Schaetzl, Michigan State University).

5. Protected Lands and Managed Areas

Map 16: Managed Areas (See Appendix A).

Approximately 9,000 acres of land within the watershed are under park protection or management. The majority of managed land is under the Lorain County Metroparks (approximately 8,500 acres)**.** The Cleveland Metroparks and Medina County Park District have conserved land within the watershed's boundaries, and ODNR manages Findley Lake State Park and the Wellington, Spencer Lake, and Camp Belden Wildlife Areas. There are no federal parklands within the Black River watershed. The Caley Reservation, located along Wellington Creek north of the Village of Wellington is controlled by the National Wildlife Federation under a management agreement with the Lorain Metroparks. The various cities and villages within the watershed also operate and manage their own municipal parks.

Figure 15: Natural shale cliffs along the Black River Main-stem in the Black River Reservation, Lorain County Metroparks (Tim Kiser).

The Western Reserve Land Conservancy (WRLC) as of fiscal year 2010 has approximately 1,800 total acres under conservation easements within the watershed. About 1,576 acres are located in the West Branch sub-watershed; specifically, the Upper West Branch (041100010502), Charlemont Creek (041100010501), and Wellington Creek (041100010503) HUC-12 sub-watersheds. About 67 acres are under conservation easement in the East Fork-East Branch (041100010301) and about 157 acres are under conservation easement in the Salt Creek-East Branch (041100010402) sub-watersheds.

The Izaak Walton League, a nation-wide conservation organization, preserves approximately 123 acres in the Salt Creek-East Branch sub-watershed.

6. Land Use Status and Trends

Map 17: Land Change in Black River Watershed 2001-2006 (See Appendix A).

Trends in land use show a shift away from agricultural use towards development and urbanization. Out of total land use change in the watershed from 2000-2006, 76% was a switch to either developed land or a more intense level of development. The majority of the change occurred in the northern sub-watersheds of French Creek, Heider Ditch-Frontal Lake Erie, and Black River main-stem. 2000 Census

information indicated that the watershed saw an approximately 11% increase in housing, the largest percentage of any area in Northeastern Ohio. In Lorain County, nearly 31,000 new homes are projected to be built by the year 2020. Over the last 30 years the region has steadily grown, with emerging land use changes altering the character of the Black River watershed. This growth trend is expected to continue for the foreseeable future, and poorly-managed development will create significant complications for environmental concerns within the watershed.

Table 18: Developed Land Analysis.

Source: 2001-2006 CCAP data-set provided by ODNR OCM's GIMS Dept.

2001-2006 Use Change to Developed Land in the Black River Basin

Description	Total mi^2 Changed	% of Total
04110001-Black River	8.7234	100.00%
0411000106-Black River	6.6126	75.80%
0400110105-West Branch Black River	1.8471	21.17%
0411000104-East Branch Black River	0.2275	2.61%
0411000103-Headwaters East Branch Black River	0.0361	0.41%
041100010601-French Creek	2.8760	32.97%
041100010603-Heider Ditch-Frontal Lake Erie	2.1858	25.06%
041100010602-Black River	1.5508	17.78%
041100010506-Lower West Branch Black River	0.9213	10.56%
041100010404-Jackson Ditch-East Branch Black River	0.2006	2.30%
041100010403-Willow Creek	0.1099	1.26%
041100010502-Upper West Branch Black River	0.0814	0.93%
041100010501-Charlemont Creek	0.0688	0.79%
041100010503-Wellington Creek	0.0679	0.78%
041100010402-Salt Creek-East Branch Black River	0.0588	0.67%
041100010302-HW West Fork East Branch Black River	0.0361	0.41%
041100010504-Middle West Branch Black River	0.0310	0.36%
Forest Loss to Developed	2.9294	33.58%
Wetland Loss to Developed	2.7695	31.75%
Agricultural Loss to Developed	2.1423	24.56%

The highest losses to developed land from 2001-2006 were from forested areas, wetland areas, and agricultural areas. The Black River Main, French Creek, and Heider Ditch-Coastal Tributaries sub-watersheds experienced the largest percentage of land use change. Forests and wetlands need to be more carefully managed and preserved in these sub-watersheds as these provide vital buffers for excessive water, sediment, and nutrient flow into the Black River resulting from land use change pressures. These stormwater-related issues will only worsen if development within the watershed

continues without land use plans or management strategies in place that acknowledge these issues and deal with them in an effective manner.

E. Cultural Resources

According to local lore, the Black River received its name from the Wyandot and Huron Native American tribes who inhabited the watershed. They called the river "Canesadooharie," meaning "river of black pearls." Human habitation of the Black River watershed dates back to approximately 6,500 B.C. People who settled the area were foragers, hunters, or farmers attracted by the gently rolling landscape and rich natural resources. The Black River offered readily-accessible water, nearby land suitable for raising livestock and growing crops, dense forests, and abundant game hunting. The geological and human history of this area is made apparent today through the sites of recreational, historical, and cultural significance found throughout the Black River watershed.

Numerous municipal parks and recreational facilities are located within the Black River watershed. The majority of the watershed is served by the regional districts of Lorain County Metro Parks and Medina County Park District. These parks provide opportunities to actively explore the geological, ecological, and historical features of the watershed through their trails, nature centers, and historic sites. The French Creek Reservation, Black River Reservation, Miller Nature Preserve, Sandy Ridge Reservation, Forest Hills Golf Course, Carlisle Reservation, Indian Hollow Reservation, Splash Zone, Caley Reservation, Wellington Reservation, and Charlemont Reservation are managed by Lorain Metroparks. The Letha House Park and Hidden Hollow Camp are managed by Medina County Park District. Bradley Woods is managed by Cleveland Metroparks. A complete listing of parks, current as of 2010 with corresponding websites can be found in Appendix D.

Findley State Park is located south of Wellington Village in the upper reaches of the Wellington Creek subwatershed. Surrounding Findley Lake, this park includes a nature center, playgrounds, fishing and hunting opportunities, hiking trails, and campgrounds.

Elyria's Cascade Park is a municipal park with a natural waterfall located at the confluence of the Black River main-stem with the East and West Branches. Here glaciers scoured away surficial soils, exposing the normally hidden bedrock geology in a steep ravine. The first recorded contact between Europeans and Native Americans in the watershed was made here in 1754, and in 1817 Herman Ely established the beginnings of the City of Elyria by constructing a gristmill at the Park's falls.

Figure 16: West Falls at Cascade Park, Elyria (Christina Znidarsic).

The French Creek Reservation in Sheffield preserves several Native American historical sites of interest. Burrell Fort is thought to date to Early (1000-100 B.C.) to Late (800-1200 A.D.) Woodland, although potential evidence of even earlier Late Paleoindian (8500-6500 B.C) contact has been found at the site. The Eiden site is a Late Woodland cemetery excavation with over 235 documented burials. The Burrell house was an important stop on the Underground Railroad, where slaves would hide before making the journey up the mouth of the Black River to Lake Erie and freedom in Canada.

The Lorain County Historical Society, headquartered in Elyria, hosts events throughout the year and recognizes historic landmarks throughout the county, including the Pittsfield Township Civil War Monument, Elyria City Hall, and the Thomas Folger Home. The Black River Historical Society preserves the history of the City of Lorain by maintaining an archival collection of documents and photographs. It also stewards the preservation of the Leonard M. Moore House which serves double-duty as a historical feature and the Society's headquarters.

The Lorain Lighthouse at the mouth of the Black River is a prominent Lorain County landmark. The current lighthouse was constructed in 1917, but previous incarnations have occupied the site since 1836.

Established in 1833, Oberlin College is a selective and nationally-recognized institution of higher learning and was the first American college to regularly admit female and black students. It includes the Oberlin

Conservatory of Music which dedicated the Bertram and Judith Kohl Building on May 1, 2010. Housing the Conservatory's jazz studies, music history, and music studies programs, the building is the first music facility in the world to be designed with the gold Leadership in Energy and Environmental Design (LEED) rating in mind. Another environmentally significant building on campus is the A.J. Lewis Center for Environmental Studies. Constructed in 1999, the AJLC was designed with complete environmental sustainability as the goal. It contains facilities that purify any wastewater generated, generates most of its power from solar energy, derives heat from geothermal resources, and serves as a "living laboratory" for Oberlin's Environmental Studies program. Other notable Oberlin buildings are the Allen Memorial Art Museum, the first collegiate art museum west of the Alleghenies, and the Apollo Theatre, a single-screen movie house in downtown Oberlin that has been in operation since 1913.

Lorain County Community College, located in Elyria, is the home of the Stocker Arts Center. This facility includes an art gallery, a robust film series, and performances that are open to the public. LCCC also recently developed in 2008 a Landscape Master Plan to address LCCC's greenspace issues. This Plan calls for aesthetic and sustainable redevelopment of LCCC's campus, utilizing BMPs like bioswales, native plantings, rain gardens, and reduced mowing to manage stormwater.

Completed in 1928, the Lorain Palace Theatre in downtown Lorain is one of the oldest continuously-operating theatres in Ohio, and it was the first in the state to show a talking motion picture.

F. Previous and Current Complementary Efforts

In 1985, the Black River was designated as one of 43 Areas of Concern (AOC) in the Great Lakes basin by the Water Quality Board of the International Joint Commission. It is the only AOC that encompasses an entire watershed. This action spurred the formation of the Black River Remedial Action Plan, an ongoing effort to remove impairments to beneficial uses in the Black River AOC. The RAP process uses an ecosystem approach to solve environmental problems and involve diverse public stakeholders throughout problem identification and clean up. The RAP steering committee coordinates the implementation and evaluation of the three RAP stages for the Black River:

Stage I involves the identification of all the environmental problems in the AOC and at a minimum describes these problems according to impacts on the fourteen beneficial uses of watersheds listed by the IJC; Stage II prescribes the actions needed to eliminate the problems and assigns responsibilities for these actions; and Stage III involves an ongoing monitoring of the AOC to ensure that problems do not develop in the future. The purpose of the RAP is to define the actions necessary to overcome the current water quality problems, to restore the river as closely as possible to its original, natural state, and keep it in a healthy condition. *(Source: NOACA's Black River RAP information site.)*

As of the 2009 Annual Report, there have been several RAP-related milestones met within the watershed, such as the Lower Black River Master Ecological Plan. This Plan encompasses the area from the mouth of the Black River in Lorain Harbor to the 31st street bridge in the City of Lorain and is intended to be a framework for improving, preserving, and restoring fishery health, aquatic and riparian habitat, and adjacent terrestrial habitats. Fish shelf installation, slag pile remediation, wetland restoration and construction, streambank stabilization, and bulkhead habitat creation are all proposed actions within this Plan.

Another current project is the City of Elyria Greenway and Trail Plan, developed and finalized in 2009 under an ODNR grant to improve upon the City of Elyria's existing greenspace and add greenway corridors. The Plan addresses the current and future needs of the city for recreational trails, trails as alternative transportation, the health of the Black River resources found in Elyria, the conveyance of storm water into the river and the potential ecotourism connection opportunities to the region.

The Black River Restoration Project is an action from the Lower Black River Master Ecological Plan that will restore approximately 11,500 feet of stream bank in the City of Lorain in the Black River Mainstem sub-watershed. It is currently the largest stream bank restoration project in the state of Ohio, and involves construction of about 320 feet of fish habitat shelves, removal of approximately 500,000 cubic yards of waste material, and floodplain restoration. It will also restore 650 feet of a large heron rookery located within the project area. The long-term goal for the project is to form a variety of wetland and floodplain habitats transitioning to a forested floodplain/wetland complex. The grading and waste material removal was expected to be completed by February of 2011. Planting of native herbaceous plants will begin at that time and extend to February 2012 in order to establish and maintain an effective barrier against invasive species.

Within the French Creek (041100010601) sub-watershed, in the fall of 2004 the City of Avon began work on the French Creek Riparian Corridor Restoration Project with the intent to protect and enhance French Creek. The project site is located north of Mills Road and west of Jaycox Road in the City of Avon and involves the placement of a conservation easement on 27 acres of open space within the Black River watershed, preservation of 6 acres of forested area containing high quality forested wetlands, and restoration of over 6 acres of wetlands. The goals of the project were to create critical habitat as well as restore floodplain functions and provide water filtration. The restored and enhanced wetlands are characterized as Category 2 or 3 emergent and scrub-shrub wetlands, and continue to be monitored to ensure they maintain their categorical quality and jurisdictional wetland status.

G. Physical Attributes of Streams and Floodplain Areas

1. Early Settlement Conditions

Map 18: Original Vegetation (see Appendix A).

The Black River watershed consisted primarily of beech forests in the East and West Branches and a combination of beech-mixed mesophytic-mixed oak forests in the Black River main-stem sub-basins. Elm-ash swamp forests were also present in smaller pockets throughout the watershed, and oak-sugar maple assemblages could be found in the upper headwaters near Lodi.

Early Conditions of the Black River Watershed at the Time of European Settlement
Written for this plan by: Col. Matthew W. Nahorn, New Indian Ridge Museum, Amherst Ohio

"Imagine giant oaks, maples, and five hundred year old sycamore trees, large enough to carve out for a canoe, gracing the banks of the Black River. This was a landscape where deer, bears, turkeys, raccoons, and other fur-bearing animals roamed the forests, meadows, and wetlands. Only a few hundred years ago, and in some areas even less than that, this was a common sight in the Black River watershed. For thousands of years, the natural resources of the Black River watershed have been used and its natural beauty has been enjoyed by the watershed's inhabitants. However, the Watershed's landscape has

changed dramatically since the first permanent European settlers arrived about two hundred years ago. This area has been called home by many people for several thousand years. But, the majority of the Watershed's prehistoric Native American inhabitants had very little effect on the landscape and water quality of the Black River and its tributaries. Of course there was no impervious cover (roads, roof tops, etc.) present; tributaries were not dredged and thus were "sluggish"; and wetland complexes were largely intact just as they had been created and perfected by nature over thousands of years. The native peoples utilized these important natural resources as hunting and trapping grounds for their sustenance.

One of the most significant changes to the Black River watershed since European settlement has been the loss of these wetlands. Wetlands act as the landscape's kidneys by cleansing and slowly releasing the stormwater into the ground and into tributaries of the Black River. With the help of these functioning wetlands, stream flows were more regular and naturally maintained. Flooding was not as frequent and stream bank erosion was much less significant. Creeks and Rivers naturally move from side to side within the confines of their floodplains over hundreds of years, but with the loss of these wetlands and riparian buffer strips along the stream banks, erosion and watercourse movement occur much more rapidly and frequently now, compared to before European settlement. European settlement brought intensive agriculture and many poor land-use practices to the Watershed.

The native plants and animals of the Black River watershed were well established within the Watershed at the time of European settlement. The biologically productive wetlands, wet-woods, and watercourses provided a main source of food for the Native American Indian inhabitants. At the time Europeans entered Northern Ohio, and more specifically the Black River watershed, the area was largely void of permanent human inhabitance and was primarily used as a hunting ground. As the Williams Brothers put it in their 1879 History of Lorain County, the land was hunted over by many but owned by none. The Eries, who were the last permanent inhabitants of a portion of this area, were annihilated by the Iroquois about 1654. Their annihilation was a consequence of disagreements and conflicts over specific highly productive hunting and trapping grounds. The Eries, or "Nation du Chat" (literally "Cat Nation" - French) were described by the Jesuit priests as wearing large cat-like furs. These furs were most likely those of raccoons, which were a plentiful animal in the region.

After the defeat of the Eries, there were no permanent Native American Indian settlements in the Black River watershed. This allowed for relatively easy settlement by Europeans. Dense forests, lack of navigable roadways, and swampy areas still had to be overcome. This was a major obstacle faced by the settlers of what we now know as the area of Oberlin, Ohio. Oberlin was a large swamp, which was important for stormwater recharge and natural water purification, but it was a challenge for the early settlers to drain and effectively use this landscape.

Col. James Smith, then a young man, provides a unique and first hand description of the "Canesadooharie" (or Black River as referred to by the Wyandots) through his journal that was later published. He was captured in the 1700s by the Wyandots, a group of Native Americans that frequented this and other Northern Ohio lands for hunting. He states in this early account, "From the headwaters of Canesadooharie to this place, the land is generally good; chiefly flat or second rate... The only refuse is some swamps, that appear to be too wet for use, yet I apprehend that a number of them, if drained, would make excellent meadows." As we can see, the European mindset of clearing and draining the land was prevalent in this young man's mind. He continues by describing the timber of the Watershed, and names the presence of many native trees such as oaks, walnut, hickory, cherry, ashes, and elm. The nut bearing trees were extremely important to not only the native animal populations but were collected by Native American inhabitants and even early settlers. Col. Smith also describes many native animals and

particularly focuses on the "remarkably large and fat" raccoons that lived in this area. This makes a clear connection to the Erie's garb described by the Jesuit priests.

In less than two hundred years, the Black River watershed has largely been altered and would not be recognized by the Native American inhabitants or Col. Smith. Some of the once cut-over forests have grown back in areas of the Watershed, and many landowners are now learning and appreciating the existence of wetlands and riparian stream bank buffers. Wild turkeys and white-tailed deer are once again beginning to roam portions of the Black River watershed. It will take many years, but preserved wooded lands such as those contained within city parks, metropolitan parks, and privately protected lands, will once again boast giant trees similar to those that existed when Europeans set eyes upon the Black River watershed."

About one mile south of the Indian Hollow Metropark on Indian Hollow Road is a 40-acre patch of virgin, first-growth forest. This area represents a "core reserve," an area of relatively undisturbed forest that can provide a template for forest restoration efforts throughout the watershed. These woods possess several characteristics of a healthy forest ecosystem. There are four well-developed and distinct canopies. The understory in the forest is well-developed and biologically diverse. Mature trees, such as red oak and pin oak, are well distributed and not densely packed. Several of the trees sampled had a trunk circumference of 15-20 feet. Within the woods, vegetation tends to vary greatly depending upon drainage conditions. In several areas, water tends to collect in drainage sinks (large low elevation areas) or large holes left behind by fallen trees. Water concentrates in these areas and supports more hydrophilic (water-tolerant) species, including pin oaks, ash trees, and the threatened marsh marigold. These wet areas also provide important habitat for salamanders and frogs. This area was acquired by the Lorain County Metroparks, providing an essential asset for understanding the original composition of forest communities in the area and offering a benchmark by which to judge future forest restoration efforts in the watershed.

2. Channel and Floodplain Conditions

Floodplains are the areas adjacent to rivers and streams that are subject to frequent or regular flooding. The 100-year flood has one chance in one hundred of occurring in any given year and represents the flood level chosen by the Federal Emergency Management Agency (FEMA) for regulatory purposes. Floodplains form a unique ecological niche and support biotic communities that are adapted for occasional inundation. Floodplains are unstable and potentially dangerous areas for human use. However, as is the case in the Black River watershed, floodplains are often targeted for agricultural purposes because the land, if drained, represents some of the best arable land available in the region. Approximately 20,524 acres or 6.7% of the total watershed lies within the 100-year floodplain.

Map 19: Floodplain Map (see Appendix A).

Presently, there are about 1,475 structures located in the Black River floodplain. Entrenchment from heavy channelization has limited stream access to the floodplain in many parts of the watershed, particularly in the urbanized downstream reaches, and some of the streams within the upper watershed have been dredged and channelized over a period of many years to drain adjacent wetlands and make the soils suitable for farming. Many small tributaries to French Creek and the Black River main-stem have had their sinuosity and floodplain access completely eliminated through channelization or

culverting. Streams that have been disconnected to their natural floodplain keep the force of flow within their channels which causes downcutting and loss of material from streambanks (erosion).

The upper reaches and tributaries in the less-populated rural areas have still retained a good portion of sinuosity, particularly in the East Branch sub-watershed. These areas should be targeted for protection and conservation. In the West Branch, many of the streams are utilized for direct drainage off nearby croplands so natural low-flow meander over a wide floodplain is not encouraged, but filter strips, grassed waterways and other agricultural BMPs can serve to mitigate and filter overland flow.

NOACA assessed a significant portion of the streams within the Black River watershed for their Clean Water 2000 Plan and determined that approximately 14% are impaired by urban runoff, 13% are impaired by channelization and dams, and 87% are impaired by agriculture. The 13% figure is probably a conservative estimate of the number of streams impacted by channelization.

Most streams in the northern sections are intentionally modified to eliminate or minimize floodplain access, as flooding of residential areas is a major concern in municipalities such as North Ridgeville and Sheffield Village. Frequent flooding in the towns of Avon and North Ridgeville illustrate challenges in the Black River watershed. Floods are typically viewed as natural disasters rather than normal events in nature. While they are dry most of the time, floodplains are actually a part of the river channel, wet only during storm events or times of high precipitation. The lowest floodplains in French Creek, where the rapidly developing cities of Avon and North Ridgeville are situated, regularly overflow 2 to 3 times a year. Floodplains at higher elevations that flood less frequently are given classifications related to time intervals between floods. These flood events are commonly referred to as 25-, 50-, or 100-year floods and indicate the probability that a flood will occur in a given year. In other words, a 25-year flood has a 1/25 chance of happening at any time.

The main factors that contribute to flooding are the volume of rain that falls over a given time period and the capacity of the land to absorb that rain. If land absorbs a small percentage of rainwater and that run-off flows into a restricted channel, flooding will tend to occur. As forest or farmland is replaced with asphalt and turf, soil loses its permeability and the volume of stormwater that rushes into a stream increases. French Creek provides a good case study for the effects of increasing development in the Black River watershed. North Ridgeville and Avon, two of the fastest growing cities in Lorain County, are both located along French Creek. A close review of flooding along the creek demonstrates the problems of stormwater management in an area experiencing rapid development. Three contributing factors for this flooding are the slope of the land, soil types, and changes in land use over the last decade.

Human development further disrupts normal flood patterns and increases the frequency and severity of flooding through the removal of riparian corridor and active floodplain. Since the recent settlement of the Black River watershed, the protective vegetative strips along the river, called buffer or riparian zones, have been mostly removed. This removal of natural vegetation increases both the volume and velocity of surface runoff into existing waterways. Many buffer zones and wetlands in floodplain areas have been removed and replaced with agricultural, residential, or commercial development. Lorain County has lost over 50% of its original wetlands, dropping from 30% to 10-15% of the total land area. Along the river, farmers plant crops right up to the stream bank to maximize the amount of acreage in production. Similarly, developers and landowners will often install turf and build right up to the stream banks to maximize their use of the land.

Figure 17: Straightened stream behind residential properties, Avon Lake (Joe Reitz).

The town of Avon exemplifies the rapid growth trend that has been occurring within the Black River watershed's lower reaches. Between 1991 and 1996, over 900 new residences, the highest in Lorain County, were constructed in Avon, and the city is one of the few places in the region still gaining in population.

Almost all of the southeastern quarter of Avon lies within the 100-year flood plain along French Creek. The development boom that has swept through Avon is largely concentrated on this level land between State Route 83 and the Cuyahoga County line. Part of the flooding in Avon comes from the increase of impervious surface within the city. Another major contributor is increased development in North Ridgeville that sits upstream from Avon. Development in North Ridgeville imposes greater impacts on Avon as the storm water volume magnifies as it moves downstream. The increased volume comes primarily from runoff from impervious surfaces such as roads, parking lots, buildings, and other features of the built environment. On a paved lot, 98% of the rainwater that hits the surface will immediately flow off as runoff. Unfortunately, most turf lawns are much less pervious due to compaction of soils during development. Lawn turf can be amended using compact or augmenting drainage through planting of deep rooted native vegetation and trees.

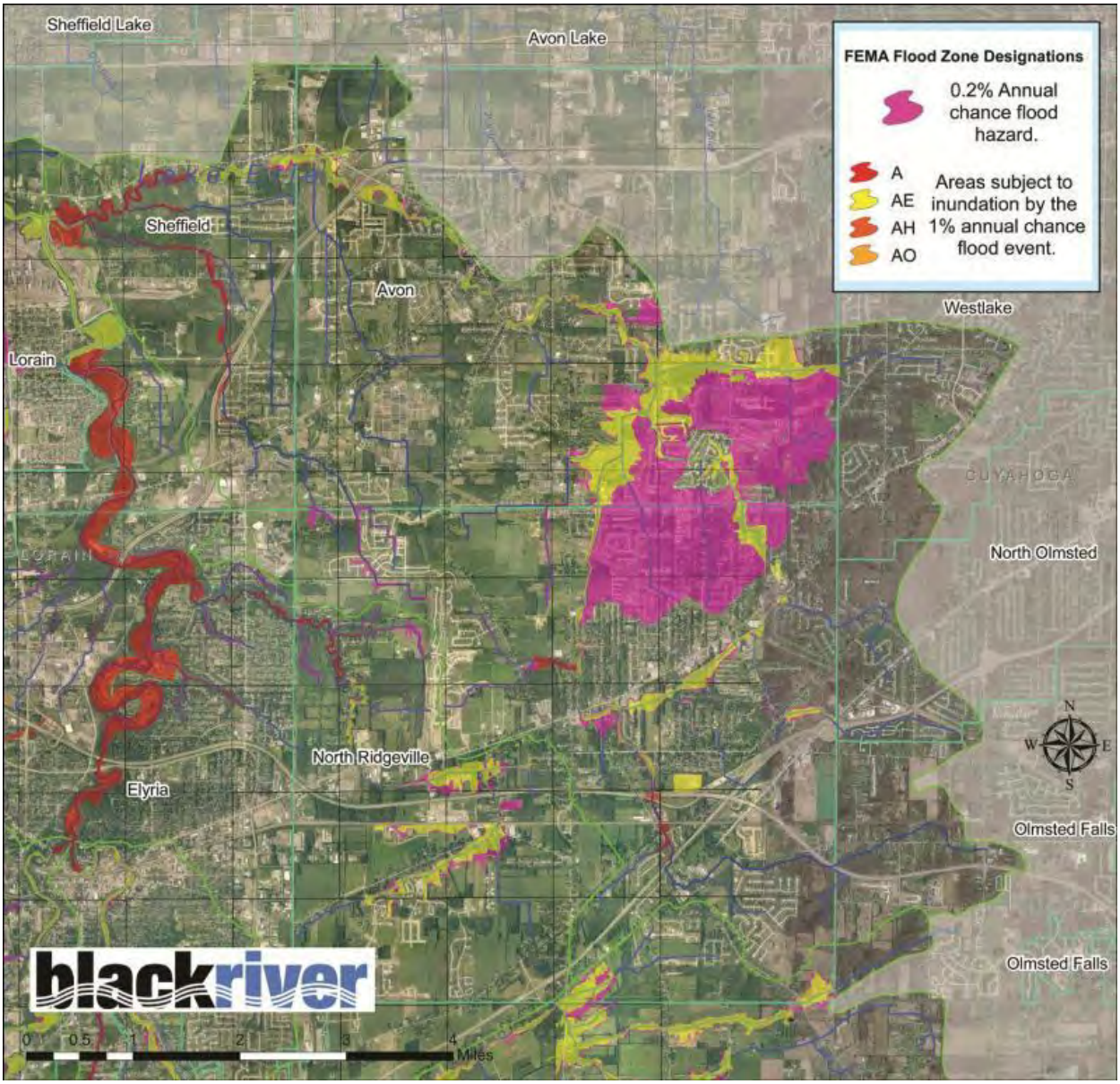


Figure 18: Avon and North Ridgeville Floodplain. Watershed boundaries are in green; city boundaries are in light blue.

Through a combination of soil type, land use, and rainfall, The Lorain County SWCD has developed calculations for run-off volume resulting from development. This formula was applied to a 23-acre site in the Avon area where a commercial development was planned. As mature woodland with trees, shrubs and other vegetation, about 886,000 gallons per year flowed off of the site and into French Creek. As cropland, the same 23 acres contributes 1.2 million gallons per year. Finally, if the land is paved and turned into commercial or residential property, the runoff volume doubled, dumping almost 2 million gallons per year into French Creek. Given the rapid growth rate of Avon, North Ridgeville, Avon Lake, and other northern watershed communities, this scenario is repeated across hundreds of acres of land, contributing to major flooding problems for Avon and downstream communities along the Black River.

The conventional engineering approach to handling storm water is to increase the volume and velocity of water passing through a system. Widening or deepening channels or digging new channels expands volume. Velocity is increased by reducing the bends or meanders in a water system and lining it with an impermeable surface such as concrete or rip rap. This kind of system hastens the drainage of storm water away from a given community. Unfortunately, as the case of Avon and North Ridgeville demonstrates, this approach has several limitations. North Ridgeville improved drainage in the late 1990's by straightening channels and lining waterways with concrete. This solution, while facilitating drainage away from North Ridgeville, exacerbated flooding for their downstream neighbors in Avon. In addition to flooding, another problem with this approach is the further degradation of aquatic habitat. Storm water surges increase sedimentation and erosion. In addition, rapid shifts in the volume of water can affect aquatic species. Greater aquatic ecosystem stability is achieved when storm water is collected and percolates slowly into a river system, insuring a more even flow and fewer wide fluctuations in stream load.

A more proactive solution to storm water issues is to mimic the more natural drainage courses in the watershed. Before large-scale settlement, a vast network of wetlands and forests would absorb storm water. Water would slowly percolate out of these systems, providing a more consistent stream flow and reducing the extremes of flooding and drought conditions. One recent development in North Ridgeville has taken a proactive approach to mimicking these more natural conditions. Houses being constructed on the property will be clustered closely together. This allows for more space to be devoted to open space. Over 50% of the property will be devoted to habitat and natural storm water containment. A 10-acre wetland will form in a sandy embankment, absorbing storm water and recreating native habitat conditions. While such housing developments are encouraging, current zoning and building codes do not support this kind of alternative development. A more proactive zoning code could encourage preservation of open space and a better approach to storm water management.

An ideal stream restoration scenario would be to retain open space in the watershed, encourage the development of well-connected floodplain areas, restore sinuosity to the channel, and develop riffle and pool habitats where appropriate. However, this is an unlikely option in the developed and urbanized Black River main-stem and French Creek sub-watersheds where the communities are near build-out. Many opportunities still exist for floodplain and wetland restoration projects, though. One example is in the City of North Ridgeville, where the Watershed Coordinator has been partnering with local government, citizens, and a consulting firm to develop a Town Center District Plan. This plan will incorporate designs that facilitate and enhance transportation through North Ridgeville's town center, including the potential floodplain restoration of a channelized tributary to French Creek and development of an educational wetland complex behind the City Library with signage and access paths.

Figure 19: How Not to be the Solution to Storm Water Pollution. This house is not located within the Black River watershed. (Christopher Alvarado)

3. Riparian Corridor Assessment

Figure 20: Riparian corridor and floodplain along the Black River, City of Lorain. (Christina Znidarsic)

Riparian corridor is an ecological definition that is applied to the connected waterways of a river system and includes stream banks and floodplains. Riparian corridors, like floodplains, offer important ecological functions and should be protected. Left in their natural state, riparian corridors act as stream buffers which help to prevent soil erosion, filter water pollutants, and provide habitat for wildlife. Flooding, erosion, excessive sedimentation of surface waters, increased storm water runoff, loss of wetlands, increased pollution, and loss of natural habitats are some of the problems the Black River watershed faces if riparian corridors are not protected.

Riparian vegetation provides shading and keeps the temperature of the water lower, increasing the amount of oxygen available in the water and improving overall stream habitat quality. Riparian corridors also support species diversity, serve as vital natural throughways for migrating fauna, and promote environmental resilience versus future negative ecological impacts.

From a social perspective, riparian zones can increase property values by being both aesthetically pleasing and providing space for many different recreational activities such as walking, bicycling, fishing, hunting, boating, and bird-watching. This diversity of interest can foster a stronger sense of community among local residents. Most people enjoy natural settings and wildlife viewing and are willing to pay a higher price to enjoy these benefits.

Forested natural areas along the corridors can also prevent erosion and reduce the amount of sediment and nutrient-laden runoff from farming or development that enters the streams, thus protecting surface

water quality. Riparian zones are instrumental in water quality improvement for both surface water runoff and water flowing into streams through subsurface flow. Research has shown that riparian zones, particularly wetland riparian zones, play a significant role in lowering nitrate contamination in surface runoff from agricultural fields. The Virginia Department of Forestry (VDF), in their efforts to protect and restore the water quality of the Chesapeake Bay Watershed, determined that riparian forests as narrow as 50 feet in width can completely filter out excess nitrogen and reduce sediment and phosphorous by a significant amount. The amount of nutrient retention, however, varies by factors such as width of buffer and slope. The VDF recommendation is that a minimum buffer of 50 feet plus 4 feet for every 1% increase in slope will alleviate a nutrient problem.

It should be a goal of Black River watershed groups to protect as many existing riparian corridors as possible. Many actions recommended by this action plan deal with the preservation of riparian corridors. The establishment and protection of riparian integrity has long been a focus of the Black River RAP Committee, who can be seen as a willing partner to protect these areas. Continued degradation of these sensitive locations will further exacerbate negative environmental impacts to water and habitat quality.

To determine the approximate area of riparian corridor for each HUC-12, a buffer was created along hydrology lines from the National Hydrology Dataset (NHD) and used as a mask to clip relevant data from a land-use layer of the watershed. The resulting area of forest along the stream banks was then calculated and percentage estimates were made.

Table 19: Riparian Corridor Statistics by HUC-12.

HUC-12	Miles of Riparian Stream	Total Miles	Percentage Riparian Cover
French Creek 041100010601	22.31	52.49	42.5%
Black River 041100010602	27.02	70.23	38.5%
Charlemont Creek 041100010501	33.58	86.9	38.6%
Upper West Branch 041100010502	17.61	32.74	53.8%
Wellington Creek 041100010503	40.55	72.37	56.0%
Middle West Branch 041100010504	41.6	80.55	51.6%
Plum Creek 041100010505	72.47	115.41	62.8%
Lower West Branch 041100010506	57.19	88.94	64.3%

Town of Litchfield-East Branch 041100010401	25.25	54.75	46.1%
Salt Creek-East Branch 041100010402	24.19	49.69	48.7%
Willow Creek 041100010403	67.5	103.87	65.0%
Jackson Ditch-East Branch 041100010404	60.1	111.34	54.0%
East Fork-East Branch 041100010301	86.09	153.72	56.0%
HW West Fork-East Branch 041100010302	64.15	132.5	48.4%
Coon Creek-East Branch 041100010303	31.31	41.76	75.0%
Total	**670.92**	**1247.26**	**53.8%**

The portions of the watershed with the most riparian border are the upper reaches of the West and East Branch 10-digit HUCs. Within the West Branch, the Charlemont Creek sub-watershed has the least amount of riparian buffer left; this is due to the elimination of riparian buffer from most of the streams for agriculture. French Creek and Black River have also lost a significant percentage of riparian buffer, mainly due to extensive development and urbanization.

4. Permanently Protected Streams

Out of approximately 1,240 miles that comprise the Black River and its tributaries only about 72.6 miles, or 5.85%, are permanently protected. The largest single stretch of permanently protected stream is located in the Lorain Metroparks Carlisle Reservation, in the Lower West Branch Black River sub-watershed.

Table 20: Miles of Protected Stream by HUC-12.

Source: 2010 GIS data provided by Western Reserve Land Conservancy (WRLC)

Miles of Protected Stream in Black River Watershed

HUC and Description	Parks and Other Protected Miles	WRLC Protected Miles	Total Protected Miles
04110001 - Black River Watershed	**64.72**	**7.837**	**72.558**
0411000103 - Headwaters East Branch Black River	***4.136***	***0.183***	***4.320***
041100010301-East Fork East Branch Black River	1.706	0.183	1.889
041100010302-Headwaters West Fork East Branch	1.536		1.536

Black River			
041100010303-Coon Creek-East Branch Black River	0.894		0.894
0411000104 - East Branch Black River	***13.075***	***1.233***	***14.308***
041100010401-Town of Litchfield-East Branch Black River	4.530		4.530
041100010402-Salt Creek-East Branch Black River	4.896	1.233	6.130
041100010404-Jackson Ditch-East Branch Black River	3.649		3.649
0411000105 - West Branch Black River	***32.859***	***6.420***	***39.280***
041100010501-Charlemont Creek	8.554	0.817	9.371
041100010502-Upper West Branch Black River	2.682	4.859	7.541
041100010503-Wellington Creek	7.660	0.743	8.403
041100010504-Middle West Branch Black River	0.130		0.130
041100010505-Plum Creek	1.962		1.962
041100010506-Lower West Branch Black River	11.873		11.873
0411000106 - Black River	***14.651***	***0.000***	***14.651***
041100010601-French Creek	4.208		4.208
041100010602-Black River	10.443		10.443
Data for 041100010603-Heider Ditch-Frontal Lake Erie are N/A			

5. Natural and Modified Channels

A comprehensive inventory of modified vs. natural channels does not currently exist for the entire Black River watershed. Using QHEI data provided by Ohio EPA, known unmodified miles were estimated for the watershed. NOACA's Clean Water 2000 Plan estimated that 13% of streams within the Black River watershed have been channelized to some extent; the actual amount is probably significantly higher. This is probably a conservative estimate of actual unmodified miles.

Table 21: Unmodified Miles by HUC-12.

Source: QHEI Data, Ohio EPA

Estimated Unmodified Miles in Black River Watershed

Stream Name	***Number of Miles***
West Branch Black River	48.1
East Branch Black River	41.5
Wellington Creek	16.3
Black River	15
Charlemont Creek	10.2
Plum Creek	7
Trib. to E. Br. Black R. (RM 22.65)	6.4
French Creek	6.1
Trib. to E. Br. Black R. (RM 39.06)	5.4
Willow Creek	4.9

West Fork East Branch Black River	4.1
Kelner Ditch	3
East Fork East Branch Black River	2.7
Trib. to Charlemont Creek	2
Clear Creek	1.8
Salt Creek	1.8
Trib. to E. Br. Black R. (RM 28.65)	1.5
Buck Creek	1
Elk Creek	1
Crow Creek	0.8
Trib. to West Branch Black River	0.5
Trib. to Charlemont Creek (RM 0.51)	0.1
Total	**181.2**

Many streams within the watershed have been heavily modified, particularly in the northern sub-watersheds where most streams have been re-routed or culverted to accommodate development. Artificially straightened river conditions in these areas cause significant amounts of suspended sediments to settle out. In the French Creek sub-watershed in particular, most sites with QHEI evaluations were channelized, re-routed, or otherwise altered for residential or commercial development.

The Black River main-stem near the mouth is an industrial waterway in a federally-regulated channel and as such is dredged and maintained in a permanent entrenched state. Most of French Creek and its tributaries have been culverted, rerouted, or buried in pipes. The southern, more rural/agricultural part of the watershed also experiences some channelization as streams are straightened, ditches are dug out and cleaned, and banks are altered to facilitate drainage off croplands. The expedited drainage increases volume and flow further downstream and exacerbates an already pressing stormwater issue, leading to down-cutting and severe erosion. The result is that many banks have lost access to their floodplain and riparian areas.

6. Dams

Map 20: Black River Dams by Location and Purpose (see Appendix A).

Table 22: Public Dams.

Name	Owner	Relevant Stream Segment	Purpose	Type
LORAIN COUNTY PARK LAKE DAM	Lorain County Metro Park Commission	TRIBUTARY TO CHARLEMONT CREEK	RECREATION, PUBLIC	DAM AND SPILLWAY
SPENCER UPGROUND RESERVOIR	Village of Spencer	TRIBUTARY TO COON CREEK - OFFSTREAM	WATER SUPPLY, PUBLIC	UPGROUND
SPENCER RESERVOIR DAM	Village of Spencer	COON CREEK	WATER SUPPLY, PUBLIC	DAM AND SPILLWAY
J.B. FIRESTONE RESERVOIR	Village of Spencer	COON CREEK - OFFSTREAM	WATER SUPPLY, PUBLIC	UPGROUND

LETHA HOUSE LAKE DAM	Medina County Park District	UNNAMED TRIBUTARY	RECREATION, PUBLIC	DAM AND SPILLWAY
UPPER LETHA HOUSE LAKE DAM	MEDINA COUNTY PARK DISTRICT	TRIBUTARY TO SPENCER LAKE	RECREATION, PUBLIC	DAM AND SPILLWAY
SPENCER LAKE - SOUTH DAM	ODNR, Division of Wildlife	TRIBUTARY TO EAST BRANCH BLACK RIVER	RECREATION, PUBLIC	DAM AND SPILLWAY
SPENCER LAKE - NORTH DAM	ODNR, Division of Wildlife	TRIBUTARY TO EAST BRANCH BLACK RIVER	RECREATION, PUBLIC	DAM AND SPILLWAY
WELLINGTON LOW-HEAD DAM	Village of Wellington	CHARLEMONT	WATER SUPPLY, PUBLIC	CHANNEL DAM
FINDLEY LAKE DAM	ODNR, Division of Parks & Recreation	WELLINGTON CREEK	RECREATION, PUBLIC	DAM AND SPILLWAY
WELLINGTON RESERVOIR NO. 2 DAM	Village of Wellington	TRIBUTARY TO CHARLEMONT CREEK	WATER SUPPLY, PUBLIC; RECREATION, PUBLIC	DAM AND SPILLWAY
WELLINGTON RESERVOIR NO. 1 DAM	Village of Wellington	TRIBUTARY TO CHARLEMONT CREEK	WATER SUPPLY, PUBLIC	DAM AND SPILLWAY
WELLINGTON UPGROUND RESERVOIR	Village of Wellington	CHARLEMONT CREEK - OFFSTREAM	WATER SUPPLY, PUBLIC; RECREATION, PUBLIC	UPGROUND
WESTLAKE PARK DAM	Village of Wellington	TRIBUTARY TO WEST BRANCH BLACK RIVER	N/A	DAM AND SPILLWAY
CALEY WOODS WILDLIFE LAKE DAM	Lorain Co. Metropolitan Park Dist.	TRIBUTARY TO WELLINGTON CREEK	RECREATION, PUBLIC	DAM AND SPILLWAY
GRAFTON UPGROUND RESERVOIR	Village of Grafton	OFFSTREAM	WATER SUPPLY, PUBLIC	UPGROUND
OBERLIN UPGROUND RESERVOIR	City of Oberlin	OFFSTREAM	WATER SUPPLY, PUBLIC; RECREATION, PUBLIC	UPGROUND
OBERLIN OLD UPGROUND RESERVOIR	City of Oberlin	PLUM CREEK - OFFSTREAM	WATER SUPPLY, PUBLIC	UPGROUND
OBERLIN WATERWORKS UPGROUND NO. 2	City of Oberlin	OFFSTREAM PLUM CREEK	WATER SUPPLY, PUBLIC	UPGROUND
OBERLIN WATERWORKS UPGROUND NO. 1	City of Oberlin	PLUM CREEK - OFFSTREAM	WATER SUPPLY, PUBLIC	UPGROUND
EAST BRANCH BLACK RIVER DAM NO. 2	City of Elyria	EAST BRANCH BLACK RIVER	RECREATION, PUBLIC	CHANNEL DAM

EAST BRANCH BLACK RIVER DAM NO. 3	City of Elyria	EAST BRANCH BLACK RIVER	RECREATION, PUBLIC	CHANNEL DAM
SANDY RIDGE WETLAND DAM	Lorain County Metro Parks	TRIBUTARY TO THE BLACK RIVER	WETLAND MITIGATION	DAM AND SPILLWAY

There are about 165 known dams within the Black River watershed. The majority of dams are privately owned and designated for recreational use to create small impoundments for fishing, boating, and swimming. There are 23 known public dams. In 2009, a dam which created Brentwood Lake, a 0.046 km^2 impoundment in Carlisle Township, was removed because of concerns that the dam would fail and flood out several nearby homes. The Lorain County Engineer's Department oversaw the removal and drained the lake, eliminating the pronounced algal blooms present in the impoundment area (Brentwood Lake, along with Findley Lake, was listed as Impaired for Eutrophication or Undesirable Algae) and restoring the natural stream which had not been free-flowing since the 1950s. However, there was no management of the property post-dam removal. The area has been subsequently overgrown by invasives and the local residents have voiced their desire to have the lake restored or at the minimum, some mowing done on the property to control the tall weeds. As a result, the Brentwood Lake site should be targeted as an important restoration area. It is situated over hydric soils and comprises about 15 acres; the relevant stream is a direct tributary to the East Branch of the Black River and takes drainage and nutrient loadings from an 18-hole golf course immediately upstream. Development of a properly-managed wetland complex in this area would serve a vital nutrient and storm water mitigation function for the Jackson Ditch-East Branch sub-watershed, which is suffering increased pressures from suburban development.

Figure 21: Lowhead dam, West Branch Black River near Oberlin Reservoir. (Christina Znidarsic)

7. Unrestricted Livestock Access

According to the Lorain SWCD's District Conservationist, there are only about a dozen farms within the watershed where livestock have access to streams, with the majority located in the West Branch sub-watershed. While most farms keep their livestock from having access to streams, sedimentation and nutrient loading are primary concerns within the Black River watershed and these sites should not be ignored as potential projects. Specific fencing sites have been identified after discussions with local citizens, and will be targeted for future projects.

8. Eroding Banks

A specific inventory of number and location of eroding banks did not exist for the watershed; however, an analysis was performed in ArcGIS using a Highly Erodible Land (HEL) dataset in conjunction with the National Hydrography Dataset (NHD). Land classified as Highly to Potentially Highly Erodible was isolated and used to mask along NHD flowlines, with the hypothesis being that the resulting measured stream miles would likely be very susceptible to eroding. A conservative estimate of 226.23 miles of

eroding banks (or 18.1% of total miles) for the entire watershed was determined. This is considered minimum mileage, as the altered hydrology of streams in the northern watershed from increased development has exacerbated erosion there as well.

Table 23: Miles of Eroding Banks by HUC-12.

HUC-12	Total Stream Miles	Erodible Stream Miles	Percentage
French Creek 041100010601	70.23	1.45	2.1%
Black River 041100010602	52.49	1.05	2.0%
Charlemont Creek 041100010501	88.94	29.01	32.6%
Upper West Branch 041100010502	115.4	28.56	24.7%
Wellington Creek 041100010503	80.55	22.93	28.5%
Middle West Branch 041100010504	72.37	15.1	20.9%
Plum Creek 041100010505	32.74	3.75	11.5%
Lower West Branch 041100010506	86.9	5.75	6.6%
Town of Litchfield-East Branch 041100010401	111.34	16.32	14.7%
Salt Creek-East Branch 041100010402	103.87	29.03	27.9%

Willow Creek 041100010403	49.69	2.64	5.3%
Jackson Ditch-East Branch 041100010404	54.75	8.79	16.1%
East Fork-East Branch 041100010301	41.76	8.37	20.0%
HW West Fork-East Branch 041100010302	132.5	19.8	14.9%
Coon Creek-East Branch 041100010303	153.72	33.68	21.9%
Total Miles	1247.26	226.23	18.1%

In 1982, the United States Army Corps of Engineers (USACE) reported the majority of cropland within the watershed is eroding at an average rate of 4.7 tons/acre/year (more than 56% greater than the soil loss tolerance). The USACE found that more than 100,000 acres of cropland within the watershed was eroding at more than twice the rate of tolerable loss. At the time, the area represented fully one-third of the entire watershed.

Figure 22: Heavily-scoured banks in the Middle West Branch sub-watershed. (Christina Znidarsic)

According to the USACE report, erosion resulting from agricultural practices within the watershed was the major source of sediment in the Black River and its tributaries. Highly Erosive Land (HEL) maps show that the most erosive soils are located in the upper, predominantly agricultural reaches of the watershed. This stresses the importance of implementing Best Management Practices (BMPs) among local farmers to control and manage soil loss on their properties.

The Black River TMDL also identifies sedimentation and turbidity as significant causes of water quality impairment. Stream bank scouring resulting from too much water being introduced into waterways is causing elevated levels of erosion and sedimentation throughout the entire watershed. Channel incision from high-energy flow alters the stream's natural morphology and prevents the stream's natural function through entrenchment and elimination of floodplain access. It is safe to say that one could find eroding banks present throughout the entire watershed area from the headwater tributaries to the main stem river, and particularly in the southern sections of the watershed where the most highly erodible soils are located.

Map 21: Highly Erodible Lands (see Appendix A).
Map 22: Erodible Banks (see Appendix A).

9. Status and Trends

No new major subdivisions were reviewed in 2009 by the Lorain County Planning Commission. Whenever any work is done within the floodplain, such as filling, grading, or building, a Special Flood Hazard Area (SFHA) Development Permit is required. Fourteen SFHA permits were issued in 2009 by Lorain County for projects that included the installation of culverts and bridges, below grade utility lines, construction of a deck, and general filling and grading. The City of North Ridgeville issued 236 residential building permits in 2009, the most out of any incorporated area in the watershed. The city of Avon came in second with 112 permits issued. In terms of percent increase of housing stock, the city of Avon is ranked first with 60.03%. These communities are located within the French Creek sub-watershed, which was designated a Rapidly Developing Watershed (RDW) by Ohio EPA.

Table 24: Road and Highway Projects, 2010-2011.

2010 - 2011 Road and Highway Projects Impacting the Black River Watershed, Lorain County Engineer's Office			
Current Projects	**Relevant Stream &/or HUC**	**Future Projects**	**Relevant Stream &/or HUC**
Colorado Ave. (Sheffield Village), City of Lorain to Abbe Rd.	French Creek (directly along French Creek Reservation's north border 041100010601)	Lear Nagle Rd. (City of North Ridgeville), S.R. 10 to Center Ridge Rd.	Unnamed tributary to French Creek (French Creek 041100010601)
Russia Rd. (New Russia/Carlisle Twp.), S.R. 58 to Oberlin-Elyria Rd.	Straw Ditch and Schroeder Ditch (Lower West Branch 041100010506)	S.R. 57 (Village of Grafton) Railroad north to the corporation limits	Jackson Ditch-East Branch (041100010404)
Island Rd. Resurfacing (Eaton Twp.), from CSX Railroad South to Grafton Twp. Line	Bannister Ditch (Willow Creek 041100010403), Hill Spaulding Ditch (Jackson Ditch-East Branch 041100010504)	Griswold Rd. (Elyria Twp.), Lake Ave. to Leona, widening to 3 lanes	Unnamed tributary to Black River Main-stem (Black River 041100010602)
Resurfacing of Durkee Rd. in Eaton Twp. and asphalt preleveling of 11 miles of roadways	Bannister Ditch and Fortune Ditch (Willow Creek 041100010403), Jackson Ditch, Hill Ditch, and Alexander Ditch (Jackson Ditch-East Branch 041100010504)	Cowley Rd. (Eaton Twp.) Crocker Rd. to S.R. 82	Bannister Ditch (Willow Creek 041100010403)
Quarry Rd. Bridge #03659 Replacement (Wellington/Brighton Twps.)	Unnamed tributary to Charlemont Creek (Charlemont Creek 041100010501)	State Rt. 301 widening (Village of LaGrange), Taylor St. to north corporation limit	Kelner Ditch (Lower West Branch 041100010506)
Guardrail Replacement Project, Phase 4 guardrail upgrades on four county roads	N/A	Abbe Rd. widening (Sheffield Village) Elyria corp. limits to S.R. 254	Black River 041100010602
2011 Resurfacing Program on various county roads	N/A	Butternut Ridge Rd. (Carlisle Twp.), Oberlin-Elyria Rd. to Grafton Rd.	West Branch Black River (Lower West Branch 041100010506), East Branch Black River (Jackson Ditch-East Branch 041100010404)

2011 Bridge Replacement Program on various county bridges	N/A	Oberlin Rd. (New Russia and Amherst Twp.), Oberlin N. Corp. to S.R. 113	Squire's Ditch (Plum Creek 041100010505)
		Grafton Rd (Carlisle Twp.), S.R. 57 to 16th St.	East Branch Black River (Jackson Ditch-East Branch 041100010404)
		Oberlin-Elyria Road (New Russia and Carlisle Twp.), S.R. 511 to Butternut Ridge Rd.	Plum Creek, Squire's Ditch (Plum Creek 041100010505)
		Lagrange Rd. (Carlisle Twp.) U.S. 10 to Oberlin-Elyria Rd.	Unnamed Tributary to West Branch (Lower West Branch 041100010506)

H. Water Resource Quality

The entire Black River watershed has been identified as an Area of Concern and a list of 14 beneficial use impairments was addressed in the Black River Remedial Action Plan. The initial AOC designation was only applied to the lower portions of the main-stem, but was expanded to the entire watershed during the development of the RAP. The RAP Committee's Stage One report identified loss of habitat and riparian vegetation due to agricultural and developmental activities, point sources, non-point sources, stream bank erosion, home sewage treatment systems, stream channelization and modifications, and combined and sanitary sewer overflows as the principal causes of beneficial use impairments in the Black River watershed.

1. Attainment Status

The Black River watershed is not in attainment of water quality goals due to habitat alterations and various municipal, rural, and agricultural pollutants, leading Ohio EPA to strictly limit new pollutant discharges.

Table 25: General Attainment Scores.

	Habitat as QHEI	Fish Populations as IBI	Fish Populations as MIwb	Benthos as ICI
Score needed for Attainment	**60**	**38**	**7.9**	**34**
Score needed for RAP to delist BUI	55	34	7.4	30
Averages of most current data				
French Creek	53.5	28.3	6.37	No Data
RM 0.0 to RM 6.9	**63**			
Above RM 6.9	39.9			
West Branch	**63.1**	32.1	6.5	**46**
Plum Creek	**62.5**	29.8	No Data	34
Wellington Creek	**72.25**	31.5	No Data	No Data
Charlemont Creek	**69.3**	33.25	6.3	22
East Branch	**64.1**	**38.9**	**8.6**	**46**
Coding:	Meets RAP Delisting Criteria			
	Meets State Attainment Criteria			
	Close to meeting attainment			
	Not in Attainment or No Data Available			

The above table describes QHEI, IBI, MIwb, and ICI scores for the watershed, using the most recent data available. The average scores indicate a system that has overall scores meeting or exceeding the target score of 60.

Table 26: Average QHEI Scores by HUC-12.

Site	QHEI	Substrate	Cover	Channel	Riparian	Pool	Riffle	Gradient
041100010602 Black River	56.6	10.6	11.1	13.3	5.7	9.1	1.5	5.4
041100010601 French Creek	67.0	14.3	13.0	16.5	5.9	8.0	2.4	7.0
041100010506 Lower West Branch	57.5	8.4	10.7	15.1	7.2	6.0	1.7	8.4
041100010505 Plum Creek	62.7	11.7	11.3	14.0	7.3	7.7	1.7	8.9
041100010504 Middle West Branch	59.7	11.5	12.3	14.0	4.2	10.3	1.3	6.0
041100010503 Wellington Creek	67.1	16.3	11.6	15.9	6.7	4.6	3.2	8.8
041100010502 Upper West Branch	63.1	13.6	11.0	16.2	6.9	5.2	2.1	8.2
041100010501 Charlemont Creek	65.5	12.7	11.7	16.0	7.7	6.1	2.7	8.6
041100010404 Jackson Ditch-East Branch	70.1	14.6	11.6	16.9	6.1	8.4	4.5	8.0
041100010403 Willow Creek	39.3	8.5	6.7	7.8	4.3	3.5	-0.2	8.7
041100010402 Salt Creek-East Branch	63.2	11.8	11.5	16.6	7.8	6.2	1.1	8.2
041100010401 Town of Litchfield-East Branch	65.5	14.3	11.7	16.0	7.0	7.3	3.8	5.3
041100010303 Coon Creek-East Branch	67.8	16.0	12.9	15.7	6.4	7.8	2.3	7.0
041100010302 Headwaters West Fork East Branch	68.4	15.0	13.2	13.9	6.6	8.4	4.4	7.6
041100010301 East Fork East Branch	62.6	13.3	11.4	11.8	6.4	8.0	3.3	8.5
Target Values from Black River TMDL (if available)	**60.0**	**≥13**		**≥14**				

Note: some of the data used for this table exceeds the Credible Data requirement, and should be updated.

This picture changes though when evaluated by 12-digit HUC. Averaged scores of the East Branch sub-watershed meet RAP delisting criteria and state attainment criteria. However, a breakdown of QHEI scores by 12-digit HUC shows that Willow Creek (041100010403) has substantially lower scores than the rest of the 12-digit HUCs in the East Branch sub-watershed. The Willow Creek sub-watershed contains the community of Eaton Township, which is experiencing changing land-use impacts from increased

development and subsequent hydromodifications to stream channels. The rest of the East Branch exhibits fairly good stream habitat quality, but as development continues, habitat alterations resulting in lower QHEI scores could increase, adding to the areas in nonattainment. Willow Creek could be prioritized as a potential target area for restoration efforts, and efforts are already underway to develop riparian setback resolutions for Eaton Township in their updated Comprehensive Land Use Plan.

The French Creek sub-watershed is shown as close but not meeting attainment. Splitting the site data into upstream and downstream of RM 6.9, though, shows a marked difference in habitat quality. The upstream section exhibits extremely low habitat scores indicative of the heavy development and subsequent hydromodification the sub-watershed has undergone in recent years. The downstream portion meets and exceeds attainment. This is due to the presence of good riparian corridor and protected stream bank along the French Creek Reservation, where the sampling was done for this section.

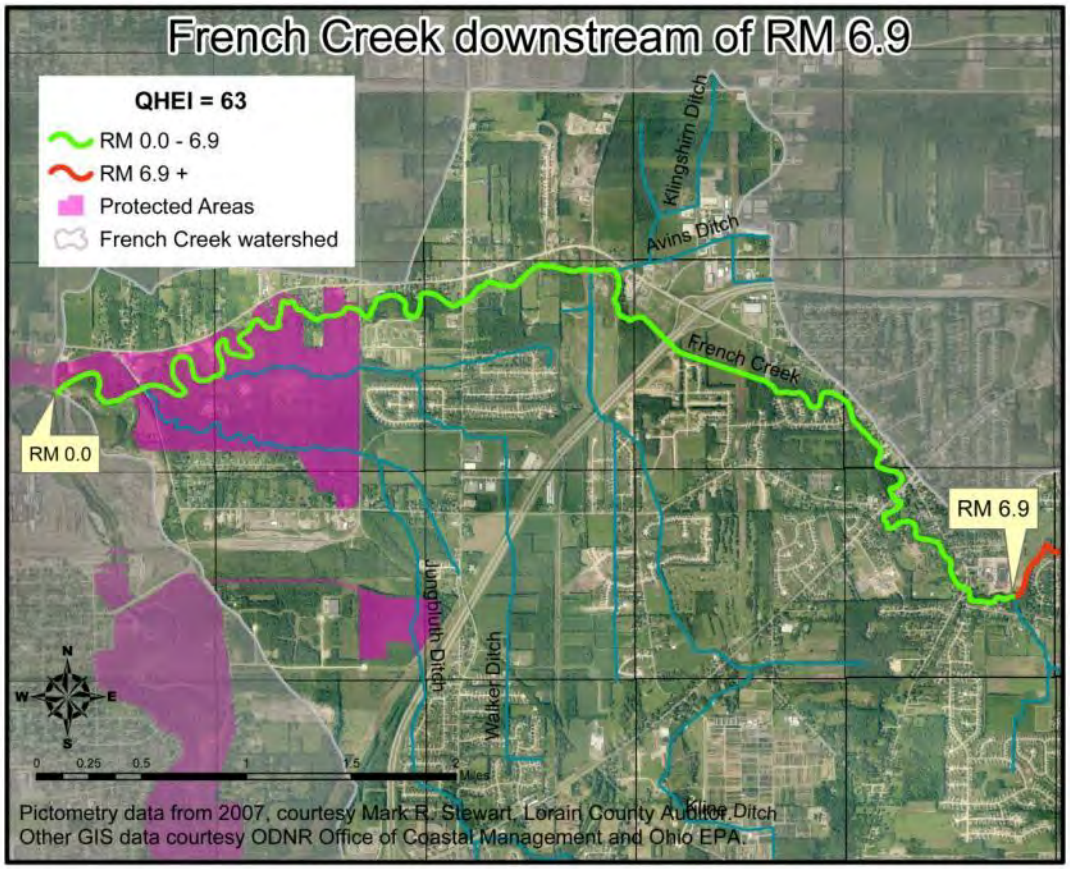


Figure 23: French Creek Attainment from RMs 0-6.9.

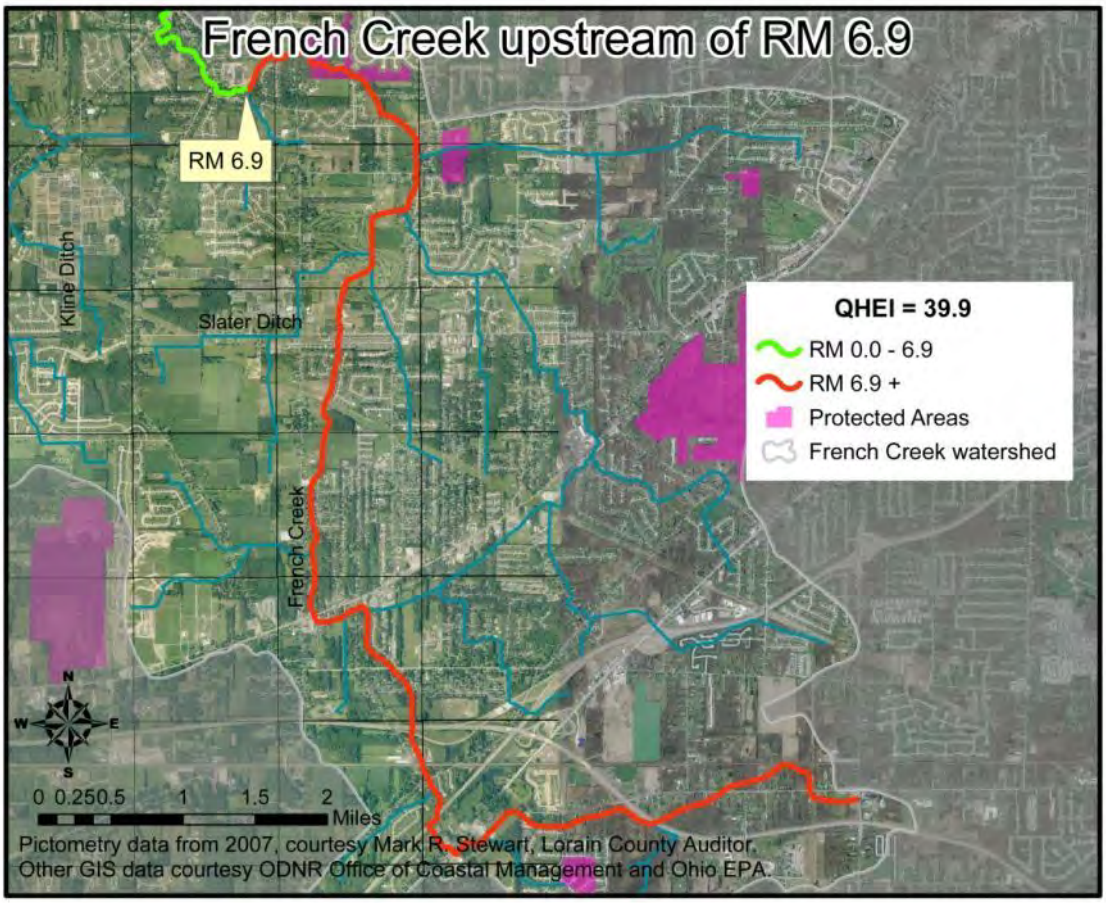


Figure 24: French Creek Attainment for RMs 6.9+.

Aside from an approximately 0.8 mile stretch that was straightened as it crosses Interstate 90, the downstream portion exhibits moderate to good sinuosity. Development is generally medium to light residential and riparian cover still exists along the stream bank. Upstream of RM 6.9, though, French Creek exhibits low to no sinuosity. Development, while still mainly residential, is more intense and most if not all of the stream has been channelized as it crosses through the community of North Ridgeville. Riparian cover is sparse or nonexistent. Out of the 15.8 miles of stream that comprise French Creek, it is estimated that nearly 75% (about 11.8 miles) are modified in some way due to development and close to 100% of the tributaries to French Creek are modified.

Although aquatic habitat, as measured by QHEI, is near the attainment score of 60, both of the fish community indices (IBI and MIwb) are a significant departure from being in attainment. The benthos score (ICI), while exceeding the attainment value of 34, may misrepresent conditions of the watershed as it represents an average score of only a single site, measured twice, once in 1997 and again in 2001.

Interestingly, the fish and benthos community scores were obtained between RM 6.10 and RM 1.00, a stretch that averaged 63.9 for QHEI, a value of attainment for aquatic habitat. The QHEI scores, by River Mile, can be seen in the chart below.

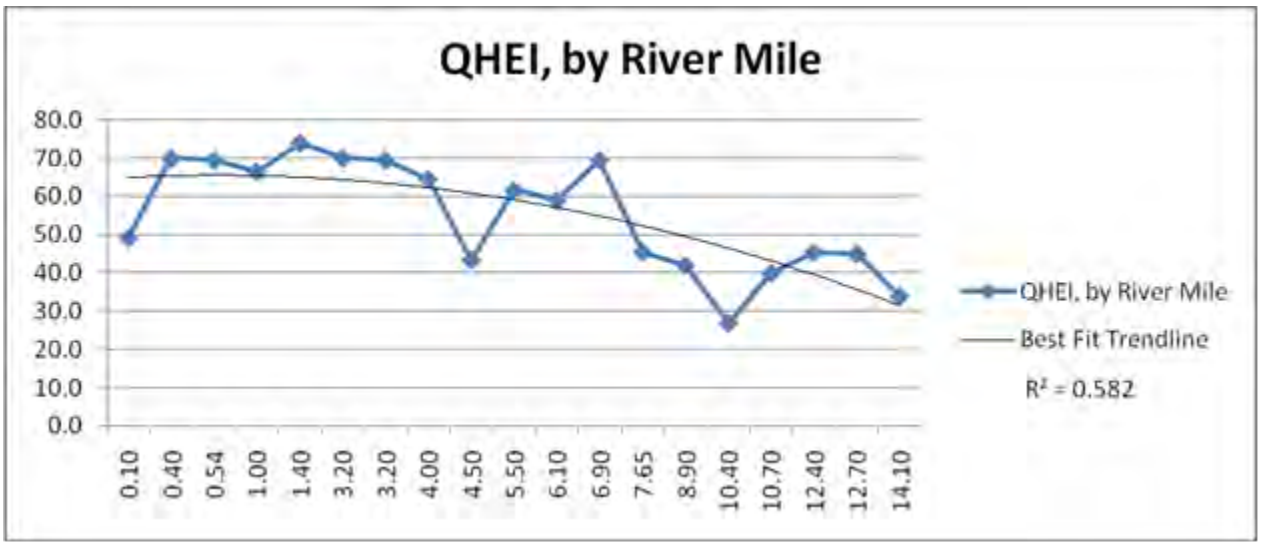


Figure 25: French Creek QHEI by River Mile.

Aside from the site at the mouth and the site at RM 4.5 (at Interstate 90), the French Creek main stem, downstream of RM 6.90 (at Stony Ridge Road in Avon), demonstrates aquatic habitat that should be sufficient to support better communities of aquatic organisms. This stretch is afforded high quality and protected aquatic habitat, especially wide riparian corridors, mainly due to the presence of James Day Park and French Creek Reservation of Lorain Metroparks.

Upstream of River Mile 6.9, no site achieved attainment for aquatic habitat. This is likely due to the flat terrain and the degree of development in this part of the watershed. The data shows the tributary systems to French Creek also exhibited non-attainment for aquatic habitat and is likely due to the same problems of flat terrain and extensive development.

2. Use Designations

All of the sampled streams in the Black River watershed are classified Warm Water Habitat (WWH), Primary Contact Recreation, Agricultural Water Supply, and Industrial Water Supply.

A section of the West Branch from Parsons Rd. to US Rt. 20 and Wellington Creek within the Findley State Park are designated State Resource Waters. The Black River main-stem and French Creek from Gulf Rd. to the mouth are also designated Seasonal Salmonid Habitat (SSH). One unnamed tributary to the East Branch Black River at RM 41.41 is classified Superior High Quality Waters (SHQW), while another unnamed tributary to the East Branch Black River at RM 39.06 is classified Outstanding State Waters based on Exceptional ecological values (OSW-E). Effective: 3/15/2010, http://www.epa.ohio.gov/portals/35/rules/01-05.pdf.

Map 23: Black River Use Designations (see Appendix A).

3. Locationally-Referenced Use Designations

Detailed Watershed Assessment Unit (WAU) results from the 2008 *Ohio EPA Integrated Water Quality Report* were used to estimate miles of stream attainment in the Black River watershed.

Headwaters East Branch Black River

Aquatic Life Use (ALU) Principal Stream Assessed Miles: 20.7 miles
- Miles attaining: 9.5
- Miles partially attaining: 11.2
- Miles in non-attainment: 0

ALU Tributaries: 8 sites; 90% full, 10% partial, 0% non
Fish Tissue Assessed Miles: 6.39
- Miles Impaired: 6.39

Aquatic life use impairment in the Headwaters East Branch was restricted to the reach of the East Branch in the vicinity of the Grafton WWTP and in an upstream reach affected by localized nonpoint sources based on monitoring conducted in 1997. 2006 Integrated report data for fish tissue documented body burdens of one or more pollutants at levels exceeding the threshold level upon which Ohio Water Quality Standards human health criteria are based which resulted in listing as impaired for fish consumption.

East Branch Black River

ALU Principal Stream Assessed Miles: 24.4
- Miles attaining: 24.4
- Miles partially attaining: 0
- Miles in non-attainment: 0

ALU Tributary assessment: 5 sites; 0% full, 16.7% partial, 83.3% non
Fish Tissue Assessed Miles: 34.91
- Miles Impaired: 34.91

All assessed principal stream miles in the East Branch met attainment for aquatic life use. Recent bacteria data indicate that a prior impairment listing for the recreation use is no longer supported and the East Branch has been delisted for that use. 2004 Integrated report data for fish tissue documented body burdens of one or more pollutants at levels exceeding the threshold level upon which Ohio Water Quality Standards human health criteria are based which resulted in listing as impaired for fish consumption.

West Branch Black River

ALU Principal Stream Assessed miles: 26.6
- Miles attaining: 0
- Miles partially attaining: 23.5
- Miles in non-attainment: 3.1

ALU Tributary assessment: 30 sites; 36.5% full, 14.0% partial, 49.5% non
Fish Tissue Assessed Miles: 35.60
- Miles Impaired: 35.60

There are no assessed principal stream miles designated in attainment for the West Branch WAU, although 36.5% of the tributary sites assessed were in full attainment. 49.5% of the 30 tributary sites, however, were in non-attainment, and 14% were in partial attainment.

Black River Main-Stem

ALU Principal Stream Assessed miles: 15.6

Miles attaining: 3.7

Miles partially attaining: 4.2

Miles in non-attainment: 7.7

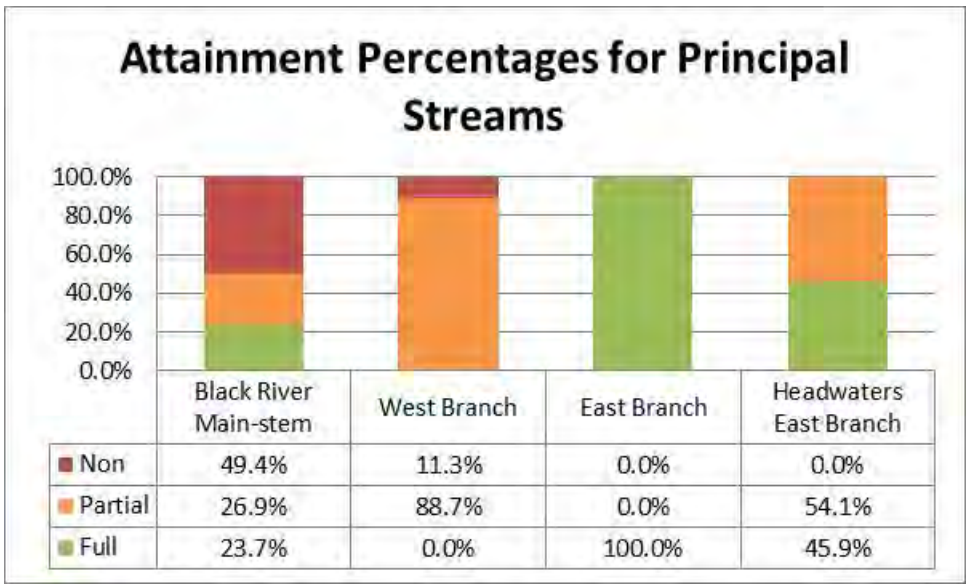
ALU Tributary Assessment: 3 sites; 0% full, 33.3% partial, 66.7% non

Fish Tissue Assessed Miles: 10.90

Miles impaired: 9.80

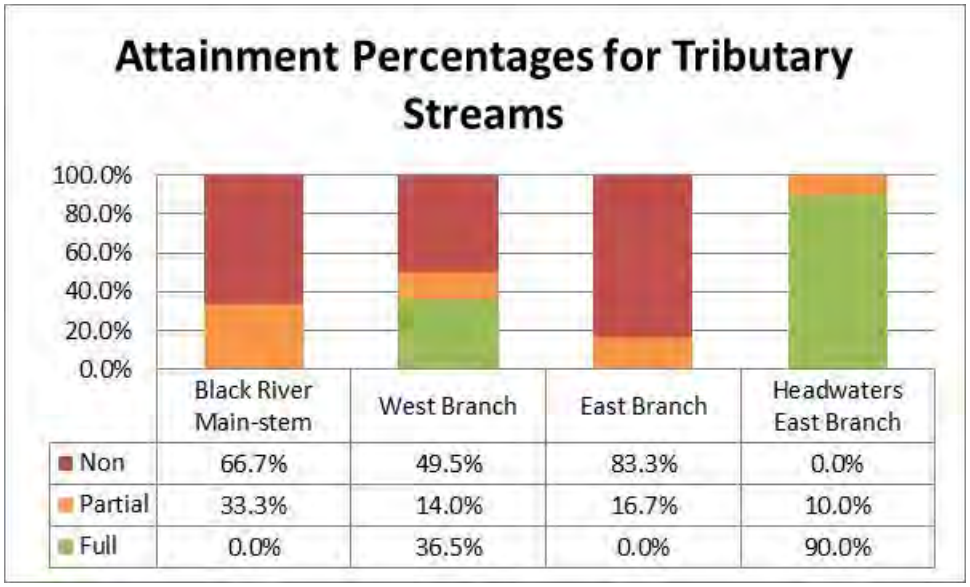
Nearly half of the principal stream miles in the Black River Main-stem are listed as in non-attainment. None of the 3 tributary sites assessed were in full attainment; one was in partial attainment and the others were in non-attainment.

Overall, attainment was high in the East Branch for principal streams. Tributaries sampled in the East Branch, however, fared significantly worse with over 80% of the sites listed as not being in attainment and no streams meeting attainment. Tributary streams in general fared poorly compared to the principal stream assessments except in the Headwaters East Branch. The data could be misleading though; only three sites were sampled in the Headwaters East Branch for the Tributary assessment.



	Black River Main-stem	West Branch	East Branch	Headwaters East Branch
Non	49.4%	11.3%	0.0%	0.0%
Partial	26.9%	88.7%	0.0%	54.1%
Full	23.7%	0.0%	100.0%	45.9%

Figure 26: Principal Stream Attainment Percentages.



	Black River Main-stem	West Branch	East Branch	Headwaters East Branch
Non	66.7%	49.5%	83.3%	0.0%
Partial	33.3%	14.0%	16.7%	10.0%
Full	0.0%	36.5%	0.0%	90.0%

Figure 27: Tributary Stream Attainment Percentages.

In addition, an assessment of streams with the potential to be impacted from human use was performed using ArcGIS software. Land delineated as "human use" (cropland, pasture, various levels of development) was selected out of a CCAP land use layer. This new layer was then used to select relevant stream segments out of a National Hydrography Database layer along a 25-foot buffer of the flow line. This was done for each 12-digit HUC, and shows the potential for a certain stream segment to be impacted by human use nearby. Analysis of this data indicates that there are few stream miles in the Black River watershed that have a low or minimal chance of being threatened by human activity, particularly from agricultural use. As a result the tributary and small headwater streams in the watershed's upper reaches are a priority target (see below image) for protection and restoration projects, as nearly all of them are shown to be potentially impacted from agriculture. Impacts from residential land use and development are prevalent in the tributaries of the Black River Main-stem, French Creek, Willow Creek, Plum Creek, Lower West Branch, and Jackson Ditch-East Branch sub-watersheds.

This analysis corresponds with the available assessment statistics, which showed the majority of secondary and primary tributary sites to either be not in attainment or only partially meeting attainment. It can also be used to more accurately pinpoint priority areas where a greater likelihood of streams not meeting attainment may be located.

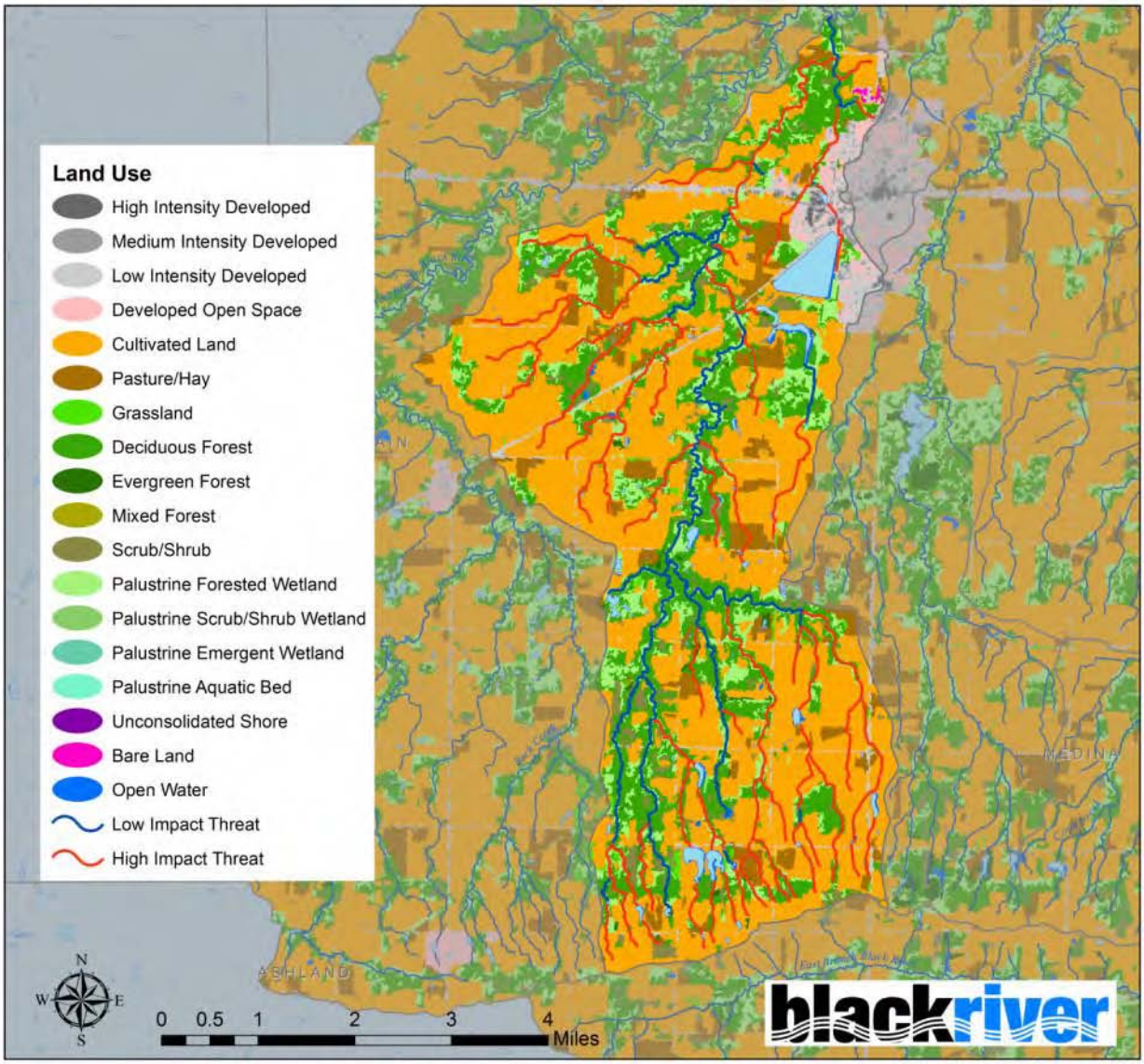


Figure 28: Sample Impact Threat Assessment, Charlemont Creek 041100010501. Note that nearly all secondary tributaries and headwater streams to Charlemont Creek are potentially impacted or threatened by agricultural land use.

Table 27: Potentially Impacted Stream Miles by HUC-12.

12-Digit HUC	Threatened Miles	Total Miles	Percentage
Black River	48.23	52.45	92%
French Creek	69.42	70.10	99%
Lower West Branch	83.47	86.90	96%
Plum Creek	28.50	29.21	98%
Middle West Branch	63.89	70.01	91%
Wellington Creek	75.65	80.55	94%
Upper West Branch	100.64	115.41	87%
Charlemont Creek	61.86	88.42	70%
Jackson Ditch-East Branch	49.81	54.75	91%
Willow Creek	48.34	49.42	98%
Salt Creek-East Branch	87.50	102.82	85%
Town of Litchfield-East Branch	102.83	111.15	93%
Coon Creek-East Branch	133.70	153.54	87%
HW West Fork East Branch	122.22	132.22	92%
East Fork East Branch	35.60	41.54	86%
Total	1111.68	1238.48	90%

4. Lakes Quality

Findley Lake, located in the Wellington Creek sub-watershed and managed by ODNR through Findley Lake State Park, was profiled in Ohio EPA's Black River 1999 TSD Report as part of their five-year Black River water quality assessment. Findley Lake is an 83-acre impoundment of the Wellington Creek tributary and sub-watershed. It drains 6.5 mi^2 upstream, has a basin volume of 810 acre-feet and an average depth of 9.6 feet. Problems identified in Findley Lake are sedimentation, nutrient enrichment, and maintaining game-fish populations. Two park WWTPs discharge to the lake with a monthly flow ranging from 20,000-44,000 gpd. The lake was assigned a Lake Condition Index (LCI) of 35.8. Lakes with LCI scores over 31 generally show impairment for one of their four designated uses. In Findley Lake, only the Recreational Use designation was in less than full attainment. Public Drinking Water and Aquatic Life uses were listed as Threatened, meaning the lake could have problems with these designations in the future and continued monitoring is recommended.

Most other lakes within the watershed are maintained as private recreational use and were formed from impoundment of existing waterways. Algal blooms are commonplace owing to stagnant conditions and sedimentation is a common problem as the impounded lakes act as sediment traps.

5. Wetlands Quality

Wetlands account for approximately 13% of the watershed. The two dominant wetland types are open water (4,523 acres) and forested (4,105 acres), based on National Wetlands Inventory, 2007/2008 data.

One driving force behind the restoration and reintroduction of wetland habitat in the Black River watershed is wetlands mitigation. In recent years, over 200 acres of wetland have been introduced to several Lorain County Metroparks, including Sandy Ridge, Carlisle, and Caley Reservations. Mitigation banking comes from provisions in the Clean Water Act Amendments of 1987, which call for a "no-net loss of wetlands policy." Developers or landowners are restricted from destroying or draining wetlands that exist on their properties. In some cases, wetland drainage has been permitted only if the landowner offsets the impact by replacing the lost wetlands with the reintroduction of wetlands at another location, desirably within the same watershed. Developers purchase credits in a mitigation bank. These credits support the compensation of another landowner for installing wetland habitat on their property. While there is some question as to whether or not wetlands that are reintroduced are always of the same quality as those that are drained, mitigation banking represents one strategy for improving large tracts of wetland habitat.

One such mitigation bank was formed at the Caley Reservation, managed by the Lorain County Metroparks. Wellington Creek, a tributary of the Black River, flows north from Wellington through this 487-acre park located in Pittsfield Township. The park features a wide range of ecosystems and recreational opportunities. Two large ponds near the entrance of the park are available for fishing. A thick riparian forest hugs the banks of Wellington Creek with mature stands of cottonwood, box elder, sycamore, walnut, elm, willow, and maple occupying much of the floodplain. About a half-mile past a cable bridge that spans Wellington Creek is the Caley mitigation bank. Occupying about 30 acres, this bank consists of a considerable stretch of wetland habitat, usually saturated year-round. The wetlands were introduced in an abandoned farm field and are surrounded by an abundance of old field wildflowers such as goldenrod, purple aster, and some exotic plants such as Queen Anne's Lace. These wetlands provide an ideal site for seeing a variety of birds, including ducks, geese, herons, egrets, sandpipers, kingfishers, and warblers.

Caley Reservation is named after John Caley who in 1960 granted 321 acres of farm and woodland to the National Wildlife Federation Endowment through his will. The will stipulated that the land be managed as a site to benefit wildlife. The National Wildlife Federation yielded stewardship responsibility for the property to the Ohio Department of Natural Resources (ODNR) in 1970. ODNR worked out a management agreement with the Lorain County Metroparks to enhance local stewardship opportunities.

A breakdown of total acres of wetlands by type over 5 acres, total acres of managed wetlands versus total acres of non-managed wetlands over 5 acres, and total acres of non-managed wetlands by type over five acres was performed in ArcGIS using National Wetland Inventory data from 2007-2008 and a Managed Areas layer compiled from GLC, WRLC, and DNAP information. The hypothesis is that extant wetlands over 5 acres in size contribute vital hydrological functions to their surrounding area and should be identified and preserved. The results were broken down by 12-digit HUC and are as follows:

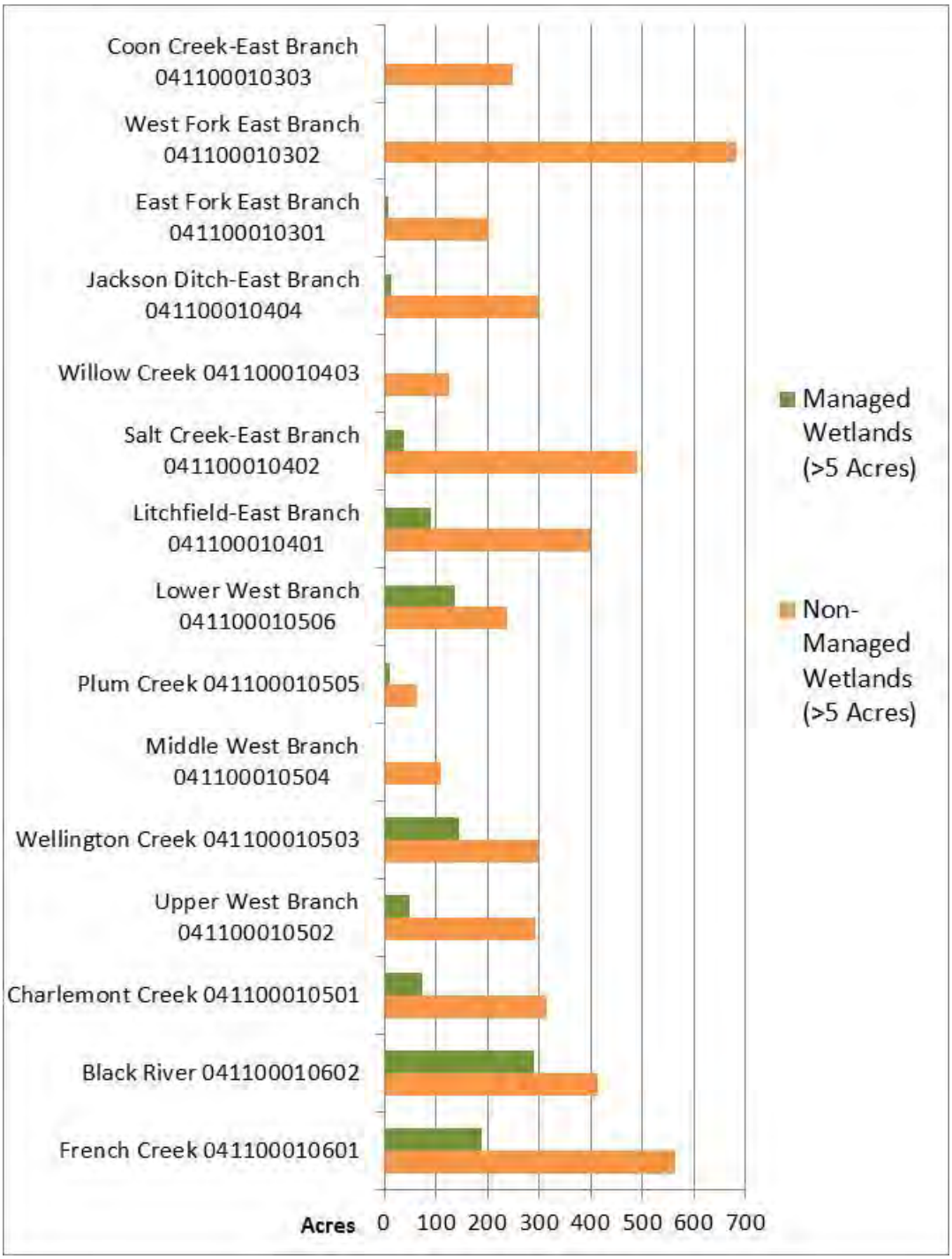


Figure 29: Managed vs. Non-Managed Wetlands (>5 acres) by HUC-12.

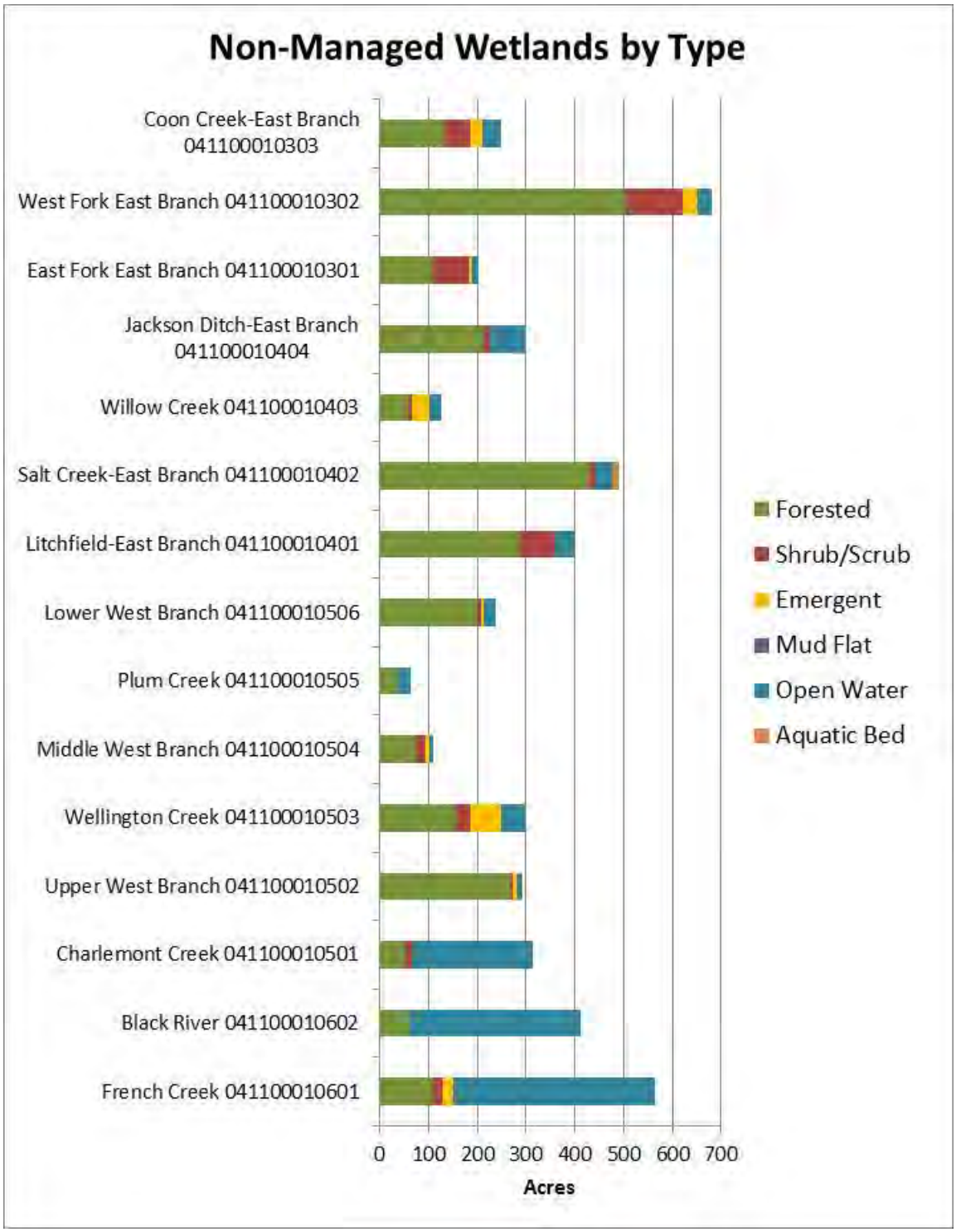


Figure 30: Non-Managed Wetlands by Type and HUC-12 (>5 acres).

There are an estimated total of 5,784.2 acres of wetlands greater than five acres within the Black River watershed. The wetland types were determined using the wetland codes outlined in Cowardin et al.'s 1979 *Classification of Wetlands and Deepwater Habitats of the United States* (http://www.fws.gov/wetlands/_documents/gNSDI/WetlandsDeepwaterHabitatsClassification.pdf).

Looking at the resulting data, one can see that forested wetlands still comprise a major portion of the wetlands found within the watershed as well as within each 12-digit HUC. The West Fork of the East Branch (041100010302) still contains a sizable acreage of forested wetland over five acres. However, none of that wetland property is protected. Other 12-digit HUCs with no managed wetlands over 5 acres in size are Coon Creek-East Branch (041100010303), Willow Creek (041100010403), and Middle West Branch (041100010504). The Plum Creek sub-watershed does have some larger wetlands under Lorain Metropark management, but has so few large wetlands overall that an effort should be made to locate and preserve what remains. The Willow Creek and Middle West Branch should also be prioritized in this manner, as both have no currently managed wetlands and very few remaining large wetlands.

6. Groundwater Quality

Since groundwater is not a major supply of public drinking water within the Black River watershed, concern over ground water quality and potential contamination is minimal.

I. Causes and Sources of Impairment/Threats

The Black River TMDL and the Ohio EPA 303(d) list have outlined the following causes and sources of impairment and/or threats to the Black River watershed.

Table 28: Section 303(d) listings for the Black River (Black River TMDL, 2008).

Assessment Unit	Designated Uses	Causes	Sources
04110001020 West Branch Black River (headwaters to mouth)	WWH, AWS, IWS, PCR	Nutrients, Siltation, Organic Enrichment - Dissolved Oxygen, Bacteria	Urban Runoff/Storm Sewers, Non-irrigated Crop Production/Pasture Land Runoff, Onsite Septic Systems
04110001030 East Branch Black River (headwaters to downstream Coon Creek)	WWH, AWS, IWS, PCR	Siltation, Bacteria	Non-irrigated Crop Production
04110001040 East Branch Black River (downstream Coon Creek to mouth)	WWH, AWS, IWS, PCR	Nutrients, Siltation, Organic Enrichment - Dissolved Oxygen, Direct Habitat Alterations, Bacteria	Minor Municipal Point Sources, Combined Sewer Overflows, Non-irrigated Crop Production, Channelization/Agriculture

04110001050 Black River (confluence of East and West Branches to mouth)	WWH, AWS, IWS, PCR	Unknown Toxicity, Priority Organics, Nutrients, Organic Enrichment - Dissolved Oxygen, Bacteria	Industrial Point Sources, Major Municipal Point Sources, Combined Sewer Overflows

Sediment is one of the most dominant stressors in the Black River watershed. A major source of the excessive sediment loads is the storm water runoff over the various land uses in the watershed. Agricultural practices contribute heavily to the sediment load; past and current agricultural and construction practices leave bare fields exposed and vulnerable to erosion. Stream bank erosion is also a significant cause of sediment. Plowing to the edges of streams, allowing livestock direct access to streams, and removal or disturbance of riparian vegetation all contribute to further destabilization and subsequent erosion of stream banks.

Nutrient concentrations are closely associated with sediments in runoff and are also elevated within the Black River and its tributaries. Excessive phosphorous and nitrate loads come from non-point agricultural runoff as well as point-source discharges and home sewage treatment systems. This nutrient enrichment leads to nuisance algal blooms, low levels of dissolved oxygen, and loss of aquatic habitat and populations.

Elevated bacteria (fecal coliform) levels within the watershed come from failed or failing HSTSs and illegal septage dumping (Boddy, 2002), combined sewage overflows, manure application in fields, and runoff from feedlots and urban areas.

Soils with very slow or moderately slow permeability are rated as having severe limitations for septic system use. Because so much of the Black River basin is either covered by hydric soils or non-hydric soils with hydric inclusions, much of the region is not optimal for septic systems. In Lorain County, for example, approximately 98% of the soils are poorly suited for septic. Common limitations include a seasonal high water table, restricted permeability, poor natural drainage, flood hazards, and a shallow depth to bedrock. The high seasonal water table common within the somewhat poorly drained, poorly drained, and very poorly drained soil types which cover most of the watershed may prevent the proper functioning of septic disposal fields for varying periods of time.

1. Point Sources

Major wastewater treatment plants (WWTPs) located within the watershed are operated largely by municipalities, including Avon Lake, Elyria, Lorain, North Ridgeville, Oberlin, Grafton, LaGrange, and Wellington. In Lorain County, two WWTPs serve Sheffield Lake and portions of Amherst and Sheffield Townships. North Ridgeville operates a regional WWTP, the French Creek WWTP, which serves not only its own community but also the communities of Avon and Sheffield Village. The Lorain County Sanitary Engineer administers six small package WWTPs in Columbia, Eaton, and Elyria Townships.

Point source discharges to the Black River watershed are regulated by the Clean Water Act. A regulated discharge requires a permit issued under the National Pollutant Discharge Elimination System (NPDES). There are currently twelve large wastewater treatment facilities which discharge in the watershed, and

several small package plants. A brief description of the major NPDES permitted discharges are described below.

2. Discharges (NPDES Permitted)

Village of Grafton WWTP
Detailed description N/A

City of Oberlin Water Environment Protection Facility
The City of Oberlin Water Environment Protection Facility has a design capacity of 1.5 million gallons per day and a peak capacity of 3 million gallons per day. The treatment process consists of preliminary screening and grit removal, primary tanks, contact stabilization tank, final settling tanks, ammonia removal tower, rapid sand filters, and ultraviolet light for disinfection. Storm water flows that are above 3 million gallons are stored in lined retention basins. Aerobic and anaerobic digestion is used on the stabilized sludge whose byproduct may later be applied to agricultural grounds.

City of Elyria WWPCP
The City of Elyria's Wastewater Pollution Control Plant has been in operation since 1929, when it was one of the first facilities in the state to provide secondary treatment utilizing the suspended growth activated sludge process. It is a Publicly-Owned Treatment Works (POTW) located at 1194 Gulf Road on a 25-acre site. This facility was designed for an average flow of 3.6 million gallons per day, and is rated for 13-mgd average dry weather flow and 30-mgd peak wet weather flow. After expansions in 1962 and 1986-1989, the plant now treats 13-mgd with a two-stage biological treatment system, with activated sludge preceded by a trickling filter tower system. Effluent is discharged to the Black River about eight miles upstream of Lake Erie. The sanitary collection system feeding the City's plant consists of 300 miles of gravity sewers, 18 lift stations, and 5 miles of force main. An industrial pretreatment program was first implemented in the early 1970's and was intensified in 1985, resulting in the City being able to consistently meet its permit for industrial parameters.

US Steel Lorain Tubular Operations
Lorain Tubular Operations manufactures seamless pipe for customers in the construction and oil and gas exploration and production industries. This facility treats its own process wastewater (used in quenching steel), non-contact cooling water, and storm water from the No. 3 and No. 4 Seamless Pipe Mills and No. 3 and No. 6 Quench and Temper lines. Effluent from the on-site D-2 landfill is also treated before discharge into the Black River. The plant draws water from the Black River for cooling processes.

Republic Engineered Products
Republic Engineered Products is located in Lorain adjacent to US Steel Lorain Tubular Operations, having purchased the steel bar facilities from US Steel in 1999. This facility's discharges into the Black River include non-contact cooling water, service water, storm water, steam condensate, onsite discharges, ground water, and offsite discharges from the City of Lorain sewer system. It has the capacity to treat 73 million gallons of wastewater per day.

French Creek WWTP
Originally built in 1975 by the Ohio Water Development Authorities to serve the communities of Avon, North Ridgeville, and Sheffield Village, the French Creek Wastewater Treatment Plant was purchased by the City of North Ridgeville in 1983, although it continues to serve the original three communities as well

as waste from septic tank cleaning facilities, local industry, and other sewer and water treatment facilities in the area. The plant typically processes 5.8 to 7.2 million gallons per day, although it has the capacity to treat 11.25 million gallons per day. The treatment process consists of debris screening, grit removal, aeration, biological digestion, further filtration, and polishing with UV rays. In 2003, the plant capacity was increased from 7.5 to its current capacity. Area industries truck to the plant wastes that cannot be flushed directly into the sewer system, whereupon these wastes receive pretreatment.

The table below contains a list of all individual NPDES permitted facilities in the Black River basin. UT denotes "Unnamed Tributary" and NCCW denotes "Non-contact cooling water."

Table 29: Individual NPDES Permitted Dischargers.

Source: Ohio EPA Division of Surface Water-

NPDES Permitted Discharges in the Black River Watershed

Entity	Receiving Stream	Discharge Volume (gpd)	Permit Number
Lodi WWTP	East Fork of the East Branch Black River	800,000	3PB00027
Black River Local Schools	West Fork of the East Branch Black River	25,000	2PT00015
Country Stage Campground	UT- West Branch Black River	6,000	2PR00121
Chatham Elementary School	East Fork Black River	3,000	3PT00092
Spencer Forge and Manufacturing	UT- East Branch Black River	Process	3IS00087
Spencer WWTP	Spencer Creek- East Branch Black River	90,000	3PA00018
Findley State Park Camp	Findley Lake	25,000	3PP00004
Wellington WTP	UT- Charlemont Creek	14,000	3IV00200
Sterling Foundry Inc	UT- Charlemont Creek	NCCW, storm water	3ID00052
Penfield Elem Sch	UT- East Branch Black River	6,600	3PT00103
Litchfield Elem Sch	UT- East Branch Black River	9,000	3PT00099
Wellington WWTP	East Fork- Charlemont Creek	750,000	3PC00014
Medina Meats	Crow Creek	2,900	3IH00110
Pheasant Run Association	Wellington Creek	100,000	3PW00001
LaGrange WPCP	Kellner Ditch	363,000	3PB00061
A-1 Construction Apts	Wellington Creek	3,000	3PW00027
Grafton WWTP	East Branch Black River	1,500,000	3PB00024
Oberlin WTP	West Branch Black River	10,000	3IW00061
Oberlin Water Environment Protection Facility	Plum Creek	1,500,000	3PD00025
BFI Lorain County Resource Recovery Complex	UT- Plum Creek	8,000	3PR00394
Cleveland Illum Co Westwood Facility	Bannister Ditch	Storm water	3IN00224
Lorain County Landfill LLC	Plum Creek and Squires Ditch	Storm water	3IN00335
D'Tanglez Studio Beauty Shop	UT- West Branch Black River	1,500	3PR00326

BP Products North America - Lorain Terminal	Willow Creek	Storm water	3IN00059
West Carlisle Elem Sch	Kellner Ditch	8,775	3PT00104
Eaton Homes WWTP	Willow Creek	200,000	3PH00023
Circle K 5317	Willow Creek	2,500	3PR00494
Browning Ferris Ind	UT- Black River	7,000	3PR00185
Brentwood Lake WWTP	Alexander Creek	120,000	3PH00024
Forest Hills Country Club	UT- West Branch Black River	5,000	3PZ00055
JED Investments	East Branch Black River	Storm water	3PW00033
Butternut Terrace Apts	Black River	7,500	3PW00038
Alco Mfg Corp	UT- Black River	7,000	3IS00123
The Activity Center	UT- Black River	2,300	3PR00487
Circle K No 5312	Storm sewer tributary- Black River	1,500	3PR00434
Elyria Motel	West Branch Black River	2,000	3PR00191
United Initiators Inc	UT- Black River	43,200	3IN00340
Elyria Foundry Co	West Branch Black River	NCCW, storm water	3ID00070
Westfield Allotment WWTP	Ridgeway Ditch	25,000	3PA00024
Remediation and Liability Mgmt Co Inc (REALM)	UT- West Branch Black River	Storm water	3II00200
Town and Country Co-Op Inc	West Branch Black River	Storm water	3IG00085
Crane Lear Romec Corp	East Branch Black River	NCCW	3IS00118
Kalt Manufacturing Co	Ridgeway Ditch	5,000	3IS00079
Elyria WWTP	Black River	13,000,000	3PD00034
National Bronze and Metals of Ohio Inc	Unnamed drainage way- Black River	Storm water	3IN00316
US Steel Lorain Tubular Operations	Black River	NCCW, storm water, process waste water 164,000	3ID00074
Republic Engineered Products, Inc.	Black River and French Creek	NCCW, ground water, service water, storm water, backwash strainer water, storm condensate, 73,000,000	3ID00028
Republic Technologies International LLC	Black River and French Creek	NCCW, process waste water,	3ID00076

		storm water, emergency storm water discharges	
French Creek WWTP	French Creek	11,250,000	3PD00043
SBS Garage	Black River	1,500	3PR00213
Barr Elementary School	Ziegman Ditch	3,240	3PT00015
Parker Marine	Black River	1,500	3PR00476
Sheffield Middle School	French Creek	25,000	3PT00088

Map 24: Map locations of major and minor NPDES permit holders (see Appendix A).

3. Spills and Illicit Discharges

An inventory of known spills and illicit discharges from 2006-2010 within the Black River watershed has been obtained from Ohio EPA and is on-file in the Lorain County Community Development Department. Interested parties can call the Watershed Coordinator's office at 440-328-2336 to request this information or write a letter to Lorain County Community Development, c/o Watershed Coordinator, 226 Middle Avenue 5th Floor Elyria, OH 44035.

J. Non-Point Sources

Non-point source pollution, which includes habitat alteration, is now responsible for most water quality problems in Lake Erie and its tributaries. Whereas large point source polluters are more easily identified and regulated, almost everyone contributes to non-point source pollution on a daily basis. This makes controlling non-point source pollution a much greater challenge. Non-point source pollution includes:

- Contaminants that originate diffusely on the land and run off with rain or snow;
- Sediment that erodes from unprotected construction sites, farm fields, and stream banks;
- Bacteria and pathogens that enter the water from septic systems and combined sewer overflows;
- Pesticides, fertilizers, road salt, pet waste, and heavy metals that wash off yards, parking lots, and golf courses.

The major sources of nonpoint impacts to the Black River watershed are characterized by the dichotomous nature of the area. The downstream reaches of the watershed, north of Route 20, are heavily affected by suburbanization and urbanization. These sources cause increased sediment loading to the streams which results in poor substrate quality, embeddedness, and overall habitat quality impairment, which can be noted in the major tributary of French Creek upstream of RM 6.9. In addition, aging and failed HSTSs within the municipal areas of Elyria, Avon, North Ridgeville, and Sheffield Village contribute excessive nutrient loading to nearby watercourses. Increases in impervious surfaces within this portion of the watershed leads to flashier stream flows which are partially responsible for channel

incision and bank destabilization, both noted as occurring within the French Creek 041100010601 sub-watershed (USACE Black River AOC/RAP French Creek Watershed Survey, 2005).

Upstream of Route 20, within the West Branch, the major sources of nonpoint impacts are sedimentation and siltation resulting from agricultural runoff and nutrient enrichment from failing HSTSs, pasture land runoff, and overfertilization of cropland. Urban runoff is also listed as a source of nonpoint impact, but that is largely limited to the City of Oberlin in the Plum Creek 041100010505 sub-watershed and the Village of Wellington, divided by the and Charlemont Creek 041100010501 sub-watersheds.

Physical changes to tributary streams also cause significant water quality degradation. Known as "habitat alteration," these actions, including straightening, deepening, widening, damming or otherwise altering a river's natural form and flow cause the failure of many of Ohio's streams to meet water quality standards.

Ohio's 312 miles of Lake Erie shoreline is a great source of wealth and vitality for its residents and visitors. Forty-one percent of Ohio's citizens live within the Lake Erie basin and reap its many natural, scenic, and economic benefits every day. Lake Erie has rapidly become one of Ohio's most popular visitor destinations. The Ohio Department of Development estimates that the shoreline brings more than $2.5 billion per year in travel revenue to Ohio's economy, which represents one-third of the state's travel revenue. Lake Erie is certainly a resource worth protecting and improving, and ensuring the water quality of its tributaries and streams is essential to that process.

Significant pollution problems remain, despite the many strides that have been made in addressing point source pollution. Some major issues outlined in the Black River TMDL are:

Habitat Alterations
According to Ohio EPA, habitat degradation and sedimentation are now the leading causes of aquatic life use impairment in Ohio streams and rivers. The source of these causes of water pollution is mainly "hydromodification," or physical changes to the stream or river. Nearly one-quarter of all hydromodification-related stream impairment is associated with suburban development.

Urban Development
Urban sprawl in recent years has expanded at an alarmingly rapid pace. Unfortunately, such fast-paced development has occurred without due consideration to the cumulative effects on water quality. As a result, urban sources of non-point pollutants, such as sediment from construction sites, combined sewer overflows, hydromodification, and storm water runoff, are having an increasingly negative impact on water quality.

Urbanization tends to harden land and streams with concrete and asphalt. Therefore, water quality restoration alternatives are limited and expensive in the urbanized environment. For example, uncovering and restoring a culverted stream is much more costly than keeping development away from the stream during the planning process.

Agriculture
Agriculture occupies approximately 70% of the land use in the Lake Erie basin and the Black River watershed is no exception, with nearly 80% of its land used for agricultural purposes. This land use has a significant impact upon the area's water quality. Although agriculture's widespread and noteworthy

adoption of conservation tillage has reduced specific non-point source pollutants such as phosphorous, significant opportunities for improvement remain. Intensive agricultural practices (e.g. larger fields, fewer types of crops, bigger equipment, concentrated livestock, and extensive drainage) continue to alter streams and wetlands and contribute sediment and nutrients to coastal waters.

Other Non-Point Issues
Alteration of the natural structure of the lakeshore, river mouths, and wetlands also contribute to water quality problems. Dam construction, shoreline modification, marina development, and diking are some of the activities causing such alteration. Significant stretches of tributaries, river mouths, and nearshore areas along Lake Erie have sediment contamination problems due to these impacts. In addition, inadequate maintenance and failure of suburban and rural HSTSs contribute nutrients and pathogens to Lake Erie and its tributaries.

(From ODNR's Coastal Non-Point Pollution Guide, http://www.ohiodnr.com/soilandwater/programs/coastalnonpoint/default/tabid8861/default.aspx)

1. Headwaters Quality

Detailed assessments of headwater streams are limited; however, there are still a significant number of primary headwater streams (>1 square mile in drainage) within the watershed, particularly in the far upper reaches of the West and East Branches. Analysis of the land use around these streams indicates that most are probably impacted from agricultural sources nearby. In addition, the soils around these streams are some of the most highly erosive in the watershed and have some of the steepest slopes (60-80+ feet/mile) so sedimentation from erosion is likely to be a significant impact on habitat quality. Loss of these streams from development is unlikely at the moment; the far upper reaches of the watershed are very rural still and the Villages of Lodi and Spencer in Medina County are not experiencing any rapid growth or build-out presently. These streams, however, are at risk of being heavily impacted by agricultural pressures and shouldbe targeted as priority sites for agricultural mitigation projects with local landowners.

2. HSTS Inventory and Projected Failed Systems

Many of the HSTS in the Black River watershed were installed decades before any kind of regular mapping or initial monitoring was implemented, and so often times a HSTS inspector cannot pinpoint a location until they're called out to fix a failing system. In Lorain County, the General Health District is now inventorying HSTS locations on a site-by-site basis in order to compile a comprehensive GIS database for the future. Detailed HSTS maps have already been generated for the communities of Avon (in French Creek HUC 041100010601), Carlisle Township (divided by Jackson Ditch-East Branch HUC 041100010404 and Lower West Branch HUC 041100010506), Elyria Township (in Black River Main-stem HUC 041100010602), Eaton Township (in Willow Creek HUC 041100010403), and Grafton Township (divided by Jackson Ditch-East Branch HUC 041100010404 and Salt Creek-East Branch HUC 041100010402).

Mound systems, absorption fields, and aeration systems with NPDES permits are the main types of systems used in the Black River watershed, with mound and aeration systems comprising the majority since absorption fields generally require sandier soils than what is commonly found in the area.

Approximately 2,787 on-lot systems composed of a traditional septic tank with subsurface leach-field are estimated to have been constructed within the watershed between 1979 and 1998. Conservative estimates from site inspections are that 20% of these older on-lot systems are not functioning adequately; the actual percentage is probably much higher owing to system age and the surrounding soils which are poorly suited for septic. A total estimate of 19,300 on-lot and off-lot discharge systems within the watershed was calculated from information provided by the Lorain County General Health District, the City of Elyria Health District, the Lorain City Health District, and the Medina County Health Department.

In the summer of 2009, the Lorain County General Health District conducted two separate surveys to evaluate the functionality of known HSTSs in the area. They found failure rates as high as 50-60% on average regardless of system age, which points to lack of homeowner maintenance resulting in the failure of HSTSs at unacceptably high rates. A portion of the survey taken in the French Creek (041100010601) sub-watershed showed that 59% of aerator systems surveyed were failing due to missing or non-operational aerators.

Using an extremely conservative estimate that 20% of systems are failed, approximately 4,000 systems could be failed or failing in the Black River watershed. The Ohio Department of Heath estimates that the average household generates 400 gallons of sewage a day. That means a potential discharge of 1,600,000 gallons a day; if a higher estimate of 60% is used the daily potential discharge increases to 4,800,000 gallons a day of untreated sewage.

Old age, poorly drained soils, and a lack of routine maintenance are the most common causes of failure. Older systems were often designed for lower water usage or have simply outlived their life expectancy. When these older systems fail, the effluent can seep into nearby drainage tiles and ditches where it is directly transported to the Black River's waterways. Routine maintenance and proper operation of HSTSs are extremely important to protect the Black River's environment and preserve public health and safety. Sanitary sewers are the only long term solution to periodic replacement and maintenance of a HSTS.

The Upper Black River Watershed Project was conducted from 1998-2002 by NOACA, the Lorain County General Health District, and the former Seventh Generation group. The goal of the project was to evaluate the effect of residential sewage treatment and disposal upon the streams and ditches located in the Upper Black River watershed. Sampling locations for the Upper Black River Watershed Project are shown on Figure 31.

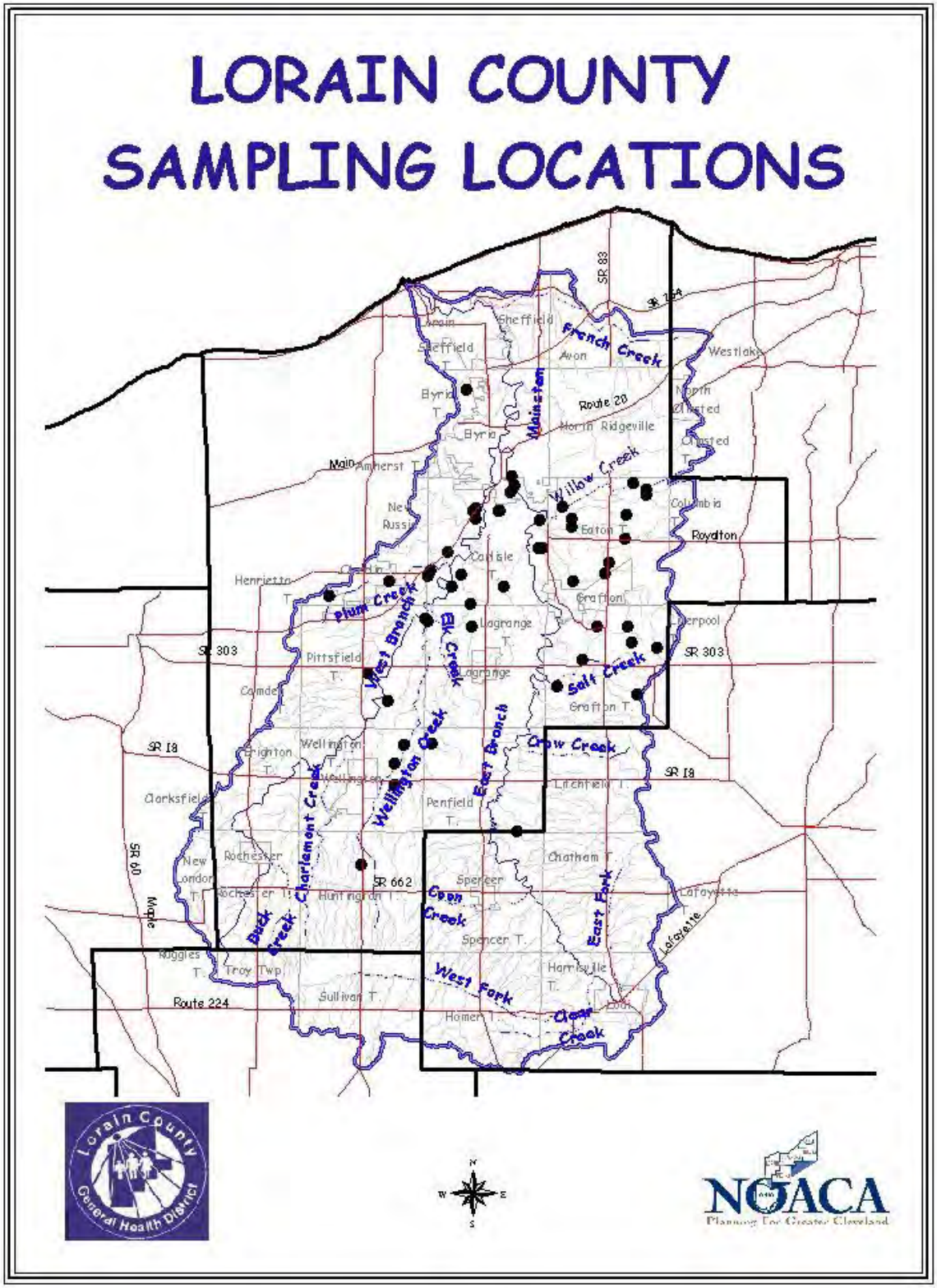


Figure 31: Sampling locations for the Upper Black River Watershed Project.

Field work was conducted from 1998-2000. A total of 617 samples from 52 locations in 10 townships in the watershed were taken. Specific care was taken to sample at locations where waterways were sited in close proximity to residential areas and not close to or directly impacted by agricultural and industrial runoff. The results are as follows:

Table 30: Summary of Samples Taken, Upper Black River Watershed Project.

Per 100ml	Average	Median	Maximum	Minimum
Fecal coliform bacteria	4,837	600	21,000	20
E coli bacteria	7,744	2,190	61,310	10
Suspended solids	113	20	22,240	0.1
Ammonia	4.6	0.67	41	0.06
COD	72	50	1,580	1

Table 31: Number of Samples Exceeding Standards, Upper Black River Watershed Project.

Parameter	Standard	Samples Exceeding Standard	Percentage
Fecal Coliforms	>5000/100ml	109	18%
(599 samples)	>2000/100ml	191	32%
	>1000/100ml	256	48%
	> 400/100ml (beach)	336	56%
	> 200/100ml (beach g.m.)	388	64% *
E.coli	>576/100ml	433	71%
(603 samples)	>235/10 ml (beach)	534	86%
	>126/100ml (beach g.m.)	565	94% *
Suspended Solids (617 samples)	>40(effluent)	163	26%
Ammonia	>1.5	258	42%
(617 samples)	>1.0	283	46%
	>0.5	315	51%

Table 32: Number of Sample Locations Exceeding Standards, Upper Black River Watershed Project.

Parameter	Standard	Sites Exceeding Standards	%Exceeding Standards
Fecal Coliform	>5000/100ml	16	31%
	>2000/100ml	25	48%
	>1000/100ml	34	65%
	> 400/100ml (beach)	49	94%
	> 200/100ml (beach g.m.)	50	96%
E.coli	>576/100ml	51	98%
	>235/10 ml (beach)	52	100%
	>126/100ml (beach g.m.)	52	100%
Suspended Solids	>40 (effluent)	24	46%
Ammonia	>1.5	34	65%

The results indicate a definitive link between failed residential sewage systems and polluted water. Streams in the Black River watershed are being adversely affected in a significant way by HSTSs. Even at the most lenient standards, 31% of sites exceeded fecal coliform levels and 98% of sites exceeded *E. coli* levels. Taking the 16.2% HSTS failure rate from the NOACA study, loading amounts of N, P, and BOD by HUC-12 were estimated using the STEPL Region 5 model.

Table 33: HSTS Load Estimates by HUC-12.

Septic System Loadings
Using 16.2% failure rate for NOACA study area (2001 NOACA report)
1. Total load by subwatershed(s)

HUC-12	N Load lb/year	P Load lb/year	BOD Load lb/year
East Fork-East Branch 041100010301	146.05	57.20	596.38
HW West Fork-East Branch 041100010302	564.06	220.93	2303.26
Coon Creek-East Branch 041100010303	387.79	151.89	1583.49
Town of Litchfield-East Branch 041100010401	1687.16	660.80	6889.23
Salt Creek-East Branch 041100010402	5484.52	2148.10	22395.13
Willow Creek 041100010403	6562.29	2570.23	26796.01
Jackson Ditch-East Branch 041100010404	8375.35	3280.35	34199.35
Charlemont Creek 041100010501	1682.12	658.83	6868.66
Upper West Branch 041100010502	2407.35	942.88	9830.00
Wellington Creek 041100010503	2633.98	1031.64	10755.42
Middle West Branch 041100010504	2855.58	1118.43	11660.27
Plum Creek 041100010505	1581.40	619.38	6457.36
Lower West Branch 041100010506	13215.23	5175.96	53962.18
French Creek 041100010601	9125.76	3574.26	37263.52
Black River 041100010602	8722.86	3416.45	35618.33
Total	**65431.49**	**25627.34**	**267178.60**

The City of North Ridgeville, which is located almost entirely within the French Creek sub-watershed, was audited by Ohio EPA on July 14, 2010 for their MS4 Storm Water Program. In 2009, septic tanks were eliminated on 38 properties by tie-in to a sanitary sewer main. Other MS4 communities within the watershed are also actively working on eliminating HSTS discharges to their relevant waterways. Tie-in to a sanitary sewer line is the only long-term solution to degraded water quality from failing HSTSs, although continued homeowner education on proper maintenance of their systems and working with the Lorain County General Health District and other local health departments and districts to continue to identify critical areas will help improve existing conditions.

3. Number of New Homes Being Built

Housing data was compiled by community for the year 2009 and split among sub-watersheds. The communities of Avon and North Ridgeville, both located mainly within the French Creek sub-watershed, contributed the highest numbers of new housing built in 2009. The next highest was the Headwaters West Fork-East Branch sub-watershed, which contains the Village of Lodi. The Jackson Ditch-East Branch and Willow Creek sub-watersheds are experiencing outbuild pressures from the Black River Main and French Creek communities to their immediate north.

Table 34: Number of New Homes in 2009 by HUC-12.

4. Number and Size of Animal Feeding Operations

There are currently no Concentrated Animal Feeding Operations (CAFOs) located within the Black River watershed. The largest farm is Dovin Dairy Farm, a 600-head dairy operation located south of Oberlin in the Middle West Branch sub-watershed (041100010504). Most other dairy or beef operations are 100 or less. There are numerous horse farms (estimated 200 or more) in the watershed; the average number of horses per farm is 4-5, although a few farms have 10 or more. Some swine operations exist but are not as common as dairy or beef. These livestock operations have a significant effect on water quality within the watershed. Most operators are careful to keep their livestock away from streams, but less have made efforts to control manure runoff on their farms with proper waste storage structures. In addition, farmers who take this manure for fertilizer over-apply it in most cases, or apply during times where it is washed off the fields and into nearby ditches and streams.

5. Acres of Highly Erodible Land and Potential Soil Loss

Soils within the Black River watershed have an average soil loss tolerance of 3 tons/acre/year. However, in 1982, the United States Army Corps of Engineers (USACE) reported the majority of cropland within the watershed is eroding at an average rate of 4.7 tons/acre/year (more than 56% greater than the soil loss tolerance). In their 1982 report, the USACE found that more than 100,000 acres of cropland within the watershed was eroding at more than twice the rate of tolerable loss. At the time, the area represented fully one-third of the entire watershed. According to the USACE report, erosion resulting from agricultural practices within the watershed was the major source of sediment in the Black River and its tributaries. Acreage of highly erodible land by HUC-12 was calculated from GIS data provided by ODNR's Office of Coastal Management. Sub-watersheds with near or greater than 10% highly erodible acreage are highlighted.

Table 35: Acres of Highly Erodible Land by HUC-12.

HUC-12	Highly Erodible Acres	Total Acres	Percentage Erodible	Slope	Soil Type
French Creek 041100010601	2.4161	24870.3	0.01%	12-18%	Ellsworth Silt Loam
Black River 041100010602	11.7630	22698.0	0.05%	12-18%	Ellsworth Silt Loam
Charlemont Creek 041100010501	2089.5	16637.5	12.56%	2-50% 12-25% 2-6%	Ellsworth Silt Loam Mentor Silt Loam Mahoning Silt Loam
Upper West Branch 041100010502	2522.7	25728.9	9.80%	2-50% 25-50% 2-6% 6-12%	Ellsworth Silt Loam Alexandria Silt Loam Mahoning Silt Loam Cardington Silt Loam
Wellington Creek 041100010503	788.6	18985.8	4.15%	2-50% 2-6%	Ellsworth Silt Loam Mahoning Silt Loam

Middle West Branch 041100010504	317.4	16404.8	1.93%	12-50%	Ellsworth Silt Loam
Plum Creek 041100010505	5.1661	8718.1	0.06%	18-50%	Ellsworth Silt Loam
Lower West Branch 041100010506	194.4	24947.4	0.78%	12-50%	Ellsworth Silt Loam
Town of Litchfield-East Branch 041100010401	1171.9	22808.2	5.14%	6-25% 6-50% 6-18% 6-12% 12-25%	Chili Gravelly Loam Ellsworth Silt Loam Geeburg Silt Loam Glenford Silt Loam Mentor Silt Loam
Salt Creek-East Branch 041100010402	503.4	24542.2	2.05%	12-25% 2-50%	Chili Gravelly Loam Ellsworth Silt Loam
Willow Creek 041100010403	7.26	14591.6	0.05%	2-18%	Ellsworth Silt Loam
Jackson Ditch-East Branch 041100010404	84.3	18551.0	0.45%	12-50%	Ellsworth Silt Loam
East Fork East Branch 041100010301	1819.1	9628.1	18.89%	25-70% 6-25% 6-12% 2-70%	Berks Silt Loam Cardington Silt Loam Chili Loam Ellsworth Silt Loam
HW West Fork-East Branch 041100010302	3378.2	27167.2	12.43%	12-50% 25-70% 6-12% 6-70% 2-70% 2-6%	Alexandria Silt Loam Berks Silt Loam Cardington Silt Loam Chili Loam Ellsworth Silt Loam Mahoning Silt Loam
Coon Creek-East Branch 041100010303	4373.8	24470.9	17.87%	6-25% 6-70% 2-70% 6-18% 6-12% 2-6%	Cardington Silt Loam Chili Loam Ellsworth Silt Loam Geeburg Silt Loam Glenford Silt Loam Mahoning Silt Loam

Soil erosion is dependent on several factors: local soil type, slope, and local land use. The upper watershed, comprising parts of southern Lorain County and western Medina County, has been identified as being the greatest contributor to in-stream sediment loads due to soil erosion. Historically the predominant land use in these areas has been agricultural. Residential and light commercial land use has increased in the upper watershed since the initial USACE report, particularly near the city of Lodi located in the Headwaters West Fork East Branch Black River sub-basin. However, agricultural

production remains the dominant land use within the watershed, which leaves significant portions of the landscape uncovered and susceptible to erosion for large parts of the year.

In addition to anthropogenic causes, naturally occurring erosion and sedimentation rates in the upper reaches of the East and West Branches of the Black River are quite high. Steep slopes and river banks in the headwaters region, combined with deep, unconsolidated till-based soils contribute to naturally high erosion rates. Exposed stream-banks lack the soil stability provided by riparian vegetation and contribute significant sediment loads to the stream system. The volume of eroded sediment becomes particularly severe during storm events or other periods of high water flow.

Unnaturally accelerated soil erosion and streambed sedimentation are detrimental in many ways. Soil loss lowers agricultural productivity, damages and clogs the stream drainage network and harms the biologic integrity of the Black River and all of its tributary streams. Excessive sedimentation interferes with reproductive and biological functions of aquatic macroinvertebrates and fish species. Sediment-laden waters increase turbidity and reduce light penetration, adversely affecting aquatic macrophytes in the benthos. This loss of benthic vegetation can lead to lower levels of dissolved oxygen in the water, placing stress on fish and macroinvertebrate populations.

The effect of excess erosion and subsequent sedimentation on the aquatic habitat of the Black River watershed is significant. Most of the streambed habitat within the Black River watershed is severely impacted as a direct result of sediment load caused by agricultural practices from the upper (headwater) reaches of the watershed. While the average soil loss across the watershed is estimated at 3 tons/acre/year, the 2008 Black River TMDL reports that more than 20% of the land area in the southern watershed erodes at more than 5 tons/acre/year. The most erosive sub-watersheds are the three 10-digit Headwaters East Branch sub-watersheds, the Upper West Branch, and Charlemont Creek.

The low permeability of these soils also means that storm water runoff enters into rivers and streams quickly through overland flow. Riparian corridors that are found alongside streams and rivers provide a natural counter to this tendency. When left undeveloped and naturally vegetated, riparian corridors function to slow drainage and filter pollutants, thereby reducing flooding and improving water quality in the stream.

6. Culverting of Streams

Minor culverts for roadways are found throughout the Black River watershed. Heavily culverted streams can be found in the French Creek and Black River main-stem 12-digit HUCs, where large segments of stream are buried underground to accommodate residential development. Heavy culverting is rare in the southern watershed below Route 20.

Figure 32: Culverted stream, Draper Ditch. (Christina Znidarsic)

The Lorain County Engineer's Department is responsible for the maintenance of over 1,000 culverts. For the purposes of the Lorain County Engineer's Department, any structure with a span of less than 10 feet is described as a culvert.

7. Channelization of Streams

Channelization is any activity that moves, straightens, shortens, cuts off, diverts, or fills a stream channel, whether natural or previously altered. Such activities include the widening, narrowing, straightening, or lining of a stream channel which alters the amount and speed of the water flowing through the channel. Some examples of channelization are: lining channels with concrete, pushing gravel from the stream bed and placing it along the banks, or placing streams into culverts. (Ohio EPA Region 7, Section 404 of the Clean Water Act/Wetlands Program, February 2005.)

A large number of streams in the Black River watershed have been channelized and many are maintained in a modified state to facilitate drainage for agricultural and residential land uses. In the West Branch, where row crop agriculture dominates the land use along with pastureland, the removal of trees from stream banks coupled with the deepening and straightening of the stream course to expedite drainage can cause the loss of sustained stream flow. Less stream flow in a given drainage area means

less assimilative capacity from a pollutant loadings standpoint. In the French Creek sub-watershed, a sizable amount of streams have been straightened, culverted, and rerouted to accommodate residential and industrial development. The mouth of the Black River is permanently maintained as a shipping channel and is dredged and armored as a result.

Ditch cleaning has been traditionally viewed by residents as a needed activity to control localized flooding, but scientific studies discourage it because of its negative impact to stream biology and wildlife. These opposing viewpoints create a challenge for Lorain and Medina SWCDs, who must attempt to take a balanced approach when conducting drainage activities. Limited drainage ditch improvements that mitigate local flooding issues without complete disruption to the stream corridor and surrounding habitat, such as one-sided construction, maintaining natural vegetation on one bank, seeding of wildlife grasses and, where practical, maintaining stream pools, would be the most practical solution to this complicated issue (Black River TMDL, 2008).

8. Levied Streams and Dikes

Sections of Ridgeway Ditch and the Black River main-stem have levees in place. One such location is at the City of Elyria Waste Water Pollution Control Plant (WWPCP), where levees are maintained to prevent 100-year flooding to the plant. Temporary levees may be constructed along waterways during construction projects as well to prevent any flooding during the construction phase, as was done along French Creek for their Restoration Project.

9. Streams Exhibiting Little Human Impact

A comprehensive map or inventory of non-impacted streams does not currently exist for the watershed. In the more developed lower reaches, streams that could exhibit minimal impact exist primarily in managed areas, such as the Lorain Metroparks French Creek Reservation or the Black River Reservation. Most waterways within the Black River watershed have been impacted or altered by humans, particularly from urbanization and agriculture, at some point. However, land use change data indicates that agricultural land use is diminishing within the watershed. As this occurs, more streams will be left to natural forces without the need for drainage modification and may once again return to their pre-impact state. The majority of the streams that exhibit little human impact can be found in the East Branch sub-watershed. A direct correlation can also be drawn between presence of riparian buffer and degree of impact, particularly in the upper reaches of the watershed.

Figure 33: Unnamed tributary to Guthrie Ditch, Middle West Branch. (Christina Znidarsic)

10. Stream Effluent Volume

There are a total of 53 individual discharge permits in the Black River watershed. This does not include municipal or construction storm water permits. There are four municipal wastewater treatment plants with design flows of greater than 1 million gallons per day which are classified as major dischargers by Ohio EPA. There are also two industrial facilities classified as major dischargers by Ohio EPA. Major dischargers are listed in the table below.

Table 36: Major Permitted Dischargers in the Black River.

Ohio EPA Permit #	**Facility Name**
3PB00024	Grafton WWTP
3PD00025	Oberlin Water Environment Protection Facility
3PD00034	Elyria WWTP
3ID00074	US Steel Lorain Tubular Operations-D2 Landfill
3ID00028	Republic Technologies International LLC
3PD00043	French Creek WWTP

A review of all 53 individual dischargers' discharge monitoring reports was conducted for the time

period January 2005 to present. When reported, average discharge flow volumes were summed for municipal and industrial dischargers and compared to the average annual stream flow of the Black River at its mouth. Using the USGS Stream Stats application (http://water.usgs.gov/osw/streamstats/ohio.html) discharge drainage area and mean annual flow was calculated for the Black River. Based on a drainage area of 471 square miles, a calculated mean annual flow of 446 cubic feet per second was generated. This flow was then compared to summed annual average flows for municipal and industrial dischargers and is presented in the figure below. It should be noted that the majority of industrial wastewater is used as cooling water, withdrawn from the river and then discharge back following treatment.

Overall, the Black River does not have a high percentage of discharger flow to stream flow. Tinkers Creek, for example, has an effluent discharger flow of over 70% treated effluent at the USGS gauge during certain parts of the year.

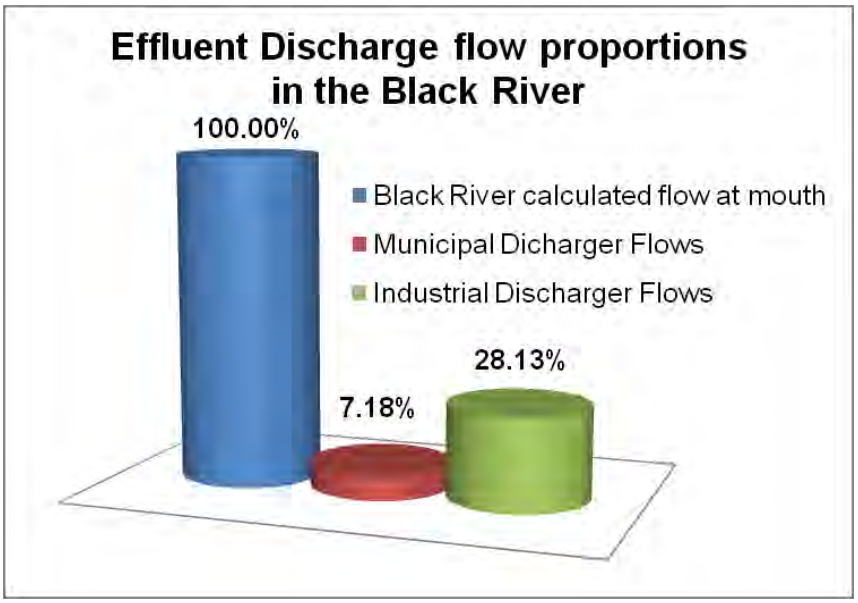


Figure 34: Percentage contribution from Municipal and Industrial Dischargers.

11. Impounded Streams

A considerable number of impounded streams exist in the watershed. There are about 165 dams located within the Black River watershed; most are for private recreational use. Impounded streams disrupt natural stream morphology by acting as sediment sinks and impeding stream flow. Most of the impoundments are found on tributaries in the central and southern reaches of the watershed, which correlates with the poor attainment percentages of tributary streams in these sub-watersheds. Removal of dams will probably be difficult as residents prefer having the small lakes the dams create for boating, fishing, and aesthetic reasons.

Table 37: Impoundments and Miles of Impounded Stream by HUC-12.

HUC-12	Number of Dams	Dam Types	Dam Purposes	Impounded Streams	Miles of Impounded Streams

French Creek 041100010601	6	Dam and Spillway (Earthfill)	Water supply (agricultural)	French Creek, Slater Ditch, Kline Ditch	1.583
Black River 041100010602	10	Dam and Spillway (Earthfill); Channel Dam; Upground (Earthfill)	Wetland mitigation; private recreation; public water supply; waste retention; private water supply	Black River Main, tributaries to Black River	2.06
Charlemont Creek 041100010501	24	Dam and Spillway (Earthfill); Channel Dam (Concrete); Upground (Earthfill)	Private recreation; public recreation; public water supply	Charlemont Creek, tributaries to Charlemont Creek, tributary to West Branch Black River	3.294
Upper West Branch 041100010502	20	Dam and Spillway (Earthfill)	Private recreation; private water supply	Tributaries to Buck Creek, tributaries to West Branch Black River, tributaries to East Creek	0.318
Wellington Creek 041100010503	18	Dam and Spillway (Earthfill)	Private recreation; public recreation	Tributaries to Wellington Creek, Wellington Creek	1.497
Middle West Branch 041100010504	4	Dam and Spillway (Earthfill)	Private recreation	Tributaries to West Branch Black River	0.189
Plum Creek 041100010505	4	Dam and Spillway (Earthfill); Upground (Earthfill)	Private recreation; public water supply	Tributary to Plum Creek, Plum Creek (offstream)	1.195
Lower West Branch 041100010506	7	Dam and Spillway (Earthfill); Upground (Earthfill); Channel Dam (Masonry)	Private recreation; public recreation; public water supply	Tributary to Elk Creek, tributaries to West Branch Black River, West Branch Black River	1.247

Town of Litchfield-East Branch 041100010401	14	Dam and Spillway (Earthfill)	Private recreation; public recreation	Tributaries to East Branch Black River	0.9697
Salt Creek-East Branch 041100010402	13	Dam and Spillway (Earthfill)	Private recreation	Tributaries to East Branch Black River, Salt Creek, East Branch Black River	0.57
Willow Creek 041100010403	1	Dam and Spillway (Earthfill)	Private recreation	Willow Creek	0.07
Jackson Ditch-East Branch 041100010404	7	Dam and Spillway (Earthfill); Upground (Earthfill); Channel Dam (Masonry); Channel Dam (Concrete)	Private recreation; public recreation; public water supply	Tributaries to East Branch Black River, East Branch Black River	0.586
East Fork-East Branch 041100010301	4	Dam and Spillway (Earthfill)	Private recreation	Tributaries to East Fork	0.04
HW West Fork-East Branch 041100010302	10	Dam and Spillway (Earthfill)	Private recreation; public recreation	Tributaries to Clear Creek, Tributaries to West Fork	0.5
Coon Creek-East Branch 041100010303	23	Dam and Spillway (Earthfill); Upground (Earthfill)	Private recreation; public recreation; public water supply	Tributaries to Coon Creek, tributaries to East Branch Black River, tributaries to East Fork, Coon Creek, Spencer Lake	1.379

12. Petition Ditches

The Lorain County Engineers currently maintain 40 miles of ditches and 35 detentions along with Lorain SWCD. Generally, vegetation is not completely cleared during ditch maintenance unless necessary, and some digging may be required in the channel to remove sediment buildup. Log jams are taken on a case by case basis; most are removed. Weed spraying within the ditches and detentions is on a three year rotation. Last year, work was completed on five ditches: McConnel Perkins Ditch (culvert repairs and

spot dipping), Gessner Waterway (culvert repaired and rock protection put in place), King Kobelt Ditch (rock channel protection because of erosion), Draper Ditch (trees removed and clearing of locations along the bank), and Kelner Ditch (log removal). Draper Ditch is also the location of a Conservation Reserve Enhancement Program (CREP) filter strip installation. Because the ditch is maintained by Lorain County, mowing has to occur along the immediate stream bank to facilitate access (see below image). Ordinarily the filter strip would be closer to the bank. It is a constant challenge to the Lorain and Medina SWCDs and County Engineer's Offices to maintain these ditches in a way to both mitigate local water quality issues and retain natural stream corridor and habitat.

Figure 35: Filter strip installation, Draper Ditch. (Christina Znidarsic)

13. Status and Trends

One of the largest problems in proper assessment of the current water quality situation in the Black River is lack of recent or comprehensive habitat or biocriteria data for a large portion of the watershed. The most recent QHEI data for the Black River Main-stem is from 1997, and most of the French Creek QHEI data is based off studies conducted pre-2005. The 2008 TMDL based much of its modeling off analysis from samples gathered in 2000-2006, and only 15 sites were sampled in 2006 (8 in the Headwaters East Branch 0411000103, 7 in the West Branch 0411000105). There is no detailed EPA Level 3 water quality data available that's more recent than 2006. This means that almost all of the

water quality data for the Black River watershed will be beyond the EPA's 10-year Credible Data regulations by 2011, and all of it will be outside the 10-year limit by the end of 2016. IBI, ICI, and MIwb assessments have only been performed in limited locations and have already exceeded or will exceed Credible Data limits within the next year or two as well.

Given the status of the current biocriteria situation, a request for updated biocriteria monitoring throughout the watershed has been made by the Black River RAP Committee in order to more accurately assess the true state of the watershed.

IV. Watershed Impairments

Black River watershed impairments have been identified from the data collection and reporting in the Black River TMDL, as well as the Great Lakes Water Quality Agreement which designated the entire Black River Watershed as an Area of Concern (AOC). Input from community sources such as elected officials, environmental groups, educational faculty and local residents has also been used to develop an assessment of the watershed's health. Problem statements and corresponding solutions are then developed from identified impairments. The Black River TMDL, which was finalized in 2008 describes impairments within the Black River in more detail (Pages 4-5 and 10-11). A TMDL, or Total Maximum Daily Load, is the total amount of a pollutant that can be assimilated by the receiving water while still achieving water quality standards.

A. Watershed Stressors

As discussed in the TMDL, the dominant watershed stressors are siltation, habitat loss, elevated nutrient concentrations, and increased bacterial levels.

1. Siltation/Sedimentation

Sediment loading sources are identified as runoff over both urban and agricultural land uses, agricultural practices that leave fields exposed, and stream bank erosion. Loss of riparian corridor, unfenced livestock, and plowing fields to the edge of waterways all cause stream bank destabilization and exacerbate erosion in the upper reaches of the watershed. The downstream northern reaches such as the lower East Branch, French Creek, and Black River sub-watersheds experience bank destabilization from high volumes of storm water runoff over impervious surfaces. Lack of riparian corridor and changing land-use pressures from rural/agricultural to heavier residential densities also contribute to excessive erosion and sedimentation in the Willow Creek and Jackson Ditch-East Branch 12-digit HUCs. Siltation is listed as a cause of impairment in nearly every area of the watershed.

Sediment flux in and out of an ecosystem is a natural process, but when deposition exceeds export, degradation of habitat may result. Sediment deposited on the streambed fills interstitial spaces within the substrate, eliminating the niche in which bottom-dwelling organisms reside.

While no statewide numeric criteria has been developed specifically for sediment or total suspended solids (TSS), target QHEI scores based on reference data sites for some of the aquatic life use

designations, can be used as surrogates. Since the Black River and all of its tributaries are classified Warmwater Habitat (WWH), the target QHEI score is 60. In addition, sub-metrics of the QHEI can also be used as target attributes.

2. Habitat Loss

Degraded habitat is a major cause of non-attainment in the watershed, particularly in the lower reaches of the East Branch in the Willow Creek and Jackson Ditch-East Branch sub-watersheds, where increases in suburban development activities have led to significant habitat impacts. As development continues, habitat alterations resulting in lower QHEI scores could increase, adding to the areas in non-attainment.

Row crop agriculture and pastureland account for over fifty percent of land use in the Black River watershed. Agricultural activities remain a major source of habitat degradation responsible for non-attainment of aquatic life uses in many of the tributaries. Residential development in the Black River watershed is expected to increase which will lead to increases in imperviousness and additional infringement upon riparian corridors.

3. Nutrients

Elevated nutrient concentrations within the Black River watershed are caused by both nonpoint and point sources. Major nonpoint sources are runoff from commercial and residential fertilizers, livestock operations and failing home sewage treatment systems. Wastewater treatment plants contribute point source loading, but the majority of nutrient loading comes from nonpoint sources within the watershed.

Table 38: Target Values for Sediment and Nutrients, Black River TMDL.

Water Quality Parameter	Source of TMDL Target	Target Value	Duration
Phosphorous	Ohio EPA	0.17 mg/L	Monthly Average
Nitrate Nitrogen	Ohio EPA	1.5 mg/L	Monthly Average
Siltation (Total Suspended Solids)	Reference Reach Approach	41 mg/L	Monthly Average

The effects of nutrient enrichment can be exacerbated by poor physical habitat; conversely, high quality habitat can mitigate those effects.

4. Bacteria

High bacteria levels within the watershed are closely tied to nutrient sources. In the southern East and West Branch sub-watersheds, manure runoff from pastures, feedlots, and application to fields is a major source of elevated fecal coliform counts. Failed home sewage treatment systems are sources in both the French Creek and West Branch sub-watersheds. Combined Sewer Overflows are a source of elevated bacteria levels in the French Creek and Black River main-stem 12-digit HUCs.

The Black River TMDLs are based on meeting the Primary Contact fecal coliform standard during the season of May 1 to October 15. Geometric mean fecal coliform content should not exceed this standard

based on not less than five samples within any thirty-day period, and instantaneous fecal coliform content should not exceed this standard in more than ten percent of the samples taken in any thirty-day period.

Table 39: Bacterial Standards for the state of Ohio.

Parameter	Bathing Waters		Primary Contact		Secondary Contact
	Geometric Mean	Instantaneous	Geometric Mean	Instantaneous	Instantaneous
Fecal Coliform	200/100 mL	400/100 mL	1,000/100 mL	2,000/100 mL	5,000/100 mL
E. coli	126/100 mL	235/100 mL	126/100 mL	298/100 mL	576/100 mL

B. Load Reduction Targets from the Black River TMDL

1. Fecal Coliform

For fecal coliform load allocations, the TMDL assessed nine locations in the watershed:

- Black River Main at RM 9.8, downstream of the City of Elyria WWTP (in the Black River Main 041100010602 sub-watershed).
- Black River Main at RM 10.6, upstream of the City of Elyria WWTP (in the Black River Main 041100010602 sub-watershed).
- French Creek at RM 2.8, upstream of the French Creek WWTP (in the French Creek 041100010601 sub-watershed).
- Schroeder Ditch, at intersection of Oberlin-Elyria Road and Murray Ridge Road (in the Lower West Branch 041100010506 sub-watershed).
- Elk Creek, at Nickel Plate Diagonal Road (in the Lower West Branch 041100010506 sub-watershed).
- Plum Creek at RM 2.9, upstream of the Oberlin WWTP (in the Plum Creek 041100010505 sub-watershed).
- Brentwood Lake tributary, at Robson Road (in the Jackson Ditch-East Branch 041100010404 sub-watershed).
- East Branch Black River at RM 11.2, upstream of the Grafton WWTP (in the Salt Creek-East Branch sub-watershed).
- East Fork East Branch of Black River at RM 41.5, upstream of the Lodi WWTP (in the East Fork-East Branch 041100010301 sub-watershed).

Table 40: Black River TMDL Percent Load Reductions for Fecal Coliform.

Sampling Area	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
Black River Main at RM 9.8	93%	0%	0%	0%	0%

Black River Main at RM 10.6	0%	0%	0%	0%	0%
French Creek at RM 2.8	94%	0%	27%	0%	0%
Schroeder Ditch	N/A	46%	0%	0%	N/A
Elk Creek	N/A	0%	0%	12%	0%
Plum Creek	0%	0%	0%	0%	0%
Brentwood Lake tributary	0%	0%	34%	0%	0%
East Branch Black River at RM 11.2	0%	0%	0%	0%	0%
East Fork East Branch Black River at RM 41.5	N/A	0%	0%	0%	N/A

2. Nutrients and Sediment

For nutrient and sediment load allocations, the TMDL assessed three locations in the watershed:

- West Branch Black River near the mouth (SWAT Subbasin 8- corresponds to the furthest downstream point on the West Branch 10-digit sub-watershed 0411000105).

- East Branch Black River near the mouth (SWAT Subbasin 9- corresponds to the furthest downstream point on the East Branch 10-digit sub-watershed 0411000104).

- East Branch Black River, east of Spencer (SWAT Subbasin 24- corresponds to the furthest downstream point in the Headwaters East Branch 10-digit sub-watershed 0411000103).

Table 41: Black River TMDL Percent Load Reductions for Phosphorous, Nitrate, and Suspended Solids.

Modeled Sub-basin	Percent reduction total Phosphorous	Percent reduction total nitrate	Percent reduction suspended solids
West Branch Black River 0411000105	54%	43%	48%
East Branch Black River 0411000104	54%	41%	52%
HW East Branch Black River 041100103	59%	53%	13%

C. Black River RAP AOC Beneficial Use Impairments Delisting

The entire Black River watershed is designated an Area of Concern and is part of the Black River Remedial Action Planning Area. The Great Lakes Water Quality Agreement of 1978 and its 1987 Protocol Amendments required identification of Areas of Concern and identified a list of 14 beneficial use impairments to be addressed in the Remedial Action Plan. In 1990 the Ohio EPA appointed the Black River RAP Coordinating Committee and charged them to identify the existing use impairments, their sources and causes, and to develop and implement remedial measures or actions to eliminate the impairments.

Originally the AOC designation was only applied to the lower portions of the main-stem, but was expanded to the entire watershed area during RAP development. The RAP process was initiated to fully evaluate and address pollutant sources to improve water and habitat quality of the AOC and reduce its subsequent influence on Lake Erie.

The 1994 *Black River Remedial Action Plan Stage One Report –Impairments of Beneficial Uses and Sources of Pollution in the Black River Area of Concern* identified loss of habitat and riparian vegetation due to agricultural and developmental activities; point sources; agricultural, urban and developing suburban non-point sources of pollution; stream bank erosion; home sewage treatment systems; stream channelization and modifications; and combined and sanitary sewer overflows as the principal causes of the use impairments in the Black River watershed (Black River TMDL, 2008).

1. Beneficial Use Impairments

Table 42: Beneficial Use Impairment Status for the Black River.

Beneficial Use Impairments	2008 TMDL	2009 Assessment
1. Restrictions on fish and wildlife consumption	Impaired for fish, Not Impaired for wildlife	Impaired for fish, Not Impaired for Wildlife
2. Tainting of fish and wildlife flavor	Not Impaired	Not Impaired
3. Degradation of fish and wildlife populations	Impaired for fish and wildlife	Impaired for fish, Not Impaired for Wildlife
4. Fish tumors or other deformities	In recovery phase	In recovery phase
5. Bird or animal deformities or reproduction problems	Unknown	Not Impaired
6. Degradation of benthos	Impaired	Impaired, Restored in East Branch

7. Restrictions on dredging activities	Impaired	Impaired
8. Eutrophication or undesirable algae	Impaired	Impaired
9. Restrictions on drinking water consumption, or taste and odor problems	Not Impaired	Not Impaired
10. Beach closings	Impaired	Impaired
11. Degradation of aesthetics	Impaired	Impaired
12. Added costs to agriculture or industry	Not Impaired	Not Impaired
13. Degradation of phytoplankton and zooplankton populations	Not Impaired	Not Impaired
14.Loss of fish and wildlife habitat	Impaired for fish and wildlife	Impaired for fish and wildlife

BUI 1: Restrictions on Fish and Wildlife Consumption
State of Ohio Delisting Target: No fish consumption advisories of one meal per month (or more stringent) have been issued by Ohio Department of Health that are attributed to contaminants within the AOC.

Areas of Impairment in AOC: Main-stem (Common Carp, Freshwater Drum), East Branch (Rock Bass, Yellow Bullhead, Smallmouth Bass, Common Carp), West Branch (White Sucker), Findley Lake (Largemouth Bass).

In 2007, PCBs were noted to be seeping from the Ford Road Landfill by US EPA. Remedial actions were proposed in 2009 and were expected to begin in 2010. The RAP Committee will continue to monitor developments at the landfill to evaluate a potential source of PCB contamination.

This BUI is impaired for certain stretches of streams in the Black River AOC and the impairment will likely remain in effect for the next few years. Ohio EPA is planning to re-monitor fish tissue starting in 2011, and follow-up monitoring should occur in 2013.

BUI 3: Degradation of Fish Populations
State of Ohio Delisting Target: The fish community assessments of Index of Biotic Integrity (IBI) and Modified Index of Well-Being (MIwb) reveal numeric scores that do not significantly diverge from state-applicable ecoregional biocriteria in free-flowing river segments or from guidelines based on Thoma 1999 for lacustrine and near-shore areas.

Areas of Impairment in AOC: Entire Black River watershed.

Unfortunately, fish community data from most areas of the AOC are old. Ohio EPA is planning to monitor the fish communities in the next couple of years. In 2009, the completion of the Lower Black River Ecological Restoration Master Plan and the start of the Black River Restoration Project in the City of Lorain should go a long way towards improving fish habitat and populations within the AOC.

BUI 4: Fish Tumors and Other Deformities
State of Ohio Delisting Target: Deformities, Eroded Fins, Lesions and Tumors (DELT) levels in fish populations do not exceed 0.5% of the population, and where brown bullheads are present, low tumor prevalence in the population 3 years and older. Lake Erie regional targets are being developed but are expected to be below 5% liver tumors.

Areas of Impairment in AOC: Impaired but In Recovery Phase in the Black River Main-stem.

Higher percentages of both external and internal fish tumors have long been associated with polluted water and sediments. This is especially true for the lower Black River main-stem which had been known around the Great Lakes as the "river of fish tumors." In the Black River, the main contaminant causing fish tumors and deformities was polynuclear aromatic hydrocarbons (PAH) from an old steel mill coking plant. The coking plant has been closed since 1983, and the PAH-contaminated sediments were dredged from the lower river between 1989 and 1990.

By 2004, sufficient improvement had been documented to change the status of this use impairment to In Recovery Phase. The In Recovery Phase designation means that remedial actions have been completed, improvements have been documented and natural processes are expected to complete the restoration. Ohio EPA is planning to monitor the health of the Black River fish populations in the next few years.

BUI 6: Degradation of Benthos
State of Ohio Delisting Target: Average of ICI scores in AOC greater than or equal to 30 for free-flowing segments or greater than or equal to 38 in lacustrine and lake near-shore areas (state attainment value with a non-significant departure allowance of 4 points).

Areas of Impairment in AOC: Main-stem, West Branch, French Creek. This Impairment was listed as Restored in the East Branch in 2005.

For attainment of state water quality standards in warm-water rivers and streams, the ICI score must be 34 or more but allowing for an insignificant departure from the state's criteria would allow for an ICI score of 30 to be used as a BUI delisting target. Even with this significant departure allowance, it will be difficult for the Black River AOC to achieve this goal in and along the maintained shipping channel due to the depth of and the numerous modifications to the river for shipping, industrial, and urban needs. It is likely that the RAP Coordinating Committee will need to determine what specific level of quality is attainable in the lower main-stem, hence the numeric target for delisting the impairment for benthic macroinvertebrate communities.

In addition, very little data are available for ICI in the main-stem and throughout the Black River AOC. Ohio EPA is looking to secure additional funding to allow for additional monitoring in the next couple of years. Remedial projects outlined in the Lower Black River Restoration Master Plan can help restore the benthic communities in the main-stem.

BUI 7: Restrictions on Navigational Dredging Activities
State of Ohio Delisting Target: No restrictions on navigational dredging activities due to contaminants in sediments.

Areas of Impairment in AOC: Black River Main-stem and Outer Harbor.

This use impairment concerns only areas that are dredged for navigational purposes. For an assessment of sediment quality in the federally-maintained stretch of the Black River shipping channel, the Black River RAP Coordinating Committee relied on data supplied by the USACE. The Corps of Engineers conducts an extensive sediment assessment of federal navigation channels about every five years. The last sampling was conducted a few years ago and the sample results were included in a 2009 Corps report that led the RAP Coordinating Committee to look into a re-designation of this use impairment.

The USACE's May 2009 Finding of No Significant Impact and Environmental Assessment Report determined that the sediments of the Outer Harbor as well as sediments from the lower 2.25 miles of the navigation channel met federal guidelines for unconfined open-lake placement. In June 2009, Ohio EPA agreed with the Corps findings and issued a Section 401 water quality certification for the dredging operation that included open-lake placement of the sediments from the Outer Harbor and the lower 2.25 miles of the Black River channel. This is the first time since the late 1970's that sediment from any part of the river channel met applicable federal and state guidelines for open-lake placement. The 2.25 mile length of the federal channel represents an improvement of about 80% of the federally-maintained channel in the Black River.

Based on these findings, the Black River RAP Coordinating Committee has determined that the Main-stem sediments may have recovered sufficiently for change in status for the Restrictions on Dredging Activities beneficial use, and have contacted US EPA about submitting an application for a re-designation of the beneficial use impairment from Impaired to In Recovery Phase.

BUI 8: Eutrophication or Undesirable Algae
State of Ohio Delisting Target: Waters of the AOC meet the minimum dissolved oxygen criteria listed in Ohio Water Quality Standards, and no nuisance growths of algae, such as filamentous *Cladophora*, or blooms of blue-green algae exist and no nuisance growths of aquatic weeds that hinder recreational use or human contact with the water body.

Areas of Impairment in AOC: Low Dissolved Oxygen in Main-stem, Nuisance algae growths in Findley Lake.

According to the RAP's Stage 1 Document, the Eutrophication or Undesirable Algae beneficial use was listed Impaired for the Black River AOC due to pronounced algal blooms in Findley and Brentwood Lakes. In 2009, the earthen dam at Brentwood Lake was removed, so the impairment only remains for Findley Lake, where surrounding agriculture and the ODNR WWTP at Findley Lake State Park contribute phosphorous and other nutrient loads to the lake. In the past, Ohio EPA recommended a phosphorous reduction for the treatment plant. Ohio EPA plans to resurvey Findley Lake in 2011, and the Black River RAP Coordinating Committee will re-evaluate the impairment at Findley Lake when the new data become available. The RAP's Stage 1 Report also stated that there is the potential for Eutrophication impairment in the lower main-stem and in some small slow-moving tributaries in the upper watershed.

An earlier dissolved oxygen study for the main-stem revealed that while dissolved oxygen sags are evident in the lower main-stem, little can be done to improve the situation due to the maintained depth of the navigation channel. The flat topography of the upper watershed areas is the primary cause of the slow, almost stagnant flow regimes through much of the summer. A lack of riparian canopy exacerbates the condition by allowing sunlight to warm the slow-moving waters. This is likely no different than many non-AOC tributary systems located in primarily flat agricultural areas. The potential for restoration in the upper reaches of the watershed will have to be assessed by the RAP Coordinating Committee.

BUI 10: Beach Closings (Recreational Use)

State of Ohio Delisting Target:

- Total Body Contact, Bathing Waters: No more than 10 posted advisory days, due to high bacteria levels, per year for five consecutive years.
- Total Body Contact, Primary Contact Waters, for five consecutive years: 75th percentile for all samples collected in one year does not exceed 1000 CFU per 100 mL fecal coliform; or 90th percentile of all samples collected in one year does not exceed 298 CFU per 100 mL.
- Partial Body Contact, Secondary Contact Waters: 90th percentile of samples collected over a five year period does not exceed 5000 CFU per 100 mL for fecal coliform; or 90th percentile of samples collected over a five year period does not exceed 576 CFU per 100 mL for *E. coli.*

Areas of Impairment in AOC: Throughout portions of the AOC, including Lakeview Park and Century Park bathing beaches.

The Black River Main-stem's contact advisory due to PAH contaminated sediments was lifted by the Ohio Department of Health in 2004, so this impairment use is for bacterial contamination only.

There are three recreational public beaches in the Black River AOC: Lakeview Park Beach, Century Park Beach (both located on the Lake Erie shore) and the Findley Lake State Park Beach. As part of their Bathing Beach monitoring program, the Ohio Department of Health (ODH) routinely monitors the bacteria levels at these beaches. The delisting target for any bathing waters beach is no more than 10 ODH posted swimming advisory days, due to high bacteria levels, per year for five consecutive years. The Findley Lake beach does not have a history of bacteriological contamination and is not considered Impaired for the recreational beneficial use, but both Lake Erie beaches are considered Impaired for this beneficial use. In the 2009 season, Lakeview Park Beach had 12 posted advisory days with an average E. coli level of 106 CFU and Century Park Beach had 26 posted advisory days with an average E. coli level of 227.8 CFU. While this still meets the Impairment criteria, it is significantly better than the 2008 seasons at each beach. In 2008, Lakeview Park Beach had 44 posted advisory days with an average E. coli level of 249.1 CFU and Century Park Beach had 52 posted advisory days with an average E. coli level of 330.2 CFU.

Ohio EPA's Integrated Reports are the initial source of bacteria monitoring results for the Black River RAP, and describe conditions for all of Ohio's surface waters. One of the conditions reported is on the suitability of the water resource for recreational use. The upstream sub-basins of the West and East Branches are impaired for this BUI as they have consistently shown levels of bacteria exceeding the delisting criteria. However, an improvement has been noted in the main-stem sub-watershed. The 2008 Integrated Report revealed significant improvements to bacteria levels in the Black River main-stem. Ohio EPA does not consider the river to be Impaired for recreational use.

BUI 11: Degradation of Aesthetics

State of Ohio Delisting Target: General surface water quality meets applicable OAC water quality criteria and is free from the following:

- Suspended solids of other substances that will settle to form putrescent or otherwise objectionable sludge deposits, or that will adversely affect aquatic life,
- Floating debris, oil, scum and other floating material in amounts sufficient to be unsightly or cause degradation,
- Materials producing color, odor, or other conditions in such a degree to create a nuisance,
- Public health nuisances associated with raw or poorly-treated sewage.

Areas of Impairment in AOC: Entire Black River watershed.

The Degradation of Aesthetics use impairment is listed throughout the entire Black River AOC. Excessive loadings of sediment from upstream areas, failed or failing home sewage treatment systems, combined sewer overflows and trash still impact the water system.

The Black River watershed contains 12 discharging Waste Water Treatment Plants and an estimated 19,300 Home Sewage Treatment Systems. Because not all HSTSs are working properly, some fail and discharge untreated effluent into the Black River and its tributaries. According to OAC 3745-1-04, both the Ohio EPA and local health departments have jurisdiction to address these problems as public health nuisances. The criteria to determine a nuisance is bacteria sampling, odor and color, and other visual manifestations.

Several studies in the Black River watershed by the Lorain County General Health District have indicated "critical areas" in the watershed as non-sewered areas in close proximity to the cities of Lorain and Elyria in the Black River Main-stem, Lower West Branch, Jackson Ditch-East Branch, Willow Creek, and French Creek sub-watersheds. These areas have older homes with small lots, undersized systems of poor and aging design, poorly-drained soils, and include the communities of Carlisle Township, Elyria Township, Sheffield Village, Sheffield Township, and Eaton Township.

BUI 14: Loss of Fish Habitat

State of Ohio Delisting Target: For free-flowing segment of AOC, Qualitative Habitat Evaluation Index (QHEI) scores must average greater than or equal to 60. For Lake Erie and lacustrine areas, Lacustuary Qualitative Habitat Evaluation Index (LQHEI) must average greater than or equal to 55.

Areas of Impairment in AOC: Entire Black River watershed.

For Fish Habitat assessments, the RAP Coordinating Committee relies upon the Lacustuary Qualitative Habitat Evaluation Index (LQHEI) for Lake Erie, Lake Erie nearshore and lacustuarine areas and the Qualitative Habitat Evaluation Index (QHEI) for free-flowing areas of the AOC. Although not formally adopted by Ohio EPA, the LQHEI index is useful in assessing fish habitat conditions along the Lake Erie shoreline and in the lower stretches of river that drain to the lake.

Both habitat methodologies are intended to provide a qualitative evaluation of the physical characteristics for amount and quality of fish habitat in a given stream reach and Lake Erie shoreline. Both methods are composed of six metrics which take into account variables such as substrate, cover, morphology, riparian cover and erosion, aquatic vegetation and other modifications. The maximum score for each method is 100.

Most of the downstream areas of the lower Black River AOC have hard-armored or sheet-piled river banks which do not provide sufficient fish habitat and do not score well using LQHEI. In the lower Black River, the City of Lorain's Black River Restoration Project is helping to restore and protect aquatic and near-shore habitats. As part of the process, new LQHEI values were obtained for the lower six miles of the main-stem. The average LQHEI for the lower river study area is 39.4.

In the upstream areas of the AOC, the unprecedented degree of recent development in the French Creek, Jackson Ditch-East Branch, Lower West Branch, and Willow Creek sub-watersheds, a lack of quality riparian habitat throughout the entire watershed and agricultural land use practices in the upper reaches of the watershed have led to eroding stream banks, excessive sediment loads, and a smothering of aquatic habitat. Data available from Ohio EPA have not been inclusive of all segments in a tributary sub-watershed, and new habitat studies need to be conducted before the RAP Coordinating Committee is able to delist fish habitat in the AOC. Ohio EPA is seeking funds to conduct these habitat evaluation studies.

What data exists is old, but indicates that the Black River may be nearing attainment in certain areas:

Table 43: Average QHEI Scores for Black River Tributaries (Black River RAP 2009 Annual Report).

Tributary Basin	Average QHEI	Data Source	Age of Data
French Creek	53.5	USACE	2002*
East Branch	64.1	USACE & Ohio EPA	2001 & 2003*
East Fork	66.5	Ohio EPA	2006
West Fork	65	Ohio EPA	2006
West Branch	63.1	Ohio EPA	2001 & 2006**
Plum Creek	62.5	Ohio EPA	2001 & 2006**
Wellington Creek	72.3	Ohio EPA	2001 & 2006**
Charlemont Creek	69.3	Ohio EPA	2001 & 2006**
* Data is too old for use in assessing BUI, new data is needed			
** One year of the dataset is too old for use in assessing BUI, new data is needed			

Some of the data in the table above is beyond the 5-year time limit for the state's Credible Data Bill, so its use in determining an accurate current state of fish habitat in the upper watersheds should be suspect and cannot be used in a formal delisting application to Ohio EPA and US EPA. However, the data can be used to show how close fish habitats in the upper watersheds may be to the delisting target value.

In addition to human impacts to habitat in the watershed, fish migration into the upper reaches of the Black River is limited by natural waterfalls at Cascade Park in Elyria. Tributary streams like French Creek, Jackson Ditch, Willow Creek, and Plum Creek are seeing significant habitat impacts from impervious cover and increased volumes of water entering the system. Habitat loss due to flashy water volumes does not allow for solidifying fish communities.

BUI 14: Loss of Wildlife Habitat
State of Ohio Delisting Target:

- Forested buffers on 50% of residential waterways and forested buffers on 25% of urban waterways
- Headwater Habitat Evaluation Index (HHEI) average of greater than or equal to 30 for warm water habitat streams and greater than or equal to 70 for cold water habitat streams; OR

- Wildlife officials do not identify loss of or poor quality habitat as cause for non-attainment with wildlife goals.

Little work has been done on assessing wildlife habitat conditions in the AOC. Current delisting guidelines for wildlife habitat were developed from Canadian AOCs and are likely unattainable in not only the Black River AOC but most Ohio AOCs as well. As the Black River AOC nears delisting in other BUIs, the RAP Coordinating Committee will devise wildlife habitat delisting targets and milestones that are more applicable and present their proposed targets and milestones to Ohio EPA and US EPA for consideration and approval before proceeding with any re-designation or delisting action for the wildlife habitat portion of this beneficial use.

(Excerpted from the Black River RAP 2009 Annual Report)

V. Problem Statements, Goals, Objectives, and Actions

The following problem statements have been developed based on linkages between causes and sources of impairments identified in the Black River watershed, and as discussed in the Black River TMDL and 303(d) report (see Table 44; Page 209). The problem statements and accompanying restoration/protection goals were used to develop the objectives and actions for implementation in each respective subwatershed. The long-term goals for each subwatershed are to address the stated problems and bring all streams into full attainment of designated aquatic life uses. Pollutant loading reductions stated within the problem statements represent the attainment targets set by Ohio EPA. Attainment status' and impairments described below for each 12-digit subwatershed were derived from the watershed inventory (Section III), Ohio EPA Biological and Water Quality Monitoring Reports, and the Total Maximum Daily Load (TMDL) Report.

Problem statements, goals, objectives, and actions for nine of the fifteen 12-digit subwatersheds are described (a summary table of the goals, objectives, and actions is included in Appendix F). These subwatersheds are highlighted in Table 45 (Page 210) and represent the most impaired subwatersheds.

In addition to the goals listed for each subwatershed, the de-listing of Beneficial Use Impairments (BUIs) applicable to the Area of Concern (AOC) designation is also a long-term objective of this plan. Furthermore, the preservation and/or set-aside of 25% of existing open space within each 12-digit subwatershed is also a long-term goal of the plan.

A. Wellington Creek 041100010503

The entirety of the Wellington Creek mainstem is in non-attainment (19.3 miles) of its warmwater habitat use designation. The problem statements for this subwatershed are as follows:

Problem Statement 1:

Excessive nutrients from stream bank erosion, agricultural runoff, and failing HSTS are contributing excessive loads to streams. In-stream nitrate-nitrogen loads need to be reduced by 43% (45,542 lb/yr) to meet TMDL concentration targets (1.5 mg/L). Achievement of the objectives for this problem statement will result in a reduction of nitrate-nitrogen loads by 8,596 lb/yr.

Goal 1:

Reduce nutrient loads (3,222 lb/yr of in-stream nitrate-nitrogen) resulting from stream bank erosion.

Objective 1:

Restore 6 miles of eroding stream banks in Wellington Creek and its tributaries utilizing natural bank stabilization practices, which would result in an N load reduction of 2,154 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, Lake Erie Protection Fund, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 4 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in an N load reduction of 1,068 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 4:

Preserve 25% of existing open spaces, with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.

4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (3,169 lb/yr of in-stream nitrate-nitrogen) resulting from agricultural runoff.

Objective 1:

Restore 4 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in an N load reduction of 1,068 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in an N loading reduction of 1,803 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in an N loading reduction of 138 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in an N loading reduction of 10 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in an N loading reduction of 150 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 3:

Reduce nutrient loads (2,205 lb/yr of in-stream nitrate-nitrogen) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 52 failing HSTS, which would result in an N loading reduction of 2,205 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).

2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 2:

Excessive nutrients from stream bank erosion, agricultural runoff, and failing HSTS are contributing excessive loads to streams. In-stream total phosphorus loads need to be reduced by 54% (5,951 lb/yr) to meet TMDL concentration targets (0.17 mg/L). Achievement of the objectives for this problem statement will result in a reduction of total phosphorus loads by 4,581 lb/yr.

Goal 1:

Reduce nutrient loads (2,727 lb/yr of total phosphorus) resulting from stream bank erosion.

Objective 1:

Restore 6 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a P load reduction of 1,077 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, Lake Erie Protection Fund, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 4 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in a P loading reduction of 573 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 4:

Preserve 25% of open spaces, with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (1,019 lb/yr of total phosphorus) resulting from agricultural runoff.

Objective 1:

Restore 4 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in a P loading reduction of 573 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in a P load reduction of 333 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a P load reduction of 74 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a P load reduction of 2 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a P load reduction of 37 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 3:

Reduce nutrient loads (835 lb/yr of total phosphorus) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 52 failing HSTS, which would result in a P load reduction of 835 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 3:

In-stream and/or riparian habitat loss are causing non-attainment of aquatic life use designations within an estimated 60% (43 miles) of the streams in the Wellington Creek 12-digit subwatershed.

Goal 1:

Restore in-stream and riparian habitat along 10 miles of streams (including ditch retrofits where applicable) to achieve QHEI, ICI, and IBI scores indicative of attainment of aquatic life use designations.

Objective 1:

Restore 10 miles of non-attaining streams, including restoration of in-stream habitat, stabilization of eroding banks, and re-connection to floodplain (including ditch retrofits where applicable).

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 8 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, Lake Erie Protection Fund, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 4:

Preserve 25% of open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Objective 5:

Remove invasive species (particularly *Phragmites australis*) from 10 acres of affected areas within the subwatershed.

Action Items:

1. Pursue grant programs and other potential funding sources for invasive species removal.
2. Work with entities such as Lorain County Metro Parks and Ohio DNR on invasive species removal programs.

Problem Statement 4:

Siltation from stream bank erosion and agricultural runoff is contributing to poor in-stream habitat and low QHEI scores. Total suspended solids (TSS) need to be reduced by 48% (572 tons/yr) to meet total maximum daily load targets (41 mg/L). Achievement of the objectives for this problem statement will result in a reduction of TSS loads by 572 tons/yr.

Goal 1:

Reduce TSS loads (363.3 tons/yr) resulting from stream bank erosion.

Objective 1:

Restore 1.1 miles of eroding stream banks utilizing natural bank stabilization practices and incorporate forested/riparian habitat restoration (including ditch retrofits where applicable), resulting in a TSS load reduction of 195.3 tons/yr.

Action Items:

1. Inventory potential stream, wetland, and floodplain restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
3. Create brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 2:

Restore 2 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in a TSS loading reduction of 168 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.

5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Preserve 25% of open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce TSS loads (208.7 tons/yr) resulting from agricultural runoff.

Objective 1:

Restore 2 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in a TSS loading reduction of 168 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 2:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a TSS load reduction of 2.5 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 3:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a TSS load reduction of 1.2 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 4:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a TSS load reduction of 37 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Problem Statement 5:

Excessive in-stream fecal coliform and E. coli bacteria loadings are resulting from failing home sewage treatment systems (HSTS). It is estimated that 10% or 52 HSTS are failing.

Goal 1:

Reduce bacteria loadings by removing, repairing, or replacing 52 failing HSTS.

Objective 1:

Remove/Repair/Replace 52 failing HSTS.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.
4. Continue outreach and education efforts to inform homeowners of maintenance requirements (including methods, costs, etc.) for HSTS.

B. French Creek 041100010601

The French Creek mainstem is in non-attainment of its warmwater habitat use designation at RM 3.2-6.1 and in partial attainment at RM 1.0.

Problem Statement 1:

Excessive nutrients from industrial point sources, wastewater treatment plants (WWTP), stream bank erosion, urban runoff, and failing HSTS. In-stream nitrate-nitrogen loads need to be reduced by 46% (70,280 lb/yr) to meet TMDL concentration targets (1.5 mg/L). Achievement of the objectives for this problem statement will result in a reduction of nitrate-nitrogen loads by 10,998 lb/yr.

Goal 1:

Reduce nutrient loads (3,094 lb/yr of in-stream nitrate-nitrogen) resulting from stream bank erosion.

Objective 1:

Restore 5 miles of eroding stream banks in French Creek and its tributaries utilizing natural bank stabilization practices, resulting in an N load reduction of 1,795 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 3,400 linear feet of French Creek Tributary #4 near Lorain County Public Library, resulting in an N load reduction of 231 lb/yr.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants.

Objective 3:

Restore 4 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in an N load reduction of 1,068 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.

2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open spaces with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (266 lb/yr of in-stream nitrate-nitrogen) resulting from urban runoff.

Objective 1:

Restore 3 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in an N load reduction of 825 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in an N load reduction of 168 lb/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial

measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.

4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 3:

Expand West Point Retention Basin and restore wetlands on-site by an additional 11 acre-feet of storage, resulting in an N load reduction of 98 lb/yr.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants.

Goal 3:

Reduce nutrient loads (7,638 lb/yr of in-stream nitrate-nitrogen) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 181 failing HSTS, resulting in an N load reduction of 7,638 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 2:

Excessive nutrients from industrial point sources, wastewater treatment plants (WWTP), stream bank erosion, urban runoff, and failing HSTS. In-stream total phosphorus loads need to be reduced by 38% (6,893 lb/yr) to meet TMDL concentration targets (0.17 mg/L). Achievement of the objectives for this problem statement will result in a reduction of total phosphorus loads by 5,919 lb/yr.

Goal 1:

Reduce nutrient loads (2,082 lb/yr of total phosphorus) resulting from stream bank erosion.

Objective 1:

Restore 5 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a P load reduction of 898 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 3,400 linear feet of French Creek Tributary #4 near Lorain County Public Library, resulting in a P load reduction of 116 lb/yr.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants.

Objective 3:

Restore 4 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in a P load reduction of 1,068 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (853 lb/yr of total phosphorus) resulting from urban runoff.

Objective 1:

Restore 3 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in a P load reduction of 825 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in a P load reduction of 12 lb/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.

3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 3:

Expand West Point Retention Basin and restore wetlands on-site by an additional 11 acre-feet of storage, resulting in a P load reduction of 16 lb/yr.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants.

Goal 3:

Reduce nutrient loads (2,984 lb/yr of total phosphorus) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 181 failing HSTS, resulting in a P load reduction of 2,984 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 3:

In-stream and/or riparian habitat loss are causing non-attainment of aquatic life use designations within an estimated 75% (53 miles) of the streams in the French Creek 12-digit subwatershed.

Goal 1:

Restore in-stream and riparian habitat along 13 miles of streams to achieve QHEI, ICI, and IBI scores indicative of attainment of aquatic life use designations.

Objective 1:

Restore 5 miles of eroding stream banks utilizing natural bank stabilization practices.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 3,400 linear feet of French Creek Tributary #4 near Lorain County Public Library.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants.

Objective 3:

Restore 7 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.

2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Objective 5:

Remove invasive species (particularly *Phragmites australis*) from 10 acres of affected areas within the subwatershed.

Action Items:

1. Pursue grant programs and other potential funding sources for invasive species removal.
2. Work with Lorain County Metro Parks and other natural resource management entities on invasive species removal programs.

Problem Statement 4:

Siltation from stream bank erosion and urban runoff is contributing to poor in-stream habitat and low QHEI scores. Total suspended solids (TSS) need to be reduced by 38% (725 tons/yr) to meet total maximum daily load targets (41 mg/L). Achievement of the objectives for this problem statement will result in a reduction of total TSS loads by 725 tons/yr.

Goal 1:

Reduce TSS loads (536 tons/yr) resulting from stream bank erosion.

Objective 1:

Restore 1.4 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a TSS load reduction of 252 tons/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 3,400 linear feet of French Creek Tributary #4 near Lorain County Public Library, resulting in a TSS load reduction of 116 tons/yr.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants.

Objective 3:

Restore 2 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in a TSS load reduction of 168 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce TSS loads (189 tons/yr) resulting from urban runoff.

Objective 1:

Restore 2 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment which will result in a TSS load reduction of 168 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in a TSS load reduction of 9 tons/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.

2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 3:

Expand West Point Retention Basin and restore wetlands on-site by an additional 11 acre-feet of storage, resulting in a TSS load reduction of 12 tons/yr.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants.

Problem Statement 5:

Excessive in-stream fecal coliform and E. coli bacteria loadings are resulting from failing home sewage treatment systems (HSTS). It is estimated that 10% or 181 HSTS are failing.

Goal 1:

Reduce bacteria loadings by removing, repairing, or replacing 181 failing HSTS.

Objective 1:

Remove/Repair/Replace 181 failing HSTS.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Continue outreach and education efforts to inform homeowners of maintenance requirements (including methods, costs, etc.) for HSTS.

C. Lower West Branch 041100010506

The Lower West Branch mainstem is in non-attainment of its warmwater habitat use designation (approximately 15 miles) with the exception of approximately 0.5 miles immediately upstream of the mouth, which is in partial attainment.

Problem Statement 1:

Excessive nutrients from stream bank erosion, agricultural runoff, failing HSTS, and CSOs are contributing excessive nutrient loads to streams. In-stream nitrate-nitrogen loads need to be reduced by 43% (62,397 lb/yr) to meet TMDL concentration targets (1.5 mg/L). Achievement of the objectives for this problem statement will result in a reduction of nitrate-nitrogen loads by 10,528 lb/yr.

Goal 1:

Reduce nutrient loads (3,691 lb/yr of in-stream nitrate-nitrogen) resulting from stream bank erosion.

Objective 1:

Restore 6 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in an N load reduction of 2,154 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 6 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 1,537 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (3,169 lb/yr of in-stream nitrate-nitrogen) resulting from agricultural runoff.

Objective 1:

Restore 4 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 1,068 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.

3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in an N load reduction of 1,803 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in an N load reduction of 138 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in an N load reduction of 10 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in an N load reduction of 150 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 3:

Reduce nutrient loads (3,668 lb/yr of in-stream nitrate-nitrogen) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 87 failing HSTS, resulting in an N load reduction of 3,668 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Goal 4:

Reduce nutrient loads (40 lb/yr of in-stream nitrate-nitrogen) resulting from CSOs.

Objective 1:

Reduce CSO discharges at 10 locations in Elyria, resulting in an N load reduction of 40 lb/yr.

Problem Statement 2:

Excessive nutrients from stream bank erosion, agricultural runoff, failing HSTS, and CSOs are contributing excessive loads to streams. In-stream total phosphorus loads need to be reduced by

54% (9,495 lb/yr) to meet TMDL concentration targets (0.17 mg/L). Achievement of the objectives for this problem statement will result in a reduction of total phosphorus loads by 4,310 lb/yr.

Goal 1:

Reduce nutrient loads (1,902 lb/yr of total phosphorus) resulting from stream bank erosion.

Objective 1:

Restore 6 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a P load reduction of 1,077 lb/yr.

Action Items:

1. Inventory potential stream, wetland, and floodplain restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
3. Create brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 2:

Restore 6 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 825 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (1,019 lb/yr of total phosphorus) resulting from agricultural runoff.

Objective 1:

Restore 4 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 573 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.

3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in a P load reduction of 333 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a P load reduction of 74 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a P load reduction of 2 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a P load reduction of 37 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 3:

Reduce nutrient loads (1,389 lb/yr of total phosphorus) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 87 failing HSTS, resulting in a P load reduction of 1,389 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Goal 4:

Reduce nutrient loads (7 lb/yr of total phosphorus) resulting from CSOs.

Objective 1:

1. Reduce CSO discharges at 10 locations in Elyria, resulting in a P load reduction of 7 lb/yr.

Problem Statement 3:

In-stream and/or riparian habitat loss are causing non-attainment of aquatic life use designations within an estimated 60% (52 miles) of the streams in the Lower West Branch 12-digit subwatershed.

Goal 1:

Restore in-stream and riparian habitat along 17 miles of streams (including ditch retrofits where applicable) to achieve QHEI, ICI, and IBI scores indicative of attainment of aquatic life use designations.

Objective 1:

Restore 10 miles of non-attaining streams, including restoration of in-stream habitat, stabilization of eroding banks, and re-connection to floodplain (including ditch retrofits where applicable).

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 10 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other potential funds for demonstration project.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Objective 5:

Remove invasive species (particularly *Phragmites australis*) from 10 acres of affected areas within the subwatershed.

Action Items:

1. Pursue grant programs and other potential funding sources for invasive species removal.
2. Work with Lorain County Metro Parks and other natural resource management entities on invasive species removal programs.

Problem Statement 4:

Siltation from stream bank erosion and agricultural runoff is contributing to poor in-stream habitat and low QHEI scores. Total suspended solids (TSS) need to be reduced by 48% (842 tons/yr) to meet total maximum daily load targets (41 mg/L). Achievement of the objectives for this problem statement will result in a reduction of TSS loads by 842 tons/yr.

Goal 1:

Reduce TSS loads (580 tons/yr) resulting from stream bank erosion.

Objective 1:

Restore 2 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a TSS load reduction of 359 tons/yr.

Action Items:

1. Inventory potential stream, wetland, and floodplain restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
3. Create brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 2:

Restore 2.7 miles of riparian buffers along non-attaining streams, resulting in a TSS load reduction of 221 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce TSS loads (261.7 tons/yr) resulting from agricultural runoff.

Objective 2:

Restore 2.7 miles of riparian buffers along non-attaining streams, resulting in a TSS load reduction of 221 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 2:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a TSS load reduction of 2.5 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 3:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a TSS load reduction of 1.2 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 4:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a TSS load reduction of 37 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Problem Statement 5:

Excessive in-stream fecal coliform and E. coli bacteria loadings are resulting from failing home sewage treatment systems (HSTS). It is estimated that 10% or 262 HSTS are failing.

Goal 1:

Reduce bacteria loadings by removing, repairing, or replacing 87 failing HSTS.

Objective 1:

Remove/Repair/Replace 87 failing HSTS.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.
4. Continue outreach and education efforts to inform homeowners of maintenance requirements (including methods, costs, etc.) for HSTS.

D. Black River Mainstem 041100010602

The lower Black River mainstem (Below River Mile 6.0) is in non-attainment of its warmwater habitat use designation. The upper mainstem (Above River Mile 6.0) is in partial attainment (approximately 5 river miles) and full attainment (approximately 2 river miles).

Problem Statement 1:

Excessive nutrients from industrial point sources, wastewater treatment plants (WWTP), stream bank erosion, urban runoff, failing HSTS, and combined sewer overflows (CSO's). In-stream nitrate-nitrogen loads need to be reduced by 46% (63,911 lb/yr) to meet TMDL concentration targets (1.5 mg/L). Achievement of the objectives for this problem statement will result in a reduction of nitrate-nitrogen loads by 10,775 lb/yr.

Goal 1:

Reduce nutrient loads (1,868 lb/yr of in-stream nitrate-nitrogen) resulting from stream bank erosion.

Objective 1:

Restore 1 mile of eroding stream banks utilizing natural bank stabilization practices, resulting in an N load reduction of 359 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Great Lakes Restoration Initiative (GLRI), Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 3,000 linear feet of the Black River in Cascade Park in Elyria, resulting in an N load reduction 204 lb/yr.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants.

Objective 3:

Restore 5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 1,305 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (1,582 lb/yr of in-stream nitrate-nitrogen) resulting from urban runoff.

Objective 1:

Restore 5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 1,305 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in an N load reduction of 168 lb/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 3:

Implement 1 stormwater retrofit project at the Lorain County Job & Family Services facility, resulting in an N load reduction of 67 lb/yr.

Action Items:

1. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources to complete the project.

Objective 4:

Establish one certified Green Marina along the lower mainstem of the Black River, resulting in an N load reduction of 42 lb/yr.

Action Items:

1. Distribute brochures explaining the Green Marina programs to local marina owners and encourage participation.
2. Pursue grant funds and other potential funding sources for education and implementation of Green Marinas.

Goal 3:

Reduce nutrient loads (7,313 lb/yr of in-stream nitrate-nitrogen) resulting from failing HSTS.

Objective 1:

Implement stormwater/illicit discharge solutions along 4,000 linear feet of Packard Ditch, resulting in an N load reduction of 3,392 lb/yr.

Action Items:

1. Conduct stakeholder/landowner interviews to evaluate problem sources, determine willingness to participate, and collect ancillary information.
2. Conduct assessment of existing ditch to determine presence of potential contaminants and develop a conceptual solution. Continue collaboration with stakeholders/landowners.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, other grants, stormwater district funds, and other potential funding sources for final design and construction of the project.

Objective 2:

Remove/Repair/Replace 93 failing HSTS, resulting in an N load reduction of 3,921 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Goal 4:

Reduce nutrient loads (12 lb/yr of in-stream nitrate-nitrogen) resulting from CSOs.

Objective 1:

1. Reduce CSO discharges at 3 locations in Elyria, resulting in an N load reduction of 12 lb/yr.

Problem Statement 2:

Excessive nutrients from industrial point sources, wastewater treatment plants (WWTP), stream bank erosion, urban runoff, failing HSTS, and combined sewer overflows (CSO's). In-stream total phosphorus loads need to be reduced by 38% (6,594 lb/yr) to meet TMDL concentration targets (0.17 mg/L). Achievement of the objectives for this problem statement will result in a reduction of total phosphorus loads by 4,387 lb/yr.

Goal 1:

Reduce phosphorus loads (880 lb/yr of total phosphorus) resulting from stream bank erosion.

Objective 1:

Restore 1 mile of eroding stream banks utilizing natural bank stabilization practices, resulting in a P load reduction of 180 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Great Lakes Restoration Initiative (GLRI), Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 3,000 linear feet of the Black River in Cascade Park in Elyria, resulting in a P load reduction of 102 lb/yr.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants.

Objective 3:

Restore 5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 700 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce phosphorus loads (733 lb/yr of total phosphorus) resulting from urban runoff.

Objective 1:

Restore 5 miles of riparian buffers (including wetlands and floodplains) along non-attaining streams, resulting in a P load reduction of 700 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in a P load reduction of 12 lb/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 3:

Implement 1 stormwater retrofit project at the Lorain County Job & Family Services facility, resulting in a P load reduction of 5 lb/yr.

Action Items:

1. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources to complete the project.

Objective 4:

Establish one certified Green Marina along the lower mainstem of the Black River, resulting in a P load reduction of 16 lb/yr.

Action Items:

1. Distribute brochures explaining the Green Marina programs to local marina owners and encourage participation.
2. Pursue grant funds and other potential funding sources for education and implementation of Green Marinas.

Goal 3:

Reduce phosphorus loads (2,772 lb/yr of total phosphorus) resulting from failing HSTS.

Objective 1:

Implement stormwater/illicit discharge solutions along 4,000 linear feet of Packard Ditch, resulting in a P load reduction of 1,285 lb/yr.

Action Items:

1. Conduct stakeholder/landowner interviews to evaluate problem sources, determine willingness to participate, and collect ancillary information.
2. Conduct assessment of existing ditch to determine presence of potential contaminants and develop a conceptual solution. Continue collaboration with stakeholders/landowners.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, other grants, stormwater district funds, and other potential funding sources for final design and construction of the project.

Objective 2:

Remove/Repair/Replace 93 failing HSTS, resulting in a P load reduction of 1,485 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.

3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Goal 4:

Reduce phosphorus loads (2.1 lb/yr of total phosphorus) resulting from CSOs.

Objective 1:

1. Reduce CSO discharges at 3 locations in Elyria, resulting in a P load reduction of 2.1 lb/yr.

Problem Statement 3:

In-stream and/or riparian habitat loss are causing non-attainment of aquatic life use designations within an estimated 90% (47 miles) of the streams in the Black River mainstem 12-digit subwatershed.

Goal 1:

Restore in-stream and riparian habitat along 16 miles of streams (including ditch retrofits where applicable) to achieve QHEI, ICI, and IBI scores indicative of attainment of aquatic life use designations.

Objective 1:

Restore 1 mile of eroding stream banks utilizing natural bank stabilization practices.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Great Lakes Restoration Initiative (GLRI), Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 3,000 linear feet of the Black River in Cascade Park in Elyria.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants.

Objective 3:

Restore 10 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.

3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Objective 5:

Remove bulkhead along 1,000 linear feet of the Black River, restore to natural condition, and install aquatic habitat features.

Action Items:

1. Work with the City of Lorain to identify priority locations for bulkhead removal.
2. Pursue grant programs and other potential funding sources for the acquisition and/or removal of bulkheads/restoration of identified priority locations.

Objective 6:

Remove slag and other steel-making byproducts and restore riparian habitat within 100 acres of property between RM 1.8 and RM 5.0 of the Black River.

Action Items:

1. Pursue grant programs and other potential funding sources for slag removal and restoration.
2. Work with existing brokerages operating within these areas to expedite recycling of steel-making byproducts and exportation from riparian areas.
3. Pursue grant monies or other potential funding to assess locations as necessary for potential contaminants and develop remediation plans.
4. Pursue grant monies or other potential funding to remediate any areas identified during assessments discussed in Action Item No. 3.

Objective 7:

Remove slag and other steel-making byproducts from 8-acre area near existing heron rookery and restore riparian habitat.

Action Items:

1. Pursue grant programs and other potential funding sources for slag removal and restoration.

Objective 8:

Remove invasive species, primary *Phragmites australis*, from 6 miles of the Black River and restore native vegetation along the river banks.

Action Items:

1. Pursue grant programs and other potential funding sources for *Phragmites* removal and subsequent restoration.
2. Evaluate the potential for above-ground plant materials resulting from *Phragmites* removal projects to be composted or used otherwise in a beneficial re-use manner.
3. Work with Lorain County Metro Parks and other natural resource management entities on invasive species removal programs.

Objective 9:

Remove an abandoned bio-remediation system and underlying slag and restore approximately 2.7 acres of riparian areas near RM 3.7 of the Black River.

Action Items:

1. Pursue grant programs and other potential funding sources for completion of the project.

Objective 10:

Plant 2 acres of aquatic vegetation in shallow and near-shore areas of the Black River from RM 0 to RM 6.

Action Items:

1. Pursue grant programs and other potential funding sources for completion of aquatic vegetation planting.

Objective 11:

Create/Restore aquatic habitat along 1,000 linear feet of the Black River between RM 0 and RM 3.

Action Items:

1. Pursue grant programs and other potential funding sources for installation of aquatic habitat.

Objective 12:

Create/Restore aquatic habitat along 10,000 linear feet of the Black River between RM 3 and RM 6.

Action Items:

1. Pursue grant programs and other potential funding sources for installation of aquatic habitat.

Problem Statement 4:

Siltation from stream bank erosion and urban runoff is contributing to poor in-stream habitat and low QHEI scores. Total suspended solids (TSS) need to be reduced by 38% (730 tons/yr) to meet total maximum daily load targets (41 mg/L). Achievement of the objectives for this problem statement will result in a reduction of TSS loads by 731 tons/yr.

Goal 1:

Reduce TSS loads (500 tons/yr) resulting from stream bank erosion.

Objective 1:

Restore 1 mile of eroding stream banks utilizing natural bank stabilization practices, resulting in a TSS load reduction of 180 tons/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Great Lakes Restoration Initiative (GLRI), Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 3,000 linear feet of the Black River in Cascade Park in Elyria, resulting in a TSS load reduction of 102 tons/yr.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants.

Objective 3:

Restore 2.7 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a TSS load reduction of 218 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.

5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Objective 5:

Preserve 7 acres of existing wetlands near RM 1.7 on the Black River by recording a protective instrument with the County Auditor.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of the wetlands.
2. Work with the City of Lorain to negotiate terms for acquisition of the wetland property.

Goal 2:

Reduce TSS loads (230.5 tons/yr) resulting from urban runoff.

Objective 1:

Restore 2.7 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a TSS load reduction of 218 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
5. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in a TSS load reduction of 9 tons/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.

4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 3

Implement 1 stormwater retrofit project at the Lorain County Job & Family Services facility, resulting in a TSS load reduction of 3.5 tons/yr.

Action Items:

1. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources to complete the project.

Problem Statement 5:

Excessive in-stream fecal coliform and E. coli bacteria loadings are resulting from failing home sewage treatment systems (HSTS). It is estimated that 10% or 173 HSTS are failing.

Goal 1:

Reduce bacteria loadings by removing, repairing, or replacing 93 failing HSTS.

Objective 1:

Remove/Repair/Replace 93 failing HSTS.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.
4. Continue outreach and education efforts to inform homeowners of maintenance requirements (including methods, costs, etc.) for HSTS.

E. Charlemont Creek 041100010501

The entirety of the Charlemont Creek mainstem (12.5 miles) is in non-attainment of its warmwater habitat use designation. The problem statements for this subwatershed are as follows:

Problem Statement 1:

Excessive nutrients from stream bank erosion, agricultural runoff, and failing HSTS are contributing excessive loads to streams. In-stream nitrate-nitrogen loads need to be reduced by 43% (41,166 lb/yr) to meet TMDL concentration targets (1.5 mg/L). Achievement of the objectives for this problem statement will result in a reduction of nitrate-nitrogen loads by 9,692 lb/yr.

Goal 1:

Reduce nutrient loads (4,895 lb/yr of in-stream nitrate-nitrogen) resulting from stream bank erosion.

Objective 1:

Restore 10 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in an N load reduction of 3,590 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 1,305 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (3,406 lb/yr of in-stream nitrate-nitrogen) resulting from agricultural runoff.

Objective 1:

Restore 5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 1,305 lb/yr.

Action Items:

6. Inventory potential riparian restoration projects and prioritize.
7. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
8. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
9. Work with NRCS to implement cost share program for filter strips in priority areas.
10. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in an N load reduction of 1,803 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in an N load reduction of 138 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in an N load reduction of 10 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in an N load reduction of 150 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 3:

Reduce nutrient loads (1,391 lb/yr of in-stream nitrate-nitrogen) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 33 failing HSTS, resulting in an N load reduction of 1,391 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 2:

Excessive nutrients from stream bank erosion, agricultural runoff, and failing HSTS are contributing excessive loads to streams. In-stream total phosphorus loads need to be reduced by 54% (5,025 lb/yr) to meet TMDL concentration targets (0.17 mg/L). Achievement of the objectives for this problem statement will result in a reduction of total phosphorus loads by 3,470 lb/yr.

Goal 1:

Reduce nutrient loads (1,797 lb/yr of total phosphorus) resulting from stream bank erosion.

Objective 1:

Restore 10 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a P load reduction of 1,097 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 700 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (1,146 lb/yr of total phosphorus) resulting from agricultural runoff.

Objective 1:

Restore 5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 700 lb/yr.

Action Items:

6. Inventory potential riparian restoration projects and prioritize.
7. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
8. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
9. Work with NRCS to implement cost share program for filter strips in priority areas.
10. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in a P load reduction of 333 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a P load reduction of 74 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a P load reduction of 2 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a P load reduction of 37 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 3:

Reduce nutrient loads (527 lb/yr of total phosphorus) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 33 failing HSTS, resulting in a P load reduction of 527 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 3:

In-stream and/or riparian habitat loss are causing non-attainment of aquatic life use designations within an estimated 60% (53 miles) of the streams in the Wellington Creek 12-digit subwatershed.

Goal 1:

Restore in-stream and riparian habitat along 17 miles of streams (including ditch retrofits where applicable) to achieve QHEI, ICI, and IBI scores indicative of attainment of aquatic life use designations.

Objective 1:

Restore 10 miles of non-attaining streams, including restoration of in-stream habitat, stabilization of eroding banks, and re-connection to floodplain (including ditch retrofits where applicable).

Action Items:

1. Inventory potential stream restoration projects and prioritize.

2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 10 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other potential funds for demonstration project.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Problem Statement 4:

Siltation from stream bank erosion and agricultural runoff is contributing to poor in-stream habitat and low QHEI scores. Total suspended solids (TSS) need to be reduced by 48% (467 tons/yr) to meet total maximum daily load targets (41 mg/L). Achievement of the objectives for this problem statement will result in a reduction of TSS loads by 467 tons/yr.

Goal 1:

Reduce TSS loads (303 tons/yr) resulting from stream bank erosion.

Objective 1:

Restore 1 mile of eroding stream banks utilizing natural bank stabilization practices, resulting in a TSS load reduction of 180 tons/yr.

Action Items:

1. Inventory potential stream, wetland, and floodplain restoration projects and prioritize.

2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
3. Create brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 2:

Restore 1.4 mile of riparian buffers along non-attaining streams, resulting in a TSS load reduction of 123 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce TSS loads (163.7 tons/yr) resulting from agricultural runoff.

Objective 1:

Restore 1.4 miles of riparian buffers along non-attaining streams, resulting in a TSS load reduction of 123 tons/yr.

Action Items:

6. Inventory potential riparian restoration projects and prioritize.
7. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
8. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
9. Work with NRCS to implement cost share program for filter strips in priority areas.
10. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 2:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a TSS load reduction of 2.5 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 3:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a TSS load reduction of 1.2 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 4:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a TSS load reduction of 37 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Problem Statement 5:

Excessive in-stream fecal coliform and E. coli bacteria loadings are resulting from failing home sewage treatment systems (HSTS). It is estimated that 10% or 33 HSTS are failing.

Goal 1:

Reduce bacteria loadings by removing, repairing, or replacing 33 failing HSTS.

Objective 1:

Remove/Repair/Replace 33 failing HSTS.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.
4. Continue outreach and education efforts to inform homeowners of maintenance requirements (including methods, costs, etc.) for HSTS.

F. Middle West Branch 041100010504

The entirety of the Middle West Branch is in non-attainment (10.9 miles) of its warmwater habitat use designation. The problem statements for this subwatershed are as follows:

Problem Statement 1:

Excessive nutrients from agricultural runoff, stream bank erosion, and failing HSTS are contributing excessive loads to streams. In-stream nitrate-nitrogen loads need to be reduced by 43% (38,866 lb/yr) to meet TMDL concentration targets (1.5 mg/L). Achievement of the objectives for this problem statement will result in a reduction of nitrate-nitrogen loads by 9,686 lb/yr.

Goal 1:

Reduce nutrient loads (3,100 lb/yr of in-stream nitrate-nitrogen) resulting from stream bank erosion.

Objective 1:

Restore 5 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in an N load reduction of 1,795 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 1,305 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (4,196 lb/yr of in-stream nitrate-nitrogen) resulting from agricultural runoff.

Objective 1:

Restore 1.1 miles of West Branch Black River and associated riparian areas on Ritter Property, resulting in an N load reduction of 790 lb/yr.

Objective 2:

Restore 5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 1,305 lb/yr.

Action Items:

6. Inventory potential riparian restoration projects and prioritize.
7. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.

8. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
9. Work with NRCS to implement cost share program for filter strips in priority areas.
10. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Establish 3 new manure storage facilities in agricultural areas, resulting in an N load reduction of 1,803 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 4:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in an N load reduction of 138 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 5:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in an N load reduction of 10 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 6:

Establish livestock exclusion fencing along streams on 2 farms, resulting in an N load reduction of 150 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 3:

Reduce nutrient loads (2,390 lb/yr of in-stream nitrate-nitrogen) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 57 failing HSTS, resulting in an N load reduction of 2,390 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 2:

Excessive nutrients from stream bank erosion, agricultural runoff, and failing HSTS are contributing excessive loads to streams. In-stream total phosphorus loads need to be reduced by 54% (5,157 lb/yr) to meet TMDL concentration targets (0.17 mg/L). Achievement of the objectives for this problem statement will result in a reduction of total phosphorus loads by 4,044 lb/yr.

Goal 1:

Reduce nutrient loads (1,598 lb/yr of total phosphorus) resulting from stream bank erosion.

Objective 1:

Restore 5 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a P load reduction of 898 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 700 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (1,541 lb/yr of total phosphorus) resulting from agricultural runoff.

Objective 1:

Restore 1.1 miles of West Branch Black River and associated riparian areas on Ritter Property, resulting in an N load reduction of 395 lb/yr.

Objective 2:

Restore 5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 700 lb/yr.

Action Items:

6. Inventory potential riparian restoration projects and prioritize.
7. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
8. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
9. Work with NRCS to implement cost share program for filter strips in priority areas.
10. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Establish 3 new manure storage facilities in agricultural areas, resulting in a P load reduction of 333 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 4

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a P load reduction of 74 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 5:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a P load reduction of 2 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 6:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a P load reduction of 37 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 3:

Reduce nutrient loads (905 lb/yr of total phosphorus) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 57 failing HSTS, resulting in a P load reduction of 905 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 3:

In-stream and/or riparian habitat loss are causing non-attainment of aquatic life use designations within an estimated 70% (51 miles) of the streams in the Middle West Branch 12-digit subwatershed.

Goal 1:

Restore in-stream and riparian habitat along 15 miles of streams (including ditch retrofits where applicable) to achieve QHEI, ICI, and IBI scores indicative of attainment of aquatic life use designations.

Objective 1:

Restore 5 miles of non-attaining streams, including restoration of in-stream habitat, stabilization of eroding banks, and re-connection to floodplain (including ditch retrofits where applicable).

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 10 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Restore 1.1 miles of West Branch Black River and associated riparian areas on Ritter Property.

Objective 4:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other potential funds for demonstration project.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 5:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Problem Statement 4:

Siltation from stream bank erosion and agricultural runoff is contributing to poor in-stream habitat and low QHEI scores. Total suspended solids (TSS) need to be reduced by 48% (495 tons/yr) to meet total maximum daily load targets (41 mg/L). Achievement of the objectives for this problem statement will result in a reduction of TSS loads by 495 tons/yr.

Goal 1:

Reduce TSS loads (317 tons/yr) resulting from stream bank erosion.

Objective 1:

Restore 1 mile of eroding stream banks utilizing natural bank stabilization practices, resulting in a TSS load reduction of 180 tons/yr.

Action Items:

1. Inventory potential stream, wetland, and floodplain restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
3. Create brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 2:

Restore 1.6 miles of riparian buffers along non-attaining streams, resulting in a TSS load reduction of 137 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce TSS loads (177.7 tons/yr) resulting from agricultural runoff.

Objective 1:

Restore 1.6 miles of riparian buffers along non-attaining streams, resulting in a TSS load reduction of 137 tons/yr.

Action Items:

6. Inventory potential riparian restoration projects and prioritize.

7. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
8. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
9. Work with NRCS to implement cost share program for filter strips in priority areas.
10. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 2:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a TSS load reduction of 2.5 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 3:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a TSS load reduction of 1.2 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 4:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a TSS load reduction of 37 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Problem Statement 5:

Excessive in-stream fecal coliform and E. coli bacteria loadings are resulting from failing home sewage treatment systems (HSTS). It is estimated that 10% or 57 HSTS are failing.

Goal 1:

Reduce bacteria loadings by removing, repairing, or replacing 57 failing HSTS.

Objective 1:

Remove/Repair/Replace 57 failing HSTS.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.
4. Continue outreach and education efforts to inform homeowners of maintenance requirements (including methods, costs, etc.) for HSTS.

G. Plum Creek 041100010505

The Plum Creek mainstem is in non-attainment (7.2 miles) and partial attainment (1.6 miles) of its warmwater habitat use designation. The problem statements for this subwatershed are as follows:

Problem Statement 1:

Excessive nutrients from stream bank erosion, urban runoff, agricultural runoff, and failing HSTS are contributing excessive loads to streams. In-stream nitrate-nitrogen loads need to be reduced by 43% (21,256 lb/yr) to meet TMDL concentration targets (1.5 mg/L). Achievement of the objectives for this problem statement will result in a reduction of nitrate-nitrogen loads by 7,634 lb/yr.

Goal 1:

Reduce nutrient loads (2,504 lb/yr of in-stream nitrate-nitrogen) resulting from stream bank erosion.

Objective 1:

Restore 4 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in an N load reduction of 1,436 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 4 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 1,068 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (168 lb/yr of in-stream nitrate-nitrogen) resulting from urban runoff.

Objective 1:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in an N load reduction of 168 lb/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Goal 3:

Reduce nutrient loads (3,638 lb/yr of in-stream nitrate-nitrogen) resulting from agricultural runoff.

Objective 1:

Restore 6 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 1,537 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
7. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
8. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in an N load reduction of 1,803 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in an N load reduction of 138 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in an N load reduction of 10 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in an N load reduction of 150 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 4:

Reduce nutrient loads (1,324 lb/yr of in-stream nitrate-nitrogen) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 31 failing HSTS, resulting in an N load reduction of 1,324 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 2:

Excessive nutrients from stream bank erosion, urban runoff, agricultural runoff, and failing HSTS are contributing excessive loads to streams. In-stream total phosphorus loads need to be reduced by 54% (2,985 lb/yr) to meet TMDL concentration targets (0.17 mg/L). Achievement of the objectives for this problem statement will result in a reduction of total phosphorus loads by 3,075 lb/yr.

Goal 1:

Reduce nutrient loads (1,291 lb/yr of total phosphorus) resulting from stream bank erosion.

Objective 1:

Restore 4 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a P load reduction of 718 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 4 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 573 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (12 lb/yr of total phosphorus) resulting from urban runoff.

Objective 1:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in a P load reduction of 12 lb/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial

measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.

4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Goal 3:

Reduce nutrient loads (1,271 lb/yr of total phosphorus) resulting from agricultural runoff.

Objective 1:

Restore 6 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 825 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in a P load reduction of 333 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a P load reduction of 74 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a P load reduction of 2 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a P load reduction of 37 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 4:

Reduce nutrient loads (501 lb/yr of total phosphorus) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 31 failing HSTS, resulting in a P load reduction of 501 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 3:

In-stream and/or riparian habitat loss are causing non-attainment of aquatic life use designations within an estimated 90% (30 miles) of the streams in the Plum Creek 12-digit subwatershed.

Goal 1:

Restore in-stream and riparian habitat along 10 miles of streams (including ditch retrofits where applicable) to achieve QHEI, ICI, and IBI scores indicative of attainment of aquatic life use designations.

Objective 1:

Restore 4 miles of non-attaining streams, including restoration of in-stream habitat, stabilization of eroding banks, and re-connection to floodplain (including ditch retrofits where applicable).

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 10 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other potential funds for demonstration project.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to

Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Objective 5:

Remove invasive species (particularly *Phragmites australis*) from 10 acres of affected areas within the subwatershed.

Action Items:

1. Pursue grant programs and other potential funding sources for invasive species removal.
2. Work with Lorain County Metro Parks and other natural resource management entities on invasive species removal programs.

Problem Statement 4:

Siltation from stream bank erosion, urban runoff, and agricultural runoff is contributing to poor in-stream habitat and low QHEI scores. Total suspended solids (TSS) need to be reduced by 48% (297 tons/yr) to meet total maximum daily load targets (41 mg/L). Achievement of the objectives for this problem statement will result in a reduction of TSS loads by 297 tons/yr.

Goal 1:

Reduce TSS loads (191 tons/yr) resulting from stream bank erosion.

Objective 1:

Restore 1 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a TSS load reduction of 135 tons/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 0.6 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining streams, resulting in a TSS load reduction of 56 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce TSS loads (9 tons/yr) resulting from urban runoff.

Objective 1:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in a TSS load reduction of 9 tons/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Goal 3:

Reduce TSS loads (96.7 tons/yr) resulting from agricultural runoff.

Objective 1:

Restore 0.6 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining streams, resulting in a TSS load reduction of 56 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.

2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a TSS load reduction of 2.5 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 3:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a TSS load reduction of 1.2 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 4:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a TSS load reduction of 37 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Problem Statement 5:

Excessive in-stream fecal coliform and E. coli bacteria loadings are resulting from failing home sewage treatment systems (HSTS). It is estimated that 10% or 31 HSTS are failing.

Goal 1:

Reduce bacteria loadings by removing, repairing, or replacing 31 failing HSTS.

Objective 1:

Remove/Repair/Replace 31 failing HSTS.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.
4. Continue outreach and education efforts to inform homeowners of maintenance requirements (including methods, costs, etc.) for HSTS.

H. Willow Creek 041100010403

The entirety of the Willow Creek mainstem is in non-attainment of its warmwater habitat use designation (8.6 miles). The problem statements for this subwatershed are as follows:

Problem Statement 1:

Excessive nutrients from stream bank erosion, urban runoff, agricultural runoff, and failing HSTS are contributing excessive loads to streams. In-stream nitrate-nitrogen loads need to be reduced by 54% (47,767 lb/yr) to meet TMDL concentration targets (1.5 mg/L). Achievement of the objectives for this problem statement will result in a reduction of nitrate-nitrogen loads by 11,418 lb/yr.

Goal 1:

Reduce nutrient loads (1,902 lb/yr of in-stream nitrate-nitrogen) resulting from stream bank erosion.

Objective 1:

Restore 3 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in an N load reduction of 1,077 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 3 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 825 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.

7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (168 lb/yr of in-stream nitrate-nitrogen) resulting from urban runoff.

Objective 1:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in an N load reduction of 168 lb/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Goal 3:

Reduce nutrient loads (3,867 lb/yr of in-stream nitrate-nitrogen) resulting from agricultural runoff.

Objective 3:

Restore 7 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 1,766 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.

7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in an N load reduction of 1,803 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in an N load reduction of 138 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in an N load reduction of 10 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in an N load reduction of 150 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 4:

Reduce nutrient loads (5,481 lb/yr of in-stream nitrate-nitrogen) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 60 failing HSTS, resulting in an N load reduction of 2,530 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Objective 2:

Remove/Repair/Replace 70 failing HSTS through implementation of LORCO Phase I HSTS Disconnection, resulting in an N load reduction of 2,951 lb/yr.

Problem Statement 2:

Excessive nutrients from stream bank erosion, urban runoff, agricultural runoff, and failing HSTS are contributing excessive loads to streams. In-stream total phosphorus loads need to be reduced by 54% (5,205 lb/yr) to meet TMDL concentration targets (0.17 mg/L). Achievement of the objectives for this problem statement will result in a reduction of total phosphorus loads by 4,463 lb/yr.

Goal 1:

Reduce nutrient loads (982 lb/yr of total phosphorus) resulting from stream bank erosion.

Objective 1:

Restore 3 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a P load reduction of 539 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 3 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 443 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (12 lb/yr of total phosphorus) resulting from urban runoff.

Objective 1:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in a P load reduction of 12 lb/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Goal 3:

Reduce nutrient loads (1,393 lb/yr of total phosphorus) resulting from agricultural runoff.

Objective 1:

Restore 7 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 947 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in a P load reduction of 333 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a P load reduction of 74 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a P load reduction of 2 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a P load reduction of 37 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 4:

Reduce nutrient loads (2,076 lb/yr of total phosphorus) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 60 failing HSTS, resulting in a P load reduction of 958 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Objective 2:

Remove/Repair/Replace 70 failing HSTS through implementation of LORCO Phase I HSTS Disconnection, resulting in a P load reduction of 1,118 lb/yr.

Problem Statement 3:

In-stream and/or riparian habitat loss are causing non-attainment of aquatic life use designations within an estimated 80% (40 miles) of the streams in the Willow Creek 12-digit subwatershed.

Goal 1:

Restore in-stream and riparian habitat along 13 miles of streams (including ditch retrofits where applicable) to achieve QHEI, ICI, and IBI scores indicative of attainment of aquatic life use designations.

Objective 1:

Restore 3 miles of non-attaining streams, including restoration of in-stream habitat, stabilization of eroding banks, and re-connection to floodplain (including ditch retrofits where applicable).

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 10 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other potential funds for demonstration project.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Objective 5:

Remove invasive species (particularly *Phragmites australis*) from 10 acres of affected areas within the subwatershed.

Action Items:

1. Pursue grant programs and other potential funding sources for invasive species removal.
2. Work with Lorain County Metro Parks and other natural resource management entities on invasive species removal programs.

Problem Statement 4:

Siltation from stream bank erosion, urban runoff, and agricultural runoff is contributing to poor in-stream habitat and low QHEI scores. Total suspended solids (TSS) need to be reduced by 52% (488 tons/yr) to meet total maximum daily load targets (41 mg/L). Achievement of the objectives for this problem statement will result in a reduction of TSS loads by 488 tons/yr.

Goal 1:

Reduce TSS loads (309 tons/yr) resulting from stream bank erosion.

Objective 1:

Restore 1 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a TSS load reduction of 180 tons/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 1.5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a TSS load reduction of 129 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce TSS loads (9.2 tons/yr) resulting from urban runoff.

Objective 1:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in a TSS load reduction of 9 tons/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.

3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Construct stormwater/flooding improvement project for 7 homes on Hawke Road, resulting in a TSS load reduction of 0.2 tons/yr.

Action Items:

1. Coordinate with County, townships, and other stakeholders to identify and secure funding to complete project.

Goal 3:

Reduce TSS loads (169.7 tons/yr) resulting from agricultural runoff.

Objective 3:

Restore 1.5 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a TSS load reduction of 129 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a TSS load reduction of 2.5 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 3:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a TSS load reduction of 1.2 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 4:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a TSS load reduction of 37 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Problem Statement 5:

Excessive in-stream fecal coliform and E. coli bacteria loadings are resulting from failing home sewage treatment systems (HSTS). It is estimated that 10% or 130 HSTS are failing.

Goal 1:

Reduce bacteria loadings removing, repairing, or replacing 130 failing HSTS.

Objective 1:

Remove/Repair/Replace 60 failing HSTS.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.
4. Continue outreach and education efforts to inform homeowners of maintenance requirements (including methods, costs, etc.) for HSTS.

Objective 2:

Remove/Repair/Replace 70 failing HSTS through implementation of LORCO Phase I HSTS Disconnection.

I. Upper West Branch 041100010502

The Upper West Branch mainstem is in partial attainment (7.9 miles) and full attainment (12.5 miles) of its warmwater habitat use designation. The problem statements for this subwatershed are as follows:

Problem Statement 1:

Excessive nutrients from stream bank erosion, urban runoff, agricultural runoff, and failing HSTS are contributing excessive loads to streams. In-stream nitrate-nitrogen loads need to be reduced by 43% (63,507 lb/yr) to meet TMDL concentration targets (1.5 mg/L). Achievement of the objectives for this problem statement will result in a reduction of nitrate-nitrogen loads by 8,911 lb/yr.

Goal 1:

Reduce nutrient loads (4,056 lb/yr of in-stream nitrate-nitrogen) resulting from stream bank erosion.

Objective 1:

Restore 9 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in an N load reduction of 3,231 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 3 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 825 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (168 lb/yr of in-stream nitrate-nitrogen) resulting from urban runoff.

Objective 4:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in an N load reduction of 168 lb/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial

measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.

4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Goal 3:

Reduce nutrient loads (2,672 lb/yr of in-stream nitrate-nitrogen) resulting from agricultural runoff.

Objective 1:

Restore 2 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in an N load reduction of 571 lb/yr.

Action Items:

8. Inventory potential riparian restoration projects and prioritize.
9. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
10. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
11. Work with NRCS to implement cost share program for filter strips in priority areas.
12. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
13. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
14. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in an N load reduction of 1,803 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in an N load reduction of 138 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in an N load reduction of 10 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in an N load reduction of 150 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 4:

Reduce nutrient loads (2,015 lb/yr of in-stream nitrate-nitrogen) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 48 failing HSTS, resulting in an N load reduction of 2,015 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 2:

Excessive nutrients from stream bank erosion, urban runoff, agricultural runoff, and failing HSTS are contributing excessive loads to streams. In-stream total phosphorus loads need to be reduced by 54% (7,924 lb/yr) to meet TMDL concentration targets (0.17 mg/L). Achievement of the objectives for this problem statement will result in a reduction of total phosphorus loads by 3,586 lb/yr.

Goal 1:

Reduce nutrient loads (2,059 lb/yr of total phosphorus) resulting from stream bank erosion.

Objective 1:

Restore 9 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a P load reduction of 1,616 lb/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 3 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 443 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.

5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce nutrient loads (12 lb/yr of total phosphorus) resulting from urban runoff.

Objective 1:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in a P load reduction of 12 lb/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Goal 3:

Reduce nutrient loads (752 lb/yr of total phosphorus) resulting from agricultural runoff.

Objective 1:

Restore 2 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a P load reduction of 306 lb/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.

5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Establish 3 new manure storage facilities in agricultural areas, resulting in a P load reduction of 333 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for manure storage facilities in priority areas.

Objective 3:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a P load reduction of 74 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 4:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a P load reduction of 2 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 5:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a P load reduction of 37 lb/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Goal 4:

Reduce nutrient loads (763 lb/yr of total phosphorus) resulting from failing HSTS.

Objective 1:

Remove/Repair/Replace 48 failing HSTS, resulting in a P load reduction of 763 lb/yr.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.

Problem Statement 3:

In-stream and/or riparian habitat loss are causing non-attainment of aquatic life use designations within an estimated 45% (52 miles) of the streams in the Upper West Branch 12-digit subwatershed.

Goal 1:

Restore in-stream and riparian habitat along 14 miles of streams (including ditch retrofits where applicable) to achieve QHEI, ICI, and IBI scores indicative of attainment of aquatic life use designations.

Objective 1:

Restore 9 miles of non-attaining streams, including restoration of in-stream habitat, stabilization of eroding banks, and re-connection to floodplain (including ditch retrofits where applicable).

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Restore 5 miles of riparian buffers (including wetlands and floodplains) along streams, prioritizing those segments in non-attainment.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.

Objective 3:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other potential funds for demonstration project.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.
4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Problem Statement 4:

Siltation from stream bank erosion, urban runoff, and agricultural runoff are contributing to poor in-stream habitat and low QHEI scores. Total suspended solids (TSS) need to be reduced by 48%

(770 tons/yr) to meet total maximum daily load targets (41 mg/L). Achievement of the objectives for this problem statement will result in a reduction of TSS loads by 770 tons/yr.

Goal 1:

Reduce TSS loads (552 tons/yr) resulting from stream bank erosion.

Objective 1:

Restore 1.7 miles of eroding stream banks utilizing natural bank stabilization practices, resulting in a TSS load reduction of 311 tons/yr.

Action Items:

1. Inventory potential stream restoration projects and prioritize.
2. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.

Objective 2:

Design and construct a demonstration ditch retrofit project utilizing overwide channel and/or two-stage ditch designs.

Action Items:

1. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
2. Collaborate with Lorain County PIPE to create signage and/or brochure outlining the benefits, pitfalls, maintenance concerns, and other considerations of incorporating habitat restoration and ditch retrofits into County ditch maintenance programs and distribute to Counties. Conduct follow-up meetings with each county to discuss outreach program to further the development of ditch maintenance program updates.

Objective 3:

Restore 3 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a TSS load reduction of 241 tons/yr.

Action Items:

1. Inventory potential riparian restoration projects and prioritize.
2. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
3. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
4. Work with NRCS to implement cost share program for filter strips in priority areas.
5. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
6. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
7. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 4:

Preserve 25% of existing open space with emphasis on streams, wetlands, and riparian areas.

Action Items:

1. Pursue grant programs for the acquisition and/or preservation of existing areas.
2. Work with the County Auditor to record protective instruments.
3. Develop education and outreach materials for communities and the general public outlining benefits of setting aside natural areas for preservation.

4. Work with local park districts, land trusts, arboretums, communities and SWCDs on acquisition of easements on riparian corridors and wetlands.

Goal 2:

Reduce TSS loads (9 tons/yr) resulting from urban runoff.

Objective 1:

Construct stormwater retrofits and/or stormwater BMPs to store and treat the applicable water quality volume for 20 acres at identified priority locations, resulting in a TSS load reduction of 9 tons/yr.

Action Items:

1. Create an inventory of priority locations for stormwater retrofits and stormwater BMPs.
2. Pursue Ohio EPA Surface Water Improvement Fund (SWIF) grants, stormwater district funds, and other funding sources for potential stormwater projects.
3. Meet with communities with existing stormwater codes and erosion/sediment control codes (including Phase II MS4) and determine level and method of enforcement. Discuss remedial measures/updates necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
4. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Goal 3:

Reduce TSS loads (208.7 tons/yr) resulting from agricultural runoff.

Objective 1:

Restore 2 miles of riparian buffers (including wetlands and floodplains) with emphasis on non-attaining segments, resulting in a TSS load reduction of 168 tons/yr.

Action Items:

8. Inventory potential riparian restoration projects and prioritize.
9. Develop GIS-based map showing hypothetical riparian buffer widths and locations based on existing model riparian setback ordinance widths.
10. Pursue Ohio EPA Section 319(h) Non-point Source Program Grants, Ohio EPA Surface Water Improvement Fund (SWIF) grants, and other grants for potential restoration projects.
11. Work with NRCS to implement cost share program for filter strips in priority areas.
12. Conduct meetings with County Commissioners, local Farm Bureau offices, extension offices, and Soil and Water Conservation Districts to discuss a strategy for creation/expansion of riparian buffer programs.
13. Meet with communities with existing riparian setback codes and determine level and method of enforcement. Discuss remedial measures necessary to achieve full compliance with applicable codes and a strategy for reporting and tracking progress.
14. Review existing zoning regulations, provide educational meetings with partners, and develop strategies for adoption of codes within communities where they do not exist. Develop a reporting and tracking strategy for adopted codes.

Objective 2:

Establish 12 acres of new grassed waterways in agricultural areas, resulting in a TSS load reduction of 2.5 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for filter strips in priority areas.

Objective 3:

Restore/create 2 acres of wetlands down-gradient of agricultural areas utilizing NRCS cost share programs, resulting in a TSS load reduction of 1.2 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for wetland creation/restoration in priority areas.

Objective 4:

Establish livestock exclusion fencing along streams on 2 farms, resulting in a TSS load reduction of 37 tons/yr.

Action Items:

1. Work with NRCS to implement cost share program for livestock fencing in priority areas.

Problem Statement 5:

Excessive in-stream fecal coliform and E. coli bacteria loadings are resulting from failing home sewage treatment systems (HSTS). It is estimated that 10% or 48 HSTS are failing.

Goal 1:

Reduce bacteria loadings by removing, repairing, or replacing 48 failing HSTS.

Objective 1:

Remove/Repair/Replace 48 failing HSTS.

Action Items:

1. Review changes mandated by new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012).
2. Develop County programs to meet CMMs and new rules to position Counties for funding opportunities.
3. Develop a regular inspection program within each County (3-5 years unless complaint-driven) for each HSTS. Develop GIS-based database and inventory of existing HSTS.
4. Continue outreach and education efforts to inform homeowners of maintenance requirements (including methods, costs, etc.) for HSTS.

J. Linking Sources and Causes in the Black River Watershed

The Black River TMDL and the Ohio EPA 303(d) list have outlined the linkages in the following table to assist with the development of solutions to the water quality impairments in the Black River watershed. These linkages were used to develop the problem statements and goals listed above as well as the implementation management practices and actions discussed in Sections VI and VII.

Table 44: Sources and Causes of Water Quality Impairments.

Note: Causes and Sources of Impairment were obtained from a variety of sources, including: TMDL Report (Ohio EPA), Watershed Inventory (Section III of this report), and Biological and Water Quality Monitoring Reports (Ohio EPA).		Causes of Impairment								
		Siltation & Habitat Loss				Excessive nutrients/bacteria/low DO				Priority Organic Compounds & Heavy Metals
		Sources of Impairment								
12-Digit HUC	**HUC Name**	**Channelization, Hydromodification & Stream Bank Erosion**	**Riparian Removal**	**Urban Runoff & Storm Sewers**	**Crop & Pasture Runoff**	**Crop & Pasture Runoff**	**Failing HSTSs**	**WWTP & CSOs**	**Urban Runoff & Storm Sewers**	**Industrial Point and Non-Point Sources**
41100010503	Wellington Creek	✓	✓		✓	✓	✓			
41100010601	French Creek	✓	✓	✓			✓	✓	✓	✓
41100010506	Lower West Branch Black River	✓	✓	✓	✓	✓	✓	✓	✓	
41100010602	Black River	✓	✓	✓			✓	✓	✓	✓
41100010501	Charlemont Creek	✓	✓	✓	✓	✓			✓	
41100010504	Middle West Branch Black River	✓	✓		✓	✓	✓			
41100010401	Town of Litchfield-East Branch Black River	✓	✓		✓	✓		✓		
41100010505	Plum Creek	✓	✓			✓			✓	
41100010403	Willow Creek	✓	✓		✓	✓	✓	✓		
41100010502	Upper West Branch Black River	✓	✓		✓	✓				
41100010402	Salt Creek-East Branch Black River	✓	✓		✓	✓	✓			
41100010404	Jackson Ditch-East Branch Black River	✓	✓	✓	✓	✓	✓	✓	✓	
41100010301	East Fork of East Branch Black River	✓	✓		✓	✓				
41100010302	Headwaters West Fork East Branch Black River	✓	✓		✓	✓				
41100010303	Coon Creek-East Branch Black River	✓	✓		✓	✓				

Subwatersheds with light blue shading are the nine subwatersheds for which short-term implementation goals, objectives, and actions have been developed based on their high level of impairment.

Table 45: Attainment Status Summary

12-Digit HUC	HUC Name	Non-Attainment(Miles)	Partial Attainment (Miles)	Full Attainment (Miles)	Total Non and Partial (Miles)	Non-Attainment(%)	Partial Attainment (%)	Full Attainment (%)	Total Non and Partial (%)
041100010503	Wellington Creek	19.3			19.3	100%			100%
041100010601	French Creek	16.3	1.4		17.6	92%	8%		100%
041100010506	Lower West Branch Black River	14.8	0.5		15.3	96%	4%	0%	100%
041100010602	Black River	8.7	4.9	1.8	13.6	56%	32%	12%	88%
041100010501	Charlemont Creek	12.5			12.5	100%			100%
041100010504	Middle West Branch Black River	10.9			10.9	100%			100%
041100010401	Town of Litchfield-East Branch Black River		10.0		10.0		100%		100%
041100010505	Plum Creek	7.2	1.6		8.8	82%	18%		100%
041100010403	Willow Creek	8.6			8.6	100%			100%
041100010502	Upper West Branch Black River		7.9	12.5	7.9		39%	61%	39%
041100010402	Salt Creek-East Branch Black River		3.5	6.0	3.5		37%	63%	37%
041100010404	Jackson Ditch-East Branch Black River		2.9	15.1	2.9		16%	84%	16%
041100010301	East Fork of East Branch Black River			2.6				100%	
041100010302	Headwaters West Fork East Branch Black River			6.6				100%	
041100010303	Coon Creek-East Branch Black River			6.7				100%	

Notes: Attainment shown is based on a general extrapolation of use attainment point data. Break points for attainment were delineated based on information from Ohio EPA (e.g., presence of a tributary or WWTP that caused the change) or simply placed at the midpoint between assessment locations. It is possible and likely that there are attainment status' differing from that shown within the assigned reaches.

Subwatersheds with light blue shading are the nine subwatersheds for which short-term implementation goals, objectives, and actions have been developed based on their high level of impairment.

Map 25: Black River Watershed Attainment Status

VI. Implementation Management Practices

The following implementation management practices have been identified to meet the goals outlined in the previous section:

1. Riparian Setbacks/Buffers
2. Stream, Wetland, and Floodplain Restoration
3. Home Sewage Treatment System (HSTS) Removal or Repair
4. Point Source Controls
5. Preservation of Natural Areas
6. Storm Water Management/Green Infrastructure
7. Agricultural Best Management Practices

The TMDL report describes a successful implementation scenario that incorporates management practices 1-4. Language within the TMDL provides additional linkages between impairment causes and sources and recommendations for practices 5-7. All of these practices are important tools necessary for the achievement of the short- and long-term goals described herein. It should be noted that the successful implementation of this strategy is also expected to result in achievement of other goals that have been identified for the watershed, including de-listing of the majority, if not all, of the beneficial use impairments in the Area of Concern (AOC).

This section focuses on a set of nine 12-digit subwatersheds which include: subwatersheds within the West Branch Black River, French Creek, Willow Creek, and the mainstem Black River. These nine subwatersheds were chosen based on their high levels of non-attainment (See Table 45; Page 210) Because impairment sources and causes are similar, the implementation actions described herein are widely applicable to the rest of the Black River watershed and near-shore Lake Erie tributaries.

A. Riparian Setbacks/Buffers

The establishment and preservation of riparian buffers and setbacks are identified within the TMDL Report as a primary strategy to combat multiple impairments in the watershed. In addition, AOC de-listing guidelines for the Loss of Wildlife Habitat BUI require the establishment of forested stream buffers.

Riparian setbacks are a product of zoning codes established by communities. Such codes require the avoidance and preservation of riparian zones along streams in connection with development projects. Riparian buffers are often referred to as filter strips. Riparian buffers are simply riparian zones that are allowed to remain in a natural condition either through the use of a protective instrument (e.g., conservation easement or environmental covenant) or simply by omitting agricultural or developmental activities in those areas. Riparian setbacks/buffers serve multiple functions, namely the following:

1. Filtering of sediment, nutrients, and bacteria from overland runoff.

2. Shading of streams, lowering average temperatures and reducing algal growth, thereby reducing low dissolved oxygen problems.
3. Providing food and habitat for upland and aquatic wildlife.
4. Reducing streambank erosion, lowering sediment loads and improving in-stream habitat.

The implementation of riparian setback codes in all communities and establishment of riparian buffers is critical to the successful implementation of this strategy. Within agricultural areas, riparian buffers should be encouraged through the use of NRCS cost-share programs, on a volunteer basis, and through other grant programs. A tool should be developed to assist with determining setback/buffer widths within the watershed. This tool could involve the creation of a graphic that shows theoretical setback/buffer widths for all streams in the watershed based on watershed area. This graphic would eliminate the need for watershed calculations on a case-by-case basis, could be automated using GIS software, and could be made available in both hard-copy format and on the internet.

Table 46: Recommended Riparian Setback/Buffer Widths

Watershed Size (Square Miles)	Riparian Corridor Protection Width (Feet) Measured from Top of Bank (Minimum Recommended Width for Each Bank)
<0.5	25
0.5-20	50
20-300	120
>300	300

Riparian setback codes (See Appendix E) have been integrated by several communities within the Black River watershed as a nonstructural BMP component of Phase II Storm Water Pollution Prevention Plans for MS4s. Model codes for the protection of riparian zones have been developed by the Chagrin River Watershed Partners (http://www.crwp.org/model_ordinances/riparian_model.htm) and NOACA (http://www.noaca.org/ripwet12706.pdf). The Lorain County Community Development Department in conjunction with the BRWP are working closely with communities to develop setback legislation.

B. Stream, Wetland, and Floodplain Restoration

Stream erosion was identified as a primary contributor of sediments and nutrients in the TMDL Report. The restoration and stabilization of highly eroding stream segments will be an important component of the implementation strategy for achieving restoration goals. Several opportunities for grant funds are available for stream and wetland restoration projects in Ohio and the Lake Erie basin. Consequently, with landowner cooperation, this implementation measure has good potential for making progress on several identified impairments in the Black River watershed. The nature of restoration projects also typically involves the establishment or preservation of riparian corridors and associated wetlands and floodplains. A conservative estimate of eroding streams in the Black River watershed (by 12-digit HUC) is located in Section III.G.8 (Table 23).

Channelization, culverting, and other hydromodifications to stream channels have also resulted in degradation to water quality and habitat within stream channels. In the northern, more urban portions of the watershed, the hydromodifications are primarily a result of development. In the southern, more agricultural subwatersheds, hydromodifications are primarily caused by agricultural drainage improvement projects (i.e., stream channelization) and lack of forested buffers. These modified channels likely overlap with the eroding channels identified in Section III.G.8 in many locations; however, there are also many instances where hydromodifications are impairing stream quality apart from stream erosion. A comprehensive inventory of stream erosion problems and potential restoration sites is not currently available in the Black River watershed. Until such an inventory is completed, restoration projects must be evaluated and prioritized as they become known. A comprehensive inventory of severe streambank erosion and development an inventory of potential stream, wetland, and floodplain restoration projects should be completed. This inventory will also inform and support the identification of potential preservation projects (Section VI.E).

The removal of low-head dams and other impoundments is also needed. Dams convert flowing stream habitat into lake-like habitat, which limits populations of aquatic life. The first step in addressing dams and impoundments is the completion of an in-depth evaluation of existing dams and their potential for removal. The dam inventory/evaluation should be completed and include recommendations for additional steps necessary for removal of specific dams.

Within the Black River mainstem, historical dredging activities have resulted in the loss of aquatic vegetation and in-stream habitat. Restoration efforts should focus on the removal of hydromodifications, restoration of riparian and aquatic habitat, removal of bulkheads, and repair of areas with high erosion rates.

C. Home Sewage Treatment System (HSTS) Removal or Repair

Home sewage treatment systems (HSTSs) are used to treat sanitary sewage in areas where no municipal treatment facilities exist. HSTSs can impact water quality through both point and non-point discharges from failed, faulty, or discharging systems and improper disposal of wastes from septic systems. While the majority of HSTSs are located in the rural and agricultural areas of the upper East and West Branches, some of the oldest HSTSs are located in the developed areas of the Jackson Ditch-East Branch (041100010404), Black River (041100010602) and French Creek (041100010601) sub-watersheds.

The TMDL Report identifies the removal or repair of failing home sewage treatment systems as one of the four primary management options required to restore water quality in the Black River watershed. As described in Section III.J.2, a fair amount of work has been done in many areas of the watershed to identify, map, and assess HSTSs. However, failing HSTSs continue to contribute heavily to water quality standard exceedances for bacteria and nutrients. Older, non-sewered residential areas in close proximity to the cities of Lorain and Elyria contain homes that are on small lots with undersized and aging systems, many of which are presumed to be failing.

Implementation actions listed in the Black River TMDL to address these sources of pollution include elimination of onsite septic systems through extension of municipal sanitary sewers, public education on home sewage treatment system maintenance, oversight of septic tank waste haulers, and identification and repair of faulty septic systems.

The elimination of HSTS is the only long-term solution to reducing the bacteria loading to the Black River and its tributaries. As stated in the watershed inventory, there are an estimated 19,300 HSTSs throughout the Black River watershed. Local utility projects such as Lorain County Rural Wastewater District (LORCO) are currently working to extend sanitary lines and reduce the amount of systems in the watershed. LORCO is working on Phase 1 implementation of extending sewer lines to large portions of Carlisle and Eaton Townships in the Jackson Ditch-East Branch and Willow Creek sub-watersheds. This project is expected to disconnect approximately 1,400 existing HSTSs and serve as many as 4,000 new homes. Phase II MS4 communities such as, but not limited to, Lorain, Elyria, Avon, and North Ridgeville are also working to eliminate HSTS within their community boundaries. These communities are required to identify and eliminate illicit discharges, including failing HSTS and CSOs.

Many homeowners are unaware of the operation and required maintenance of their HSTS system. With funding from Ohio EPA, the Black River RAP and the Lorain County General Health District developed an educational DVD that 1) explains the operation of a household HSTS; 2) outlines the need for routine inspection and maintenance of household treatment systems; and 3) describes how a HSTS owner can recognize when a system is not functioning properly. The DVD will be provided to each HSTS owner in Lorain County at the time of inspection. County and local health departments are encouraged to use this DVD as an educational tool and expand the routine inspection and maintenance programs for HSTSs and Semi-Public systems.

The Lorain County General Health District is developing a database program that enables them to better regulate routine pumping of HSTSs. The database will be used to keep track of pumping dates, and queries will be run to determine which systems are due to be pumped. A reminder notice, as well as a pumping fact sheet and list of registered pumpers, will be mailed directly to the homeowner. In order to prevent an overload on pumpers, homeowners in two or three townships will be notified at a time (on a rotating monthly basis).

Because the need exists for the development of statewide regulations for Semi-Public systems, the need for proper placement of these systems is crucial to the success of compliance with the Coastal Non-Point Management Plan and for the integrity of the Black River watershed. The creation of the regulations will allow for those standards to be recognized, discussed, and properly integrated into the adoption of new regulations. The Lorain County General Health District and other relevant health departments in the watershed already incorporate regulations that require new systems to consider local soil conditions, lot size, and the design and type of system. Adoption of statewide standards under Senate Bill 110 has greatly assist to standardize the development of new on-site systems in the Black River watershed. The

Black River watershed partners should continue to coordinate with local community engineers, local health departments, and Ohio EPA on the location and management of any new disposal systems, as well as assisting with educating communities about the need for keeping HSTSs maintained and functioning properly. For current Ohio sewage treatment systems laws and rules, see: http://www.odh.ohio.gov/odhprograms/eh/sewage/sewrules.aspx

Local health departments employ registered sanitarians to inspect HSTSs for proper functioning and performance. Often effluent discharge from failing or questioned systems will be sampled to determine if elevated bacteria levels are entering waters of the state. Additionally, local health departments and the Black River watershed partners should work with communities to educate the residents about watershed integrity through Lorain County PIPE workshops, oral presentations to various city and township councils, and literature distribution.

Goals for removal/repair/replacement of HSTS are discussed in Section V and shown in Appendix F.

D. Point Source Controls

Enforcement of point source discharges falls under the jurisdiction of the Ohio EPA. The TMDL Report identifies point source controls as one of the four primary management practices. Consequently, the enforcement of state water quality standards relating to point source discharges in the watershed will be important for the achievement of short- and long-term goals described herein. The regulation of pollutant loadings and elimination of combined sewer overflows are the two most important components of this management practice. Pollutant loadings from point discharges should be reduced, which traditionally involves upgrades to treatment and pre-treatment facilities and the elimination of illicit discharges. The TMDL Report describes, in detail, the loadings that originate from each point discharge in the watershed. In order to ascertain any necessary revisions to point source discharge permit conditions, a detailed assessment should be made of existing NPDES permit-holders on a 12-digit subwatershed basis. This information should then be utilized by Ohio EPA to make management decisions regarding permit conditions going forward. A summary of point source discharges located in the watershed is included in Section III. The elimination of the twenty-six CSOs in Elyria will involve the separation of sanitary sewers from stormwater infrastructure. Phase II communities will also be identifying and eliminating any currently unknown CSOs as required by their Phase II NPDES permits. Specific projects that have been identified for point source control are included in Section V.

E. Preservation of Natural Areas

Based on the data further described in Section III.D, between 28% and 30% (85,000 - 89,000 acres) of the Black River watershed is comprised of existing forested areas, scrub/shrub, and wetlands. A portion of these areas (approximately 4% of the watershed; 12,000 acres) is already protected via a recorded protective instrument or is under management by a parks authority (Section III.D.5). These areas include existing upland tracts of forest, riparian buffers, and wetlands, all of which provide natural attenuation of pollutants and other benefits to habitat and water quality. Preservation should also focus on areas that have been identified as highly erodible (see Section III.J.5) in order to direct development towards less erodible soils. The preservation of existing natural areas is important to limit the impacts of future development and human use. Land use data, projected landowner cooperation, and existing preserves were taken into account to develop preservation goals for each 12-digit HUC

(Section V). Existing preserves were calculated from data provided by the Western Reserve Land Conservancy, the Ohio Department of Natural Areas and Preserves, local park districts, and other property/easement holders. Potential projects that would involve the preservation of existing natural areas are identified in Section V and Appendix F. Furthermore, restoration projects, riparian setback codes, and other implementation measures should require the perpetual protection of natural areas within and adjacent to the proposed project.

F. Storm Water Management/Green Infrastructure

Within urbanized areas of the watershed (as defined by the U.S. Census Bureau: Map 26), urban storm water runoff is a significant source of non-point source pollution, according to the TMDL Report. The implementation and enforcement of the National Pollution Discharge Elimination System (NPDES) Storm Water Program, particularly for municipal separate storm sewer system (MS4) communities, has and will continue to provide advancements on this front. MS4 communities are required to develop comprehensive storm water programs that address six minimum control measures, or MCMs. Public education and outreach, public involvement, illicit discharge elimination, regulation of construction site storm water runoff, regulation of post-construction storm water, and pollution prevention/good housekeeping for municipal operations are all required by the MCMs. Goals and requirements of the Phase II stormwater permits are duplicated as implementation actions in this plan. See Section V and Appendix F for details.

1. Development of Stormwater Management Codes
2. Development of Illicit Discharge Detection and Elimination Codes
3. Development/Update of Erosion and Sediment Control Codes
4. Establishment of Good Housekeeping Practices
5. Establishment of CSO Programs for Elimination and Control
6. Establishment of PIPE Programs for Public Information and Education

Stormwater retrofits, particularly within older developments, should be evaluated and implemented. The first step in this process is the development of an assessment of potential retrofit sites. This assessment should include an inventory, assessment, and prioritization of potential retrofits within each urbanized subwatershed. Once this assessment has been completed, the process can move forward into public participation, design, permitting, and implementation. Upon completion of stormwater retrofit assessments, Appendix F will be updated by the BRWP to include the recommendations of the assessment report.

As part of their comprehensive storm water programs, many communities are implementing a storm water utility. These programs collect fees from storm water dischargers and often offer credits to those dischargers that implement measures to reduce storm water runoff. According to Ohio EPA, Lorain County and all incorporated jurisdictions within Lorain County are currently assessing dischargers to fund their storm water utilities. Such programs often encourage the use of best management practices and also create a funding source for additional projects. Communities that are implementing a storm water utility or considering one should consider developing a credit structure for BMPs that reduce storm water runoff and/or improve storm water quality. Furthermore, such communities should consider utilizing assessment fees to implement additional projects of this nature. Specifically, project types that should be considered for a credit structure or implementation should be in line with those

outlined in the implementation section of this report. Other stormwater BMPs should also be considered, such as detention/infiltration practices (permeable/pervious pavement, basins, rain gardens, infiltration trenches), erosion control measures (slope stabilization, filter strips), and other green infrastructure (green roofs, LEED accreditations, rain barrels, beneficial re-use). Additional crediting/evaluation considerations for certain project types are needed. This is especially the case for projects within agricultural areas that must meet the dual purpose of maintaining adequate drainage while providing habitat and water quality improvements. Some examples are highlighted below:

Ditch Maintenance/Drainage Improvements – Should provide additional credit for over-wide or two-stage designs. Should also provide additional credit for development of in-stream habitat features (e.g., riffle-pool complexes, boulders, rootwad revetments).

Log Jam/Debris Removal – Should provide additional credit for utilizing woody debris by incorporating it into streambank stabilization projects.

Streambank Stabilization – Should provide additional credit for projects that utilize natural bank stabilization or bio-engineering techniques. Should discourage the use of "hard armoring" or riprap and encourage the use of techniques that utilize natural materials and/or incorporate the re-vegetation of banks.

Riparian Setbacks/Buffers – Should provide additional credit for projects that meet the widths specified in Section IV.A or as otherwise required by riparian setback codes.

G. Agricultural Best Management Practices

As described in Section III.D, over 52% of the Black River watershed is characterized by agricultural land uses, the majority of which is row crops. Consequently, the implementation of measures that improve habitat and water quality within these areas will be critical to the success of this plan and efforts to improve the Black River watershed. The TMDL Report cites agricultural runoff as one of the primary contributors of nitrogen, phosphorus, sediments, bacteria, and habitat degradation within the Black River watershed. Agricultural best management practices, along with other implementation strategies outlined in this section (e.g., riparian setbacks, stream restoration), are needed to reduce erosion and runoff rates. Numerous options for best management practices in agricultural areas exist; more detailed descriptions for the common practices that have been identified for the Black River watershed are discussed below.

Riparian Buffers (See Section VI.A)

Stream, Wetland, and Floodplain Restoration (See Section VI.B)

Ditch Maintenance and Retrofit to Over-wide or Two-Stage Channel
The BRWP will work with ditch maintenance programs to educate the public and encourage the conversion of traditional ditches to over-wide or two-stage channel forms. The establishment of woody vegetation outside of the drainage channel should also be encouraged to provide shade and soil stability. Such retrofits increase the assimilative capacity of drainage features and increase habitat quality without sacrificing drainage function. Such projects are eligible for grant funding and are often combined with other implementation practices, such as riparian buffers (Section VI.A) and preservation (Section VI.E).

Conservation Tillage
Conservation tillage has become more prevalent within agriculture in general in recent years; however, there is room for expansion of these practices. As described in Section III.D.4, conservation tillage practices reduce the amount of cultivation required and retain residue from the previous year's crops on the soil surface, thereby providing a cost-effective means of erosion control. Due to the highly erodible nature of the soils in the majority of the watershed, conservation tillage practices can provide a highly effective means of reducing the transport of sediment and nutrients from agricultural fields to waterways. Because this practice holds soils and nutrients on the landscape, it can also reduce the need to fertilize. Surveys of the extent of conservation tillage practices used within the watershed is needed and should be followed-up with an educational outreach program to those who are not utilizing the practice.

Grassed Waterways (Swales)
Grassed waterways are placed within natural drainage areas in agricultural fields. Installation of these features is as simple as not cultivating or planting areas where drainage is naturally concentrated. By not plowing these areas of concentrated drainage, erosion is reduced, thereby reducing the amount of sediment and nutrients that are transported to the down-gradient waterways.

Livestock Fencing (Exclusion)
As described in Section III.G.7, there are approximately 12 known facilities within the watershed where livestock have access to streams. These farms have been identified as priority livestock fencing projects to reduce stream erosion and are identified in Section V. Other potential locations will be evaluated on an ongoing basis.

Manure & Nutrient Management
While livestock access to streams is not highly prevalent in the watershed, manure runoff from livestock facilities into streams remains a contributor of bacteria into streams. Application of manure and commercial fertilizer to fields is often done at times when it is likely to be carried into streams (See Section III.J.4). The voluntary use of conservation tillage practices indicates that local farmers are willing to undertake reasonable measures to control runoff from their property. Farm-scale manure digesters can enable farmers to simultaneously address odor concerns, reduce costs for livestock bedding, and provide heat or electricity for the farm. An educational outreach program should be developed to explain how manure/fertilizer runoff affects water quality and to describe the proper manure/nutrient management practices. Potential funding sources, cost benefits, and educational resources for manure digesters should be explored and communicated with the public and other pertinent stakeholders.

Dissolved Reactive Phosphorus (DRP) BMPs
Amid rising concerns over dissolved reactive phosphorus (DRP) loads to Lake Erie and the resulting water quality impairments, Ohio EPA recently formed the Ohio Lake Erie Phosphorus Task Force to review loading data, determine causes of increased loads, and evaluate management options reducing DRP loads. An increase in available funding for projects that will reduce DRP loading within the Lake Erie watershed is anticipated. High priority areas for DRP reduction projects should be identified in anticipation of future funding. BMPs that are currently recognized for DRP load reductions include: nutrient management plans utilizing variable rate technology (VRT), cover crops, and controlled drainage structures with edge-of-field monitoring. These types of projects will benefit water quality within the Black River watershed as well as Lake Erie and should become a priority for the watershed partners and stakeholders as funding opportunities for the watershed become available.

VII. Implementation of Coastal Non-Point Control Measures

Watershed plans within the Lake Erie Watershed must describe how the Ohio Coastal Nonpoint Pollution Control Program management measures will be implemented within a specific watershed where the watershed inventory or sources and causes of impairment indicate applicability. The Black River watershed lies within the Lake Erie Watershed boundary and therefore must incorporate management measures from the Coastal Non-Point Plan into the Black River Watershed Action Plan. Many of the urban, agricultural, and hydromodification measures addressed in the Coastal Non-Point Plan will be bolstered by the actions set forth within the Implementation section of this plan. This section demonstrates how the Black River Watershed Action Plan incorporates management measures of the Coastal Non-Point Plan.

In December, 2006, the Lorain County Community Development Department, under authority of the Lorain County Board of Commissioners, published final Black River Watershed Non-Point Source Pollution Control Program Plans for the West Branch subwatershed, East Branch subwatershed, and French Creek subwatershed. These reports were prepared under awards from the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce through the Ohio Department of Natural Resources, Office of Coastal Management. The coastal non-point plan described below incorporates the findings of these final plans with updates and additions resulting from the preparation of this watershed action plan. The final Black River Watershed Non-Point Source Pollution Control Program Plans can be found at the following links:

West Branch Sub-Watershed Non-Point Source Pollution Control Program Plan:
http://www.blackriverwatershed.org/upphoto/wb_final.pdf

French Creek Sub-Watershed Non-Point Source Pollution Control Program Plan:
http://www.blackriverwatershed.org/upphoto/fc_final.pdf

East Branch Sub-Watershed Non-Point Source Pollution Control Program Plan:
http://www.blackriverwatershed.org/upphoto/eb_final.pdf

Eighteen communities within the Black River watershed are Phase II and therefore fall under the NPDES permitting process and are exempt from the following Urban Management Measures:

- New Development
- Existing Development
- Operation and Maintenance of Roads, Highways, and Bridges
- Runoff Systems for Roads, Highways, and Bridges

These Phase II communities are: City of Lorain, City of Sheffield Lake, City of Sheffield, City of Avon, City of North Ridgeville, City of Elyria, City of Oberlin, Grafton Village, City of Avon Lake, City of North Olmsted, City of Westlake, Sheffield Township, Elyria Township, Carlisle Township, Eaton Township, Columbia Township, Grafton Township, and Olmsted Township.

Medina, Ashland, and Huron County currently have no Phase II communities within the Black River Watershed.

Introduction

In recognition of the intense pressures facing our nation's coastal regions, Congress enacted the Coastal Zone Management Act (CZMA) that was signed into law on October 27, 1972. To address more specifically the impacts of nonpoint pollution on coastal water quality, Congress enacted section 6127 of the Coastal Zone Act in November 1990. Section 6127 requires that each state with an approved coastal zone management program develop and submit for approval a Coastal Nonpoint Pollution Control Program (CNPCP) to the USEPA and the National Oceanic and Atmospheric Administration (NOAA). The purpose of the program "shall be to develop and implement management measures for nonpoint source pollution to restore and protect coastal waters, working in close cooperation with other State and local authorities."

Program Specifics

Guiding Principles

1. Local groups organized to protect or improve water resources are vital to the successful implementation of non-point source programs and projects.
2. The State of Ohio shares responsibility with local agencies and organizations in the implementation of watershed protection projects.
3. Protection and restoration of stream integrity (sinuosity, riparian habitat and flow) is one of the highest priorities of Ohio's non-point program.
4. Program priorities are set by involving multiple stakeholders including, but not limited to, government, academia, industry, environmental groups and local citizens.
5. Attention and funding is focused on local watershed and aquifer projects that directly improve water quality.
6. Water resources are prioritized and programs and projects targeted to priority areas.
7. Federal, state, and locally funded best management practices have coordinated cost sharing amounts and requirements.
8. Existing regulations that target non-point sources are uniformly enforced.
9. Funding is available for nonpoint source research and evaluation of non-point source programs and best management practices.
10. Education and training are integral to the success of nonpoint source programs.

Ohio Coastal Non-Point Pollution Control Program Applicable Management Measures

Urban

(5.3.1) New Development
(5.3.2) Watershed Protection
(5.3.3) Site Development
(5.6.1) New On-Site Disposal Systems
(5.6.2) Operating On-Site Disposal Systems
(5.8.1) Planning, Siting, and Developing Roads and Highways (Local Only)

(5.8.2) Bridges (Local Only)

Hydromodification
(7.4.1) Channelization and Channel Modification – Physical and Chemical Characteristics of Surface Waters
(7.4.2) Channelization and Channel Modification – Instream and Riparian Habitat Restoration
(7.5.3) Dams – Protection of Surface Water Quality and Instream and Riparian Habitat
(7.6.1) Eroding Streambanks and Shorelines

Specific Ohio Coastal Nonpoint Pollution Control Program Management Measures are addressed in the Black River Watershed Action Plan as follows:

Urban Protection Measures

(5.3.1) New Development

This management measure is intended to accomplish the following:

- Decrease the erosive potential of increased runoff volumes and velocities associated with development-induced changes in hydrology;
- Remove suspended solids and associated pollutants entrained in runoff that result from activities occurring during and after development;
- Retain hydrological conditions to closely resemble those of the pre-disturbance condition; and
- Preserve natural systems including in-stream habitat.

As previously listed, eighteen communities within the Black River watershed are considered Phase II and as such are exempt from this Management Measure. The rest of the watershed's unincorporated communities fall under County administration which utilize Phase II Erosion and Sediment Control Rules:

Lorain County Sediment Control Regulations: http://lorainswcd.com/forms/ESC-Rules.pdf

Medina County Sediment Control Regulations:
http://www.highwayengineer.co.medina.oh.us/engineering/sediment_control_rr.pdf

These regulations should be examined and updated if need-be to properly address issues of storm water runoff and surface erosion during development. In addition, communities within the watershed which have not adopted these regulations should be encouraged to do so. The Lorain County Community Development Department, the Black River Watershed Project, and other local stakeholders should continue to implement an educational program aimed at educating landowners of the benefits of riparian and wetland setbacks. Additional recommendations and actions are contained within the Land Use Policies section of the Lorain County Environmental Strategic Plan.

(5.3.2) Watershed Protection

The purpose of this management measure is to reduce the generation of non-point source pollutants and to mitigate the impacts of urban runoff and associated pollutants that result from new development or redevelopment, including the construction of new and relocated roads, highways, and bridges. The measure is intended to provide general goals for States and local governments to use in developing

comprehensive programs for guiding future development and land use activities in a manner that will prevent and mitigate the effects of nonpoint source pollution.

Develop a watershed protection program to:

- Avoid conversion, to the extent practicable, of areas that are particularly susceptible to erosion and sediment loss;
- Preserve areas that provide important water quality benefits and/or are necessary to maintain riparian and aquatic biota; and
- Protect to the extent practicable the natural integrity of waterbodies and natural drainage systems during site development.

Lorain County has a Comprehensive Land Use Plan and an Environmental Strategy Plan that both detail the need for protection of sensitive environmental resources; however, the plans exist only as guidance documents and there are no specific implementations described within them. Therefore, the Black River Watershed Action Plan will fill the role and function of identifying criteria needed to assist in bringing the watershed into attainment, along with Coastal Non-Point Management Measures.

To accomplish the goals of this measure, the Black River watershed partners will utilize several strategies to protect critical areas to maintain water quality in the Black River and its tributaries and work with local communities to guide development in a way that is ecologically and economically sustainable.

The Black River Watershed Action Plan addresses this measure through a combination of action items. Implementation Management Practice E (Preservation of Natural Areas) supports the objective of preserving sensitive areas by public acquisition or by protection through the use of conservation easements. Implementation Practice A (Riparian Setbacks) uses setback codes to protect existing vegetated riparian corridors and wetlands. It also encourages the use of conservation development concepts to minimize disturbance of natural areas and limits stream crossings by roads and utility lines. Goals described for each 12-digit HUC call for the adoption or updating of local codes within townships and communities to control stormwater, minimize erosion/sedimentation, and to restore and protect riparian areas and floodplains. The Black River Watershed Action Plan also supports the compliance and enforcement of applicable stormwater regulations, including those requirements in the ”Rainwater and Land Development Manual” and standards adopted by the state for the National Pollutant Discharge Elimination System (NPDES).

The final Black River Watershed Non-Point Source Pollution Control Program Plans list the endorsement of a watershed action plan as the primary action item to address this management measure. Endorsement of this plan will fulfill that recommendation. The Lorain County Community Development Department, the Black River Watershed Project, and other local stakeholders should continue to implement an educational program aimed at educating landowners of the benefits of riparian and wetland setbacks. Additional recommendations and actions are contained within the Land Use Policies section of the Lorain County Environmental Strategic Plan.

(5.3.3) Site Development

Goals of this management measure are:

- Protect areas that provide important water quality benefits and/or are particularly susceptible to erosion and sediment loss.
- Limit increases of impervious areas, except where necessary.
- Limit land disturbance activities such as clearing and grading, and cut and fill to reduce erosion and sediment loss.
- Limit disturbance of natural drainage features and vegetation.

Urbanization and development will continue in the watershed with re-development of existing areas in the northern French Creek, Black River, and Heider Ditch-Frontal Lake Erie sub-watersheds and increasing development of previously rural or agricultural areas in the Jackson Ditch-East Branch, Willow Creek, Plum Creek, and Lower West Branch sub-watersheds. As this trend continues, implementation of the land use recommendations in the Black River Watershed Action Plan will assist in meeting the Coastal Non-Point Management Measures.

This management measure will be difficult to implement due to the amount of education needed at the local level. Most communities look to increase their tax base quickly and meet EPA pre- and post-construction requirements at a minimum. In addition, the siting of development for tactical, marketing, or convenience purposes often supersedes most reasons to not develop at a site where sensitive natural resources are located. Additionally, regulations at the state level do not mandate that a percentage of impervious surface be reduced so long as retention and containment requirements are addressed.

An aggressive education effort on the part of the Black River watershed partners through organizations such as Lorain County PIPE to market the principles in the Black River Watershed Action Plan and other documents created to minimize land disturbance and protect watersheds will be necessary to legitimize their information and goals.

The primary mechanism for controlling storm water, erosion and sediment control and impacts on aquatic resources during development are local development codes. Black River watershed partners such as Lorain County Community Development will work with member communities and local partners for communities to adopt best local land use practices. These practices are listed below:

- Land Use Planning
- Riparian and Wetland Setbacks
- Erosion and Sediment Control
- Comprehensive Stormwater Management Plans
- Conservation Development (with a minimum of 40% open space)

Model zoning regulations for the above codes that provide protection of existing resources while developing have been outlined by organizations like NOACA and Chagrin River Watershed Partners and will be used as guidance. Lorain County Community Development, specifically the Lorain County Planning Commission, will assist local communities and the Lorain and Medina SWCDs for adoption and implementation of these codes.

In addition, protection of the natural drainageways can be accomplished through conservation easements. These easements should be prioritized for areas next to streams on the natural floodplain and kept in perpetuity. The easement should be held by the relevant SWCD, Western Reserve Land

Conservancy, Black River watershed partners, or local community. This measure is also outlined in the Coastal Watershed Protection Measure.

Increased impervious surfaces are a direct result of standard development practices. Reducing the input of storm water into the system by implementing the Black River Watershed Action Plan BMP suggestions is an effective strategy to lessen the volume of water flowing off the site of a development site or other impervious surface. This Plan advocates the use of bio-filtration through the use of detention ponds and wetlands, rain gardens, bio-swales, pervious pavement, green roofs, and unrestricted access to floodplains. Additionally, both NOACA and the Chagrin River Watershed Partners have draft Post-Construction Management Practice codes which would serve the Black River watershed well.

(5.6.1) New On-Site Disposal Systems

The purpose of this management measure is to protect the Black River watershed from pollutants discharged by new on-site disposal systems. OSDS refers to both home sewage treatment systems (HSTS) as well as Semi-Public systems like package plants. The Lorain County General Health District and other relevant health departments in the watershed already incorporate regulations that require new systems to consider local soil conditions, lot size, and the design and type of system. Local health departments annually perform illicit discharge locating by point source tracking to find the locations of failing systems, sewer connections, and other pollutant-laden discharges. Adoption of statewide standards for OSDS would greatly assist to standardize the development of new on-site systems in the Black River watershed. The Black River watershed partners will continue to coordinate with local community engineers, Medina County Health Department, local health departments, LCGHD, and Ohio EPA on the location and management of any new disposal systems, as well as assist in educating communities about the need for keeping OSDSs maintained and functioning properly. For current Ohio sewage treatment systems laws and rules, see here:
http://www.odh.ohio.gov/odhprograms/eh/sewage/sewrules.aspx

Currently, no regulations regarding Semi-Public treatment systems exist in Ohio. The Ohio EPA acts as the regulator and reviews system design, placement, discharge, and capacity. The EPA will contract with county health departments to inspect these systems and will receive notification from the local health agencies if these systems are non-compliant. Because the need exists for the development of statewide regulations for Semi-Public systems, the need for proper placement of these systems is crucial to the success of compliance with the Coastal Non-Point Management Plan and for the integrity of the Black River watershed. The creation of the regulations will allow for those standards to be recognized, discussed, and properly integrated into the adoption of new regulations.

Protective setbacks for the implementation of on-site waste disposal can provide additional protection to the stream. No watershed community has adopted specific codes or regulations that require disposal systems to have additional setback lengths from streams, rivers, or creeks. The Black River watershed partners will assist communities and the State of Ohio in developing language for the regulation and installation of disposal systems. Using NPDES setback regulations as the template, new Semi-Public setback requirements can be justified and implemented into the process.

Local health departments should review changes mandated by the new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012). County programs should be developed to meet CMMs and new rules established to position Counties for funding opportunities.

Regular inspection programs should be continued within each County (3-5 years unless complaint-driven) for HSTS and expanded upon as funding becomes available to do so. Existing GIS-based databases and inventories of existing HSTS within each county should be expanded and consolidated. Finally, outreach and education efforts to inform homeowners of maintenance requirements (including methods, costs, etc.) for HSTS should be continued.

(5.6.2) Operating On-Site Disposal Systems

Black River watershed partners will continue to work with relevant health departments to develop and implement HSTS plans, point of sale, and other inspection programs to identify problem systems and repair or replace these systems. In the developing areas of Lorain County such as Eaton and Carlisle Township, existing systems are being eliminated through the expansion of sanitary sewer projects such as those being completed by LORCO. Phase II communities such as, but not limited to, Lorain, Elyria, Avon, and North Ridgeville are also working to eliminate HSTS within their community boundaries. As with new onsite disposal systems, new statewide regulations and standards would be beneficial in the Black River watershed.

Policies and systems to ensure that existing OSDSs are operated and maintained to prevent the discharge of pollutants to both ground and surface waters to the greatest extent practicable should be established. Where necessary to meet these objectives, encourage the reduced use of garbage disposals, encourage the use of low-volume plumbing fixtures, and reduce total phosphorous loadings to the OSDS by 15% if the use of low-level phosphate detergents has not been required or widely adopted by OSDS users. OSDSs should be inspected at a frequency to ascertain whether or not they are failing, and Semi-Public OSDSs should consider retrofitting or upgrading so that total nitrogen loadings in the effluent are reduced by 50%. This provision would apply only if:

- Conditions indicate that nitrogen-limited surface waters may be adversely affected by significant ground water nitrogen loadings from the Semi-Public, and
- Where nitrogen loadings from OSDS are delivered to ground water that is hydrologically connected to surface water.

As previously stated, eighteen communities within the Black River watershed fall under Phase II and are required to have a review of any known illicit discharges from the EPA and local health departments. Some communities will include a review of these known illicit discharges in their annual storm water reports to the EPA.

The removal of OSDS is the only long-term solution to reducing bacterial and nutrient loading to the Black River and its tributaries. As stated in the watershed inventory, there are an estimated 19,300 HSTSs throughout the Black River watershed. Local utility projects such as LORCO are currently working to extend sanitary lines and reduce the amount of systems in the watershed. In addition, local health and engineering departments monitor streams and storm sewer lines for potential illicit discharges and will further perform source tracking to locate the source of the discharge.

Local health departments employ registered sanitarians to inspect HSTSs and OSDS for proper functioning and performance. Often effluent discharge from failing or questioned systems will be sampled to determine if elevated bacteria levels are entering waters of the state. Additionally, local health departments and the Black River watershed partners will work with communities to educate the

residents about watershed integrity through Lorain County PIPE workshops, oral presentations to various city and township councils, and literature distribution.

Local health departments should review changes mandated by the new HSTS rules (effective September 2010) and future rules (to become effective after January 1, 2012). County programs should be developed to meet CMMs and new rules established to position Counties for funding opportunities. Regular inspection programs should be continued within each County (3-5 years unless complaint-driven) for HSTS and expanded upon as funding becomes available to do so. Existing GIS-based databases and inventories of existing HSTS within each county should be expanded and consolidated. Finally, outreach and education efforts to inform homeowners of maintenance requirements (including methods, costs, etc.) for HSTS should be continued.

(5.8.1) Planning, Siting, and Developing Roads and Highways (Local Only)

All watershed communities require that erosion and sediment control assurances are taken to reduce the sedimentation impacts from earth disturbances associated with these activities. No specific code, regulation, or requirement exists at the local level for projects less than one acre.

Management goals for this measure would be:

- Protect areas that provide important water quality benefits or are particularly susceptible to erosion or sediment loss;
- Limit land disturbance such as clearing and grading and cut and fill to reduce erosion and sediment loss; and
- Limit disturbance of natural drainage features and vegetation.

All watershed communities currently have codes in place to control sediment and erosion (local or County-enacted); additionally, other agencies such as ODOT have their own. Some of these regulations are part of the State mandated EPA Phase II storm water program which requires all State, County, and municipalities to have measures in place to control illicit discharges and sedimentation.

All construction of over one acre is required to follow the erosion and sediment control plan from the community or sponsoring agency. This includes new road and bridge development, residential home construction sites, capital improvement sites, commercial and industrial development, or any other construction activity within the community boundary. As stated within the plan, the Black River experiences significant sedimentation loading from stream scouring and development. Proper management of construction sites and the local enforcement of the codes and resolutions can assist in the reduction of unnecessary sediment entering the system.

Black River watershed partners, with the assistance of Lorain County Community Development, will work to identify watershed locations where mitigation from disturbing a resource can be kept within the watershed, such as Elmwood Preserve in the City of Lorain, or the Wellington Reservation. Additionally, the Black River watershed partners will work with communities to educate them about the importance of wetlands and keeping streams in a natural state and encourage integrating them as such into any road, bridge, or capital improvement site design.

All watershed communities have regulations to ensure that proper development practices and design are implemented on any new and existing roadway construction project. Consideration of future roadway development using BMPs such as installation of exfiltration trenches (for a case study of exfiltration trenches go here: http://www.fhwa.dot.gov/environment/ultraurb/5mcs1.htm) could provide assistance to reducing impervious surfaces and mitigating storm water runoff. County and municipality use of the Ohio Department of Transportation's Handbook for Erosion and Sediment Control is also encouraged. The handbook can be found at the link below:

http://www.dot.state.oh.us/Divisions/ConstructionMgt/Admin/Manuals/Erosion%20Control.pdf

(5.8.2) Bridges (Local Only)

The goal of this measure is to site, design, and maintain bridge structures so that sensitive and valuable aquatic ecosystems and areas providing important water quality benefits are protected from adverse effects.

ODOT, County, and local municipalities all have procedures that utilize erosion and sediment control activity. These entities are also encouraged to consult the Ohio Department of Transportation's most current Handbook for Erosion and Sediment Control, Bridge Design Manual, Bridge Maintenance Manual, and Preventative Maintenance Repair Guidelines. The Black River watershed partners will work with communities to monitor the plans and to help ensure proper maintenance.

Proper management of storm water near sensitive aquatic systems is crucial to the long term integrity of the resource being threatened. Additionally, site design and the implementation of BMPs will help ensure that proper precautions taken. Enforcement of those regulations is vital to protecting the Black River and its tributaries. Because bridge repair work or construction activities are directly over water, special care is important to minimizing the stream impact.

Hydromodification Protection Measures

The northern sections of the Black River watershed have been developed for over 100 years. Standard development practices and the addition of large-scale impervious cover across the French Creek, Black River, and Heider Ditch-Frontal Lake Erie HUCs have permanently altered these stretches of the watershed. The result has been intense channelization of the Black River and its tributaries, stream bank destabilization, loss of habitat, drastic increases in sedimentation, and frequent flooding. The southern parts of the watershed are predominantly rural and most streams are natural unless cleaned out to facilitate drainage from cropland.

(7.4.1) Channelization and Channel Modification – Physical and Chemical Characteristics of Surface Waters

The purpose of this management measure is to ensure that the planning process for new hydromodification projects address changes to physical and chemical characteristics of surface waters that may occur as a result of the proposed work. Implementation of this management measure is intended to occur concurrently with the implementation of Management Measure 7.4.2 (In-stream and Riparian Habitat Restoration) of this section.

For existing projects, the purpose of this management measure is to ensure that the operation and maintenance program uses any opportunities available to improve the physical and chemical characteristics of the surface waters. Changes created by channelization and channel modification activities are problematic if they unexpectedly alter environmental parameters to levels outside normal or desired ranges. The physical and chemical characteristics of surface waters that may be influenced by channelization and channel modification include sediment, turbidity, salinity, temperature, nutrients, dissolved oxygen, oxygen demand, and contaminants.

Implementation of this management measure in the planning process will require the following goals to be met:

- Evaluate the potential effects of proposed channelization and channel modification on the physical and chemical characteristics of surface waters in coastal areas;
- Plan and design channelization and channel modification to reduce undesirable impacts; and
- Develop an operation and maintenance program for existing modified channels that includes identification and implementation of opportunities to improve physical and chemical characteristics of surface waters in those channels.

Implementation of the management practices identified in Section VI will work towards achievement of the goals for this management measure. Specifically, riparian setbacks, stream restoration, preservation of natural areas, storm water management practices, and agricultural best management practices will minimize the effects of previous channelization activities and proposed channel modifications. Local stormwater utilities implemented by Lorain County and other jurisdictions should provide additional credit and/or consideration for projects that incorporate the management practices discussed in Section VI.

The final Black River Watershed Non-Point Source Pollution Control Program Plans list the endorsement of a watershed action plan as the primary action item to address this management measure. Endorsement of this plan will fulfill that recommendation. Furthermore, the collection of Index of Biotic Integrity (IBI) and Qualitative Habitat Evaluation Index (QHEI) data for the watershed was prescribed. In 2012, Ohio EPA will be conducting a comprehensive monitoring program within the watershed which will include IBI and QHEI data, among other metrics.

(7.4.2) Channelization and Channel Modification – In-stream and Riparian Habitat Restoration

The purpose of this management measure is to correct or prevent detrimental changes to in-stream and riparian habitat from the impacts of channelization and channel modification projects. Implementation of this management measure is intended to complement the implementation of Management Measure 7.4.1 (Physical and Chemical Characteristics of Surface Waters) of this section.

Contact between floodwaters and overbank soil and vegetation can be increased by a combination of setback levees and use of compound-channel designs. Setback levees, meaning levees set back away from the stream bank, can be constructed to allow for over-bank flooding, which provides surface water contact to important streamside areas (including wetlands and riparian areas). Additionally, setback levees still function to protect adjacent property from flood damage. Compound ditch designs consist of an incised, narrow channel to carry surface water during low (base)-flow periods, a staged overbank area into which the flow can expand during design flow events, and an extended overbank area,

sometimes with meanders, for high-flow events. Planting of the extended over-bank with suitable vegetation completes the design.

Preservation of ecosystem benefits can be achieved by site-specific design to obtain pre-defined optimum or existing ranges of physical environmental conditions. Mathematical models can be used to assist in site-specific design. In-stream and riparian habitat alterations caused by secondary effects can be evaluated by the use of models and other decision aids in the design process of a channelization and channel modification activity. After using models to evaluate secondary effects, restoration programs can be established.

The Lorain County Engineers currently maintain 40 miles of ditches along with Lorain SWCD. These ditches should be evaluated to determine if implementation of practices like setback levees or compound-channel designs are feasible. Future ditch maintenance projects petitioned through the SWCD or the County should be conducted in collaboration with an appropriate committee of the Black River watershed partners to provide technical assistance to protect the water quality of the watershed. These types of projects that incorporate compound, over-wide, or two-stage ditch designs should be given additional credit and/or consideration through the Lorain County and other storm water utilities.

The final Black River Watershed Non-Point Source Pollution Control Program Plans list the endorsement of a watershed action plan as the primary action item to address this management measure. Endorsement of this plan will fulfill that recommendation. Furthermore, the collection of Index of Biotic Integrity (IBI) and Qualitative Habitat Evaluation Index (QHEI) data for the watershed was prescribed. In 2012, Ohio EPA will be conducting a comprehensive monitoring program within the watershed which will include IBI and QHEI data, among other metrics.

(7.5.3) Dams – Protection of Surface Water Quality and In-stream and Riparian Habitat

The purpose of this management measure is to protect the quality of surface waters and aquatic habitat in reservoirs and in the downstream portions of rivers and streams that are influenced by the quality of water contained in the releases (tailwaters) from reservoir impoundments. Impacts from the operation of dams to surface water quality and aquatic and riparian habitat should be assessed and the potential for improvement evaluated. Additionally, new upstream and downstream impacts to surface water quality and aquatic and riparian habitat caused by the implementation of practices should also be considered in the assessment. The overall program approach is to evaluate a set of practices that can be applied individually or in combination to protect and improve surface water quality and aquatic habitat in reservoirs, as well as in areas downstream of dams. Then, the program should implement the most cost-effective operations to protect surface water quality and aquatic and riparian habitat and to improve the water quality and aquatic and riparian habitat where economically feasible.

This management measure is intended to be applied to dam operations that result in the loss of desirable surface water quality, and of desirable instream and riparian habitat. Dams are defined as constructed impoundments which are either:

- 25 feet or more in height *and* greater than 15 acre-feet in capacity, or
- 6 feet or more in height *and* greater than 50 acre-feet in capacity.

The Black River watershed contains nearly 165 dams; most are small lowhead dams or privately-owned. There are 23 publicly-owned dams which are referenced in the Watershed Inventory. In 2009, a dam

which created Brentwood Lake in Carlisle Township was removed because of concerns that the dam would fail and flood out several nearby homes. Lorain County engineers oversaw the removal and drained the lake, eliminating the pronounced algal blooms present in the impoundment area (Brentwood Lake, along with Findley Lake, was listed as Impaired for Eutrophication or Undesirable Algae) and restoring the natural stream which had not been free-flowing since the 1950s.

Dams cause significant adverse impacts to the ecology of rivers and streams by blocking migration of fish to upriver spawning habitat; warming water temperatures in impoundments well above downstream conditions and accumulating sediment, which degrades water quality and often buries high quality fisheries habitat.

Dam removal, on the other hand, restores the natural flowing character of a stream and restores essential ecological processes in the river. Large segments of previously inaccessible water may be open to use by a variety of fish species. In addition, dam removal and sediment management can restore buried fish spawning habitat and other critical stream habitat.

The effect of dams upon the water quality of the Black River and its tributaries has not been studied in any detail. Dams present within the watershed should be evaluated to determine current function and operational status. If the dam stands in disrepair, or is no longer operational, it should be targeted for removal and subsequent restoration of the site's natural hydrology. Black River watershed partners will continue to work with dam owners, County Engineers, local communities, and ODNR Dam Safety to evaluate and improve water quality near dams.

(7.6.1) Eroding Streambanks and Shorelines

There are no codes or resolutions that exist in the watershed that address streambank or shoreline erosion specifically. However, erosion has been identified as a significant problem in the Black River watershed by the Black River TMDL and significantly high levels of streambank erosion can be found in every 12-digit HUC within the watershed. Sub-watershed tributaries and headwater streams in particular are found to contribute substantial sediment loading due to poor stream bank stabilization and health.

The Black River and its tributaries experience quickly changing stream flows during high precipitation events which causes stream channelization and stream bank destabilization. Anthropogenic impacts to the naturally highly erosive soils in the watershed exacerbate sedimentation rates significantly and need to be addressed. Tiled drainage in the southern portions of the watershed increases flow volume and velocity to the waterways, stressing them beyond their assimilative capacity and causing massive stream bank scouring and subsequent downstream sedimentation. Increased amounts of impervious cover in the northern portions of the watershed, particularly in the French Creek, Black River, and Heider Ditch-Frontal Lake Erie sub-watersheds also contribute to channelization and stream bank destabilization.

Where stream bank erosion is a non-point source pollution problem, stream banks and shorelines should be stabilized. Methods that incorporate bio-engineering and vegetative techniques are strongly preferred, unless structural methods are more cost-effective considering the severity of shear stresses, erosion, and the potential adverse impact on other stream banks.

Some communities within the Black River watershed have or are actively trying to enact stream bank setback codes and resolutions. These regulations assist in allowing the stream access to its floodplain

and provide protection of the resource by establishing a buffer area to assimilate and mitigate surface runoff. Local land conservancies, such as the Western Reserve Land Conservancy, and SWCDs have easement programs available for community use.

Section VI of the Black River Watershed Action Plan discusses stream restoration and bank stabilization in more detail. Community participation, code and resolution adoption and enforcement, and education of the local decision makers will be crucial to restoring the stream integrity of the Black River and its tributaries.

Table 47: Coastal Non-Point Strategic Plan

Management Measure	Strategy	Lead Agencies	Cost	Timeline	Target Area
5.3.1 New Development	Review planning documents to determine coverage of Coastal Management Measures (CMMs) and address any gaps.	BRWP, Lorain County, Medina County, local planning and zoning commissions and departments.	$3,000 for staff to review plans (per commission / department). $5,000 for staff to research or develop new language to cover any omissions (per commission / department). $5,000 for staff to work with commissions / departments on changes to planning documents, and to request adoption of recommended changes (per commission / department). Total: $13,000 per commission / department within the watershed.	2012 - 2015	Target Subwatersheds

5.3.2 Watershed Protection	Site plan reviews to enforce water quality considerations included within updated policies.	BRWP, Counties, SWCDs, local planning and zoning commissions and departments, and local municipalities and townships.	$10,000/yr	2011, ongoing	Target sub-watersheds with focus on Lorain County, Medina County, Lorain, Elryia, Avon, Sheffield Village, North Ridgeville, Oberlin, LaGrange, Wellington Village, and Rochester Village
	Create subwatershed action plans at the 12-digit HUC level within the Black River watershed. There are 9 subwatersheds targeted by the WAP. Develop outreach programs to inform local partners of water quality objectives and to develop strategies for implementation.	BRWP, Counties, SWCDs, local planning and zoning commissions and departments, and local municipalities and townships.	$50,000 for the creation and development of each WAP. $15,000 per year for staff time to implement WAP's, $5,000 per year for outreach materials and education.	2012 - 2022	Target sub-watersheds.
	Adoption of Riparian and Wetland Setback Regulations Continue public education program .	Townships and Communities within the Black River Watershed	$8,195 Each	2011-2013	Target sub-watersheds with focus on Lorain County, Medina County, Lorain, Elryia, Avon, Sheffield Village, North Ridgeville, Oberlin,

					LaGrange, Wellington Village, and Rochester Village
	Implementation of Objectives and Actions Identified in Sections V, VI, and Appendix F. See Appendix F for costs associated with Implementation Objectives and Actions.	BRWP, Lorain County, Medina County, Lorain SWCD, local planning and zoning commissions and departments, and local municipalities and townships.	Site Specific	Dependent on willing parties and grant acquisition	Target subwatersheds
	Identify "High Priority Areas" (HPAs).	Black River Watershed Project	In Progress	Unknown	Watershed-wide.
	Complete resource inventory and endorsed watershed action plan	Watershed-wide.	Completed upon endorsement of this plan.	Completed upon endorsement of this plan.	Watershed-wide.
	Implement strategies outlined in the Lorain County Environmental Strategic Plan (Land Use Policies)	Townships and Communities within the Black River Watershed	Variable	Dependent on willing parties and grant acquisition	Target subwatersheds

5.3.3 Site Development	Review county and local engineering requirements, site plans, and zoning regulations. Provide multiple educational meetings to provide planners, engineers, councils, and zoning commissions information on the ODNR Coastal Management Plan and the Black River Watershed Action Plan to incorporate these details into local decision making processes. The focus of these meetings will be on minimizing sediment loss, maintaining natural drainage features and vegetation, limiting impervious surfaces, and limiting overall disturbing activities.	Black River watershed partners, ODNR Coastal Office, ODOT, EPA, RC&D Council, Lorain and Medina SWCDs, Lorain and Medina County Planning Commissions, County Engineers, local planning and zoning commissions, and Boards of Health	$20,000 for 4 workshops that will inform watershed decision makers about the CMP and the WAP and how to incorporate them into local regulations. $50,000 for staff time for the review of existing policies and the development of new sustainable policies using the CMP and WAP as guidance tools for decision making. $10,000 for staff time to provide outreach in the form of brochures and public presentations regarding the newly developed regulations. $25,000 on a study to determine the impacts of adjusting current standard regulations to more sustainable initiatives. Total Cost: $105,000	2012-2017	Target subwatersheds and communities therein

5.6.1 – New On-Site Disposal Systems	Review changes as mandated by new HSTS rules (effective September, 2010) and future rules, to become effective after January 1, 2012. Implement County HSTS programs to meet CMM and new rules. Incorporate setbacks into updated codes and programs. Setbacks from watercourses, groundwater aquifers, and impoundments are essential for ensuring the safety of the environment and public health. Using Phase II riparian setbacks as an example of why setbacks are needed will assist in the development of regulations.	County health departments in partnership with BRWP. Each county will take lead in its own county, as the current status and the needs for changes to their codes will vary.	$2,000 – for staff to review new laws as they relate to CMM. $5,000 – for staff to work with ODNR and local health departments to develop language to address shortcomings of HSTS rules. $5,000 – for staff to work with partners to request adoption of new rules and develop program to implement and enforce those changes. (Also note cost for development of GIS layer for each county, as outlined in 5.6.2, Operating Onsite Systems) Total: $12,000	2012-2013	Targeted subwatersheds (except sewered areas).

5.6.2 Operating On-Site Disposal Systems	Develop a regular inspection program (every 3-5 years unless complain-driven) for each home sewage treatment system in watershed by county health department or approved contractor. Develop a GIS-driven database and inventory of existing HSTS and Semi-Public Systems.	County health departments in partnership with BRWP. Each county will take lead in its own county, as the current status and the needs for changes to their codes will vary.	$50 per home per year for implementation of inspection program. $15,000 for staff time to work with HDs to draft language and request adoption by county health boards. $15,000 per county to develop GIS layer of septic systems. Upkeep of systems can be tracked using the GIS layer. Total: $30,000 to develop, $50 per home per year to maintain.	2012 – 2014 for development of programs and ongoing for inspection and maintenance	Targeted subwatersheds (except sewered areas).
5.8.1 Planning, Siting, and Developing Roads and Highways (local only)	Develop a manual that will be implemented by watershed counties and that satisfies the management measure. The manual will focus on protecting areas that are sensitive, reducing sedimentation, minimizing soil disturbance, and using natural drainage features	BRWP, ODOT, ODNR Coastal Office, Ohio EPA, local SWCD's, county engineers	$25,000 for staff to develop the manual with assistance from ODNR, ODOT, and county input. $7,000 to develop and provide 4 trainings within the watershed and within communities regarding the manual. $10,000 for printing costs associated with	2013-2015	Targeted subwatersheds

	when at all possible. Utilize existing manual from other watersheds as guideline, if available.		the manual. Total Cost: $42,000		
	County and municipality use of ODOT's Handbook for Erosion and Sediment Control	Counties, Townships and Communities within the Black River Watershed	Ongoing	Unknown	Watershed-wide.
5.8.2 Local Bridges	Develop a manual that will be implemented by watershed counties and that satisfies the management measure. The manual will focus on protecting areas that are sensitive, reducing sedimentation, minimizing soil disturbance, and using natural drainage features when at all possible. Utilize existing manual	BRWP, ODOT, ODNR Coastal Office, Ohio EPA, local SWCD's, county engineers	$25,000 for staff to develop the manual with assistance from ODNR, ODOT, and county input. $7,000 to develop and provide 4 trainings within the watershed and within communities regarding the manual. $10,000 for printing costs associated with the manual. Total Cost: $42,000	2013-2015	Targeted subwatersheds

	from other watersheds as guideline, if available.				
	County and municipality use of ODOT's Handbook for Erosion and Sediment Control, Bridge Maintenance Manual, Bridge Design Manual, and Preventative Maintenance Repair Guidelines for Bridges and Culverts.	Counties, Townships and Communities within the Black River Watershed	Ongoing	Unknown	Watershed-wide.
7.4.1 – Operation and Maintenance Program for Existing Modified Channels – Surface Water	Create a GIS inventory and database to identify where, how, and severity of modified channels within the watershed. Inventory should also identify those channels currently included in a maintenance program.	BRWP, Counties, SWCDs, local planning and zoning commissions and departments, and local municipalities and townships.	$8,000 for staff time to gather all data needed to create GIS database. $7,000 for staff to identify and field-check locations of modified channels. $5,000 to collaborate with other agencies for the development of a prioritization	2013-2015	Targeted Subwatersheds

	Identify potential areas for restoration and demonstration projects. Market and advertise these projects as solutions to flooding, property loss, and overall environmental health to property owners. Implementation of Objectives and Actions Identified in Sections V, VI, and Appendix F. See Appendix F for costs associated with Implementation Objectives and Actions.		list of projects for implementation. $3,000 to market and advertise demonstration / restoration projects. Total Cost: $23,000		
	Complete resource inventory and endorsed watershed action plan	Watershed-wide.	Completed upon endorsement of this plan.	Completed upon endorsement of this plan.	Watershed-wide.

7.4.2 – Operation and Maintenance Program for Existing Modified Channels – Instream and Riparian Habitat	Create a GIS inventory and database to identify where, how, and severity of modified channels within the watershed. Inventory should also identify those channels currently included in a maintenance program. Identify potential areas for restoration and demonstration projects. Market and advertise these projects as solutions to flooding, property loss, and overall environmental health to property owners. Implementation of Objectives and Actions Identified in Sections V, VI, and Appendix F. See Appendix F for costs associated with Implementation Objectives and Actions.	BRWP, Counties, SWCDs, local planning and zoning commissions and departments, and local municipalities and townships.	$8,000 for staff time to gather all data needed to create GIS database. $7,000 for staff to identify and field-check locations of modified channels. $5,000 to collaborate with other agencies for the development of a prioritization list of projects for implementation. $3,000 to market and advertise demonstration / restoration projects. Total Cost: $23,000	2013-2015	Targeted Subwatersheds

7.5.3 – Dams	Create and inventory of dams within the watershed, including owner, purpose, potential for future removal, timeline for removal, and constraints.	Dam owners, BRWP, Counties, SWCDs, local planning and zoning commissions and departments, and local municipalities and townships.	$10,000	2012-2015	Targeted Subwatersheds
7.6.1 – Eroding Streambanks and Shorelines	Create a GIS inventory and database to identify where, how, and severity of modified channels within the watershed. Inventory should also identify those channels currently included in a maintenance program. Identify potential areas for restoration and demonstration projects. Market and advertise these projects as solutions to flooding, property loss, and overall environmental	BRWP, Counties, SWCDs, local planning and zoning commissions and departments, and local municipalities and townships.	$8,000 for staff time to gather all data needed to create GIS database. $7,000 for staff to identify and field-check locations of modified channels. $5,000 to collaborate with other agencies for the development of a prioritization list of projects for implementation. $3,000 to market and advertise demonstration / restoration projects. Total Cost: $23,000	2013-2015	Targeted Subwatersheds

	health to property owners. Implementation of Objectives and Actions Identified in Sections V, VI, and Appendix F. See Appendix F for costs associated with Implementation Objectives and Actions.				

VIII. Evaluation

The ultimate goal of the Black River Watershed Action Plan is to move non-attaining segments into attainment through the implementation of this plan by the watershed coordinator and the team of community stakeholders in the watershed group who together own this plan. An evaluation process is essential for determining the effectiveness of the plan implementation so that strategies can be improved upon, tasks that are shown to be more effective can be implemented more broadly, work that is shown to be ineffective can either be improved upon or jettisoned, and funding can be solicited based on quantifiable measures.

The watershed restoration and protection goals described earlier in this document have been prioritized according to their impacts on water quality, habitat improvement, and other indicators, all of which have quantifiable objectives. Monitoring of stream quality is conducted by the Ohio EPA and periodically by other organizations such as park districts and universities. This data will be reviewed periodically during the implementation phase to evaluate the effectiveness of the plan. Similarly, this plan also includes a strategy for community engagement, including the mobilizing of volunteers and the establishment of a watershed group who will provide guidance to the watershed coordinator and who will also be responsible for other tasks such as monitoring, data collection, and education and outreach.

The watershed coordinator and the watershed group will together develop a regular and consistent evaluation process to track progress towards implementing the plan, attaining water quality standards, and engaging the public. While data will be tracked and shared with professional stakeholders including ODNR, Ohio EPA, the Soil and Water Conservation Districts, and the Black River RAP, this data will also be shared with the rest of the watershed citizenry through public meetings, on the Black River Watershed website, and through other means such as email and social media such as Facebook.

IX. Plan Update and Revision

The Black River Watershed Action Plan is a living document and will be updated by the Watershed Coordinator and/or relevant stakeholders every 5 years, at a minimum. The Plan will be made available for review on the internet to facilitate public access. Copies will also be available to school teachers, libraries, and all communities within the watershed.

References

33 U.S.C. § 1313: US Code - Section 1313: Water quality standards and implementation plans. 1972.

Allison, William J. and Goard, Robert J., 2010. *Report on septic system surveys in Lorain County.* Lorain County General Health District, Elyria, Ohio.

Anderson, Paul, 2004. *Lorain SWCD Ditch Cleaning Demonstration Project: Use of Primary Headwater Habitat Evaluation Techniques to Assess Degrees of Environmental Impact.* Ohio Environmental Protection Agency, Division of Surface Water, February 2004.

Barber, Douglas J., 1989. *Ground Water Pollution Potential of Lorain County, Ohio*. Ohio Department of Natural Resources Ground Water Pollution Potential Report No. 2.

Black, Leonard, 1991. *Natural Lakes in Ohio (Larger Than Five Acres).* Ohio Department of Natural Resources, Division of Water, Water Planning Unit, Open File Report No. 5.

Black River Remedial Action Plan Coordinating Committee, 1994. *Black River Remedial Action Plan Stage One Report: Impairment of beneficial uses and sources of pollution in the Black River Area of Concern.* Ohio Environmental Protection Agency and the Black River Coordinating Committee, 9880 South Murray Ridge Road, Elyria, Ohio.

Black River Remedial Action Plan Coordinating Committee, 2010a. *Black River Remedial Action Plan 2009 Annual Report.* Lorain County General Health District and the Black River Coordinating Committee, 9880 South Murray Ridge Road, Elyria, Ohio.

Black River Remedial Action Plan Coordinating Committee, 2010b. *Black River Remedial Action Plan Stage Two Report: Remedial Strategies for Area of Concern Restoration.* Ohio Environmental Protection Agency and the Black River Coordinating Committee, 9880 South Murray Ridge Road, Elyria, Ohio.

Boddy, James J., 2002. *Upper Black River Watershed 319 Project Executive Summary and Final Report.* Lorain County General Health District, Elyria, Ohio.

Boddy, James J., 2010. Lorain County General Health District. Personal communication and information on septic management in Lorain County.

Brabec, E., Schulte, S., and Richards, P., 2002. *Impervious surfaces and water quality: A review of current literature and its implications for watershed planning*. Journal of Planning Literature, Vol. 16, No. 4.

Bryce, S.A., Omernik J.M., and Larsen, D.P., 1999. *Ecoregions - a geographic framework to guide risk characterization and ecosystem management.* Environmental Practice 1(3):141-155.

Carroll, C., Halpin, M., Burger, P., Bell, K., Sallaway, M.M., and Yule, D.F., 1997. *The effect of crop type, crop rotation, and tillage practice on runoff and soil loss on a Vertisol in central Queensland.* Australian Journal of Soil Research. Vol. 35. pp. 925-939.

Davic, R.D., Eicher, D., and DeShon, J., 1996. *Ohio Water Resource Inventory Volume 3: Ohio's Public Lakes, Ponds, and Reservoirs*. Ohio Environmental Protection Agency, Division of Surface Water, Technical Bulletin MAS/1997-10-2.

Division of Natural Areas and Preserves. GIS Data on rare and threatened species. Ohio Department of Natural Resources, Division of Natural Areas and Preserves, Columbus, Ohio.

Ernst, J.E., Hayhurst, E.N., and Musgrave, D.K., 1976. *Soil survey of Lorain County, Ohio.* United States Department of Agriculture, Soil Conservation Service, Washington, D.C. 99pp.

Gibson, Russell W., 1998. *An Interpretive Study of the Black River for Inclusion into Ohio's Scenic Rivers Program.* Ohio Department of Natural Resources, Division of Water, March 1998.

Herdendorf, C. E., 1986. *Field Guide to the Geology of the Lake Erie Basin. Part 1: Devonian-Mississippian Sequence of Lorain and Erie Counties, Ohio.* Ohio State University, Center for Lake Erie Area Research Tech. Report No. 309, Columbus, OH. 79 pp.

Homan, R.N., Windmiller, B.S., and Reed, J.M., 2004. *Critical thresholds associated with habitat loss for two vernal pool-breeding amphibians.* Ecological Applications 14:1547-1553.

Huang, M., Shao, M., Zhang, L., and Li, Y. "Water use efficiency and sustainability of different long-term crop rotation systems in the Loess Plateau of China." Soil & Tillage Research. Vol. 72. pg. 95-104. 2003.

International Joint Commission, 1987. *Revised Great Lakes Water Quality Agreement of 1987 as Amended by Protocol*, Signed November 18, 1987.

Ireland, R.R., 1969. *A taxonomic revision of the genus Plagiothecium for North America, north of Mexico.* Natl. Mus. Canad. Publ. Bot. 1: 1-118.

Jackson, Scott K., Ostheimer, Chad J., and Whitehead, Matthew T., 2003. *Hydrologic and Hydraulic Analyses of Selected Streams in Lorain County, Ohio, 2003.* United States Geological Survey, Water Resources Investigations Report 03-4215.

Kemper, Ryan, 2010. United States Department of Agriculture, Natural Resource Conservation Service. Personal communication and information on agriculture in Lorain County.

Kottek, M., Grieser, J., Beck, C., Rudolf, B., and Rubel, F., 2006. *World Map of the Köppen-Geiger climate classification updated.* Meteorol. Z., 15, 259-263. DOI: 10.1127/0941-2948/2006/0130.

Larsen, E., and Greco, S.E., 2002. *Modeling channel management impacts on river migration: a case study of Woodson Bridge State Recreation Area, Sacramento River, California, USA.* Environmental Management Vol. 30, No. 2: 209-224.

Lorain County Board of Commissioners, 2006a. *Black River Watershed Non-Point Source Pollution Control Program: East Branch Sub-Watershed*. Prepared by Lorain County Community Development Department, Elyria, Ohio.

Lorain County Board of Commissioners, 2006b. *Black River Watershed Non-Point Source Pollution Control Program: French Creek Sub-Watershed.* Prepared by Lorain County Community Development Department, Elyria, Ohio.

Lorain County Board of Commissioners, 2006c. *Black River Watershed Non-Point Source Pollution Control Program: West Branch Sub-Watershed.* Prepared by Lorain County Community Development Department, Elyria, Ohio.

Lorain County Board of Commissioners, 2006d. *Lorain County Environmental Strategic Plan*. Lorain County Community Development Department, Elyria, Ohio.

Lorain County Board of Commissioners, 2010. *2009 Annual Report of the Lorain County Community Development Department.* Lorain County Community Development Department, Elyria, Ohio.

Lorain Soil and Water Conservation District, Medina Soil and Water Conservation District, and United States Department of Agriculture, Natural Resources Conservation Service, 2007. *Black River Watershed Nonpoint Source Pollution Management Plan.* Prepared by Lorain Soil and Water Conservation District and Natural Resources Conservation Service-USDA., Elyria, Ohio.

Masi, Brad (ed.), 2000. *Explorations of a Watershed: The Natural History of the Black River.* The Environmental Studies Program at Oberlin College, Oberlin, Ohio. 234 pp.

Matisoff, G., Whiting, P.J., and Bonniwell, E.C., 1998. *Evaluation of Watershed Management Programs by Tracing Sediment and Associated Contaminants: A One-year Study at Old Woman Creek.* Final report submitted to Sanctuaries and Reserves Program, NOAA/NOS and ODNR, Div. Natural Areas and Preserves, Columbus, OH. 49 pp.

Mitsch, W.J. and Gosselink, J.G., 2007. *Wetlands*. Fourth edition, John Wiley and Sons Inc., 582 p.

North Carolina State University, 2000. *National Management Measures to Control Nonpoint Source Pollution from Agriculture.* North Carolina State University, Water Quality Group, Raleigh, NC.

Northeast Ohio Areawide Coordinating Agency, 1996. *Black River Basin Home Sewage Disposal System Evaluation Study.* Northeast Ohio Areawide Coordinating Agency, Cleveland, Ohio.

Northeast Ohio Areawide Coordinating Agency, 2001. *A Survey of Northeast Ohio Home Sewage Disposal Systems and Semi-Public Sewage Disposal Systems.* Northeast Ohio Areawide Coordinating Agency, Cleveland, Ohio.

Ohio Department of Natural Resources, 2000. *Ohio Coastal Nonpoint Pollution Control Program Plan.* Ohio Department of Natural Resources, Division of Soil and Water Conservation, Columbus, Ohio.

Ohio Department of Natural Resources, 2001. *Gazetteer of Ohio Streams, Second Edition*. Report No. 29, Ohio Water Plan Inventory, Columbus, Ohio.

Ohio Department of Natural Resources, 2010a. *2009-2010 Watershed Coordinator Grant Program Annual Report.* Ohio Department of Natural Resources, Division of Soil and Water, Columbus, Ohio.

Ohio Department of Natural Resources, 2010b. Various GIS data. Ohio Department of Natural Resources, Office of Coastal Management, GIMS Department, Sandusky, Ohio.

Ohio Division of Geological Survey, 2001. *A brief summary of the geological history of Ohio.* Ohio Department of Natural Resources, Division of Geological Survey GeoFacts No. 23.

Ohio Division of Geological Survey, 2006. *Bedrock Geologic Map of Ohio*. Ohio Department of Natural Resources, Division of Geological Survey Map BG-1.

Ohio Environmental Protection Agency, 1987. *Comprehensive water quality report for the Black River: Amendments to the Ohio Water Quality Management Plan.* Ohio Environmental Protection Agency, Division of Water Quality Planning and Assessment, 160 pp.

Ohio Environmental Protection Agency, 1994. *Biological and water quality study of the Black river (with selected tributaries) and Beaver Creek.* OEPA Technical Report EAS/1993-12-8. Ohio EPA Division of Surface Water. 128 pp.

Ohio Environmental Protection Agency, 1997. *Guide for Developing Local Watershed Action Plans in Ohio.* Ohio Environmental Protection Agency, Columbus, Ohio.

Ohio Environmental Protection Agency, 1999a. *Association between Nutrients, Habitat, and the Aquatic Biota in Ohio Rivers and Streams*. Ohio EPA Technical Bulletin MAS/1999-1-1. Columbus, Ohio.

Ohio Environmental Protection Agency, 1999b. *Biological and Water Quality Study of the Black River Basin: Lorain and Medina Counties (Ohio).* Ohio Environmental Protection Agency, Division of Surface Water, Technical Report MAS/1998-11-4.

Ohio Environmental Protection Agency, 1999c. *State of Ohio: Water Quality Standards.* Ohio Environmental Protection Agency, Division of Surface Water, Chapter 3745-1 of the Administrative Code.

Ohio Environmental Protection Agency, 2003. *Appendix 8 Update: Outline of a Watershed Action Plan.* (In the) Guide for Developing Local Watershed Action Plans in Ohio, Ohio Environmental Protection Agency, Columbus, Ohio.

Ohio Environmental Protection Agency, 2004a. *Summary of Ohio's Antidegradation Waterbody Classification System.* Ohio Environmental Protection Agency, Division of Surface Water, Chapter 3745-1-05 of the Administrative Code.

Ohio Environmental Protection Agency, 2004b. *Summary of Ohio's Beneficial Use Designations.* Ohio Environmental Protection Agency, Division of Surface Water, Chapter 3745-1-07 of the Administrative Code.

Ohio Environmental Protection Agency, 2008a(rev. from 2005). *Delisting Targets for Ohio Areas of Concern.* Ohio Environmental Protection Agency, Division of Surface Water, Lake Erie Program Staff.

Ohio Environmental Protection Agency, 2008b. *Black River drainage basin.* Ohio Environmental Protection Agency, Division of Surface Water, Chapter 3475-1-27 of the Administrative Code.

Ohio Environmental Protection Agency, 2008c. *Ohio 2008 Integrated Water Quality Monitoring and Assessment Report.* Ohio Environmental Protection Agency, Division of Surface Water, Columbus, Ohio.

Ohio Environmental Protection Agency, 2008d. *Total Maximum Daily Loads for the Black River Watershed.* Ohio Environmental Protection Agency, Division of Surface Water, Columbus, Ohio.

Ohio Environmental Protection Agency, 2010. *Ohio 2010 Integrated Water Quality Monitoring and Assessment Report.* Ohio Environmental Protection Agency, Division of Surface Water, Columbus, Ohio.

Omernik, J.M., 1987. *Ecoregions of the conterminous United States.* Annals of the Association of American Geographers, 77:1, pp 118-125.

Piegay, H., Darby, S.E., Mosselman, E., and Surian, N., 2005. *A review of the techniques available for delimiting the erodible river corridor: a sustainable approach to managing bank erosion. River Research and Applications* 21: 773-789.

Rankin, E.T., 1989. *The Qualitative Habitat Evaluation Index: Rationale, Methods, and Application.* Ohio Environmental Protection Agency, Division of Water Quality, Planning and Assessment Section, Columbus, Ohio.

Richards, K., Brasington, J., and Hughes, F., 2002. *Geomorphic dynamics of floodplains: ecological implications and a potential modeling strategy.* Freshwater Biology 47: 559-579.
Royer, T.V., David, M.B., and Gentry, L.E., 2006. *Timing of Riverine Export of Nitrate and Phosphorous from Agricultural Watersheds in Illinois: Implications for Reducing Nutrient Loading to the Mississippi River.* Environmental Science and Technology, 40(13), pp. 4126-4131.

Sands, G., 2001. *Feasibility of Controlled Drainage for Mitigating Nutrient Loss from Tile Drainage Systems in South Central Minnesota.* Water Resources Center, University of Minnesota Extension, St.Paul, MN.

Schneider, Karl, 2010. United States Department of Agriculture, Natural Resource Conservation Service. Personal communication and information on agriculture in Lorain County.

Schueler, Thomas R., 1994a. *The importance of imperviousness.* Watershed Protection Techniques 1:3 100-111.

Schueler, Thomas R., 1994b. *The Stream Protection Approach: Guidance for Developing Effective Local Nonpoint Source Control Programs in the Great Lakes Region.* Center for Watershed Protection.

Skaggs, R.W., Breve, M.A., and Gilliam, J.W., 1994. *Hydrologic and water quality impacts of agricultural drainage.* Critical Reviews in Environmental Science and Technology, 24:1-32.

Tuckerman, S., and Zawiski, B., 2007. Case Studies of Dam Removal and TMDLs: Process and Results. Journal of Great Lakes Restoration, 33 (Special Issue 2): 103-116.

Unger, P.W., and McCalla, T.M., 1980. *Conservation Tillage Systems.* Advances in Agronomy, Vol. 33. pp. 2-53.

United States Army Corps of Engineers, Buffalo District, 1983. *Lorain Harbor, Ohio: Erosion and Sedimentation Study, Main Report.* Volume III, Report No. A133921.

United States Army Corps of Engineers, Buffalo District, 1991. *Special Flood Hazard Evaluation Report for French Creek, Mills Creek, and Robinson Ditch, City of North Ridgeville, Lorain County, Ohio.* Prepared for Ohio Department of Natural Resources, AD-A243 848, December 1991.

United States Army Corps of Engineers, Buffalo District, 2003. *Black River Watershed Sediment Delivery and Transport Modeling Assessment.* United States Army Corps of Engineers, Buffalo District, Buffalo, New York.

United States Army Corps of Engineers, Buffalo District, 2005. *Survey of French Creek Final Report.* Prepared for Ohio Department of Natural Resources, March 2005.

United States Department of Agriculture, 2007. *2007 Census of Agriculture.* United States Department of Agriculture, National Agricultural Statistics Service, Washington, D.C.

United States Environmental Protection Agency, 1976. *Quality Criteria for Water.* Washington, D.C.

United States Environmental Protection Agency, 1998. *Sediment Assessment and Remediation Report: Assessment of Sediment Quality in the Black River Watershed.* United States Environmental Protection Agency, Washington, DC.

United States Environmental Protection Agency, February 23, 2011. Clean Water Act (CWA). *In United States Environmental Protection Agency - Agriculture*. Retrieved April 23, 2011, from http://www.epa.gov/oecaagct/lcwa.html.

Webster, J.R., Gurtz, M.E., Hains, J.J., Meyer, J.L., Swank, W.T., Waide, J.B., and Wallace, J.B., 1983. *Stability of Stream Ecosystems.* Stream Ecology, edited by James Barnes and G.W. Marshall, Plenum Publishing Corporation, pp. 355-395.

Western Reserve Land Conservancy, 2010. GIS data on preserved lands. Western Reserve Land Conservancy, Firelands Office, Oberlin, Ohio.

White, George W. 1982. *Glacial Geology of Northeastern Ohio.* Bulletin 68. Ohio Department of Natural Resources, Division of Geological Survey.

Wickens, William G., 1985. *The Birth of a City*. The Lorain Journal, Lorain, Ohio. 52 pp.

Willrich, Ted L. and Smith, George E., 1970. *Agricultural Practices and Water Quality.* The Iowa State University Press, Ames, Iowa.

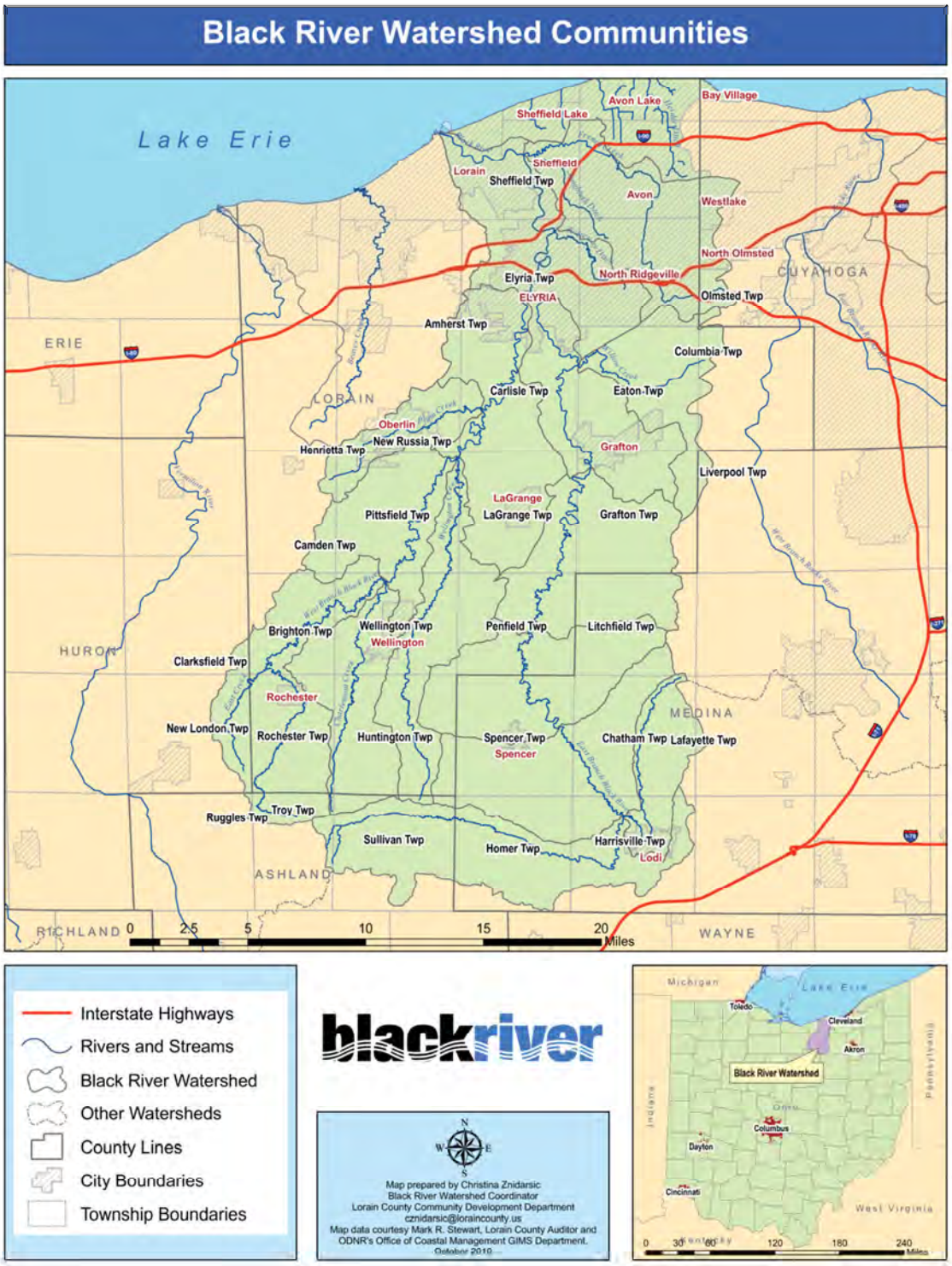
Yoder, C.O. and Rankin, E.T., 1995. *The Role of Biological Criteria in Water Quality Monitoring, Assessment, and Regulation.* Ohio EPA Technical Series, Division of Water Quality Monitoring and Assessment, Surface Water Section, Columbus, Ohio.

Appendix A

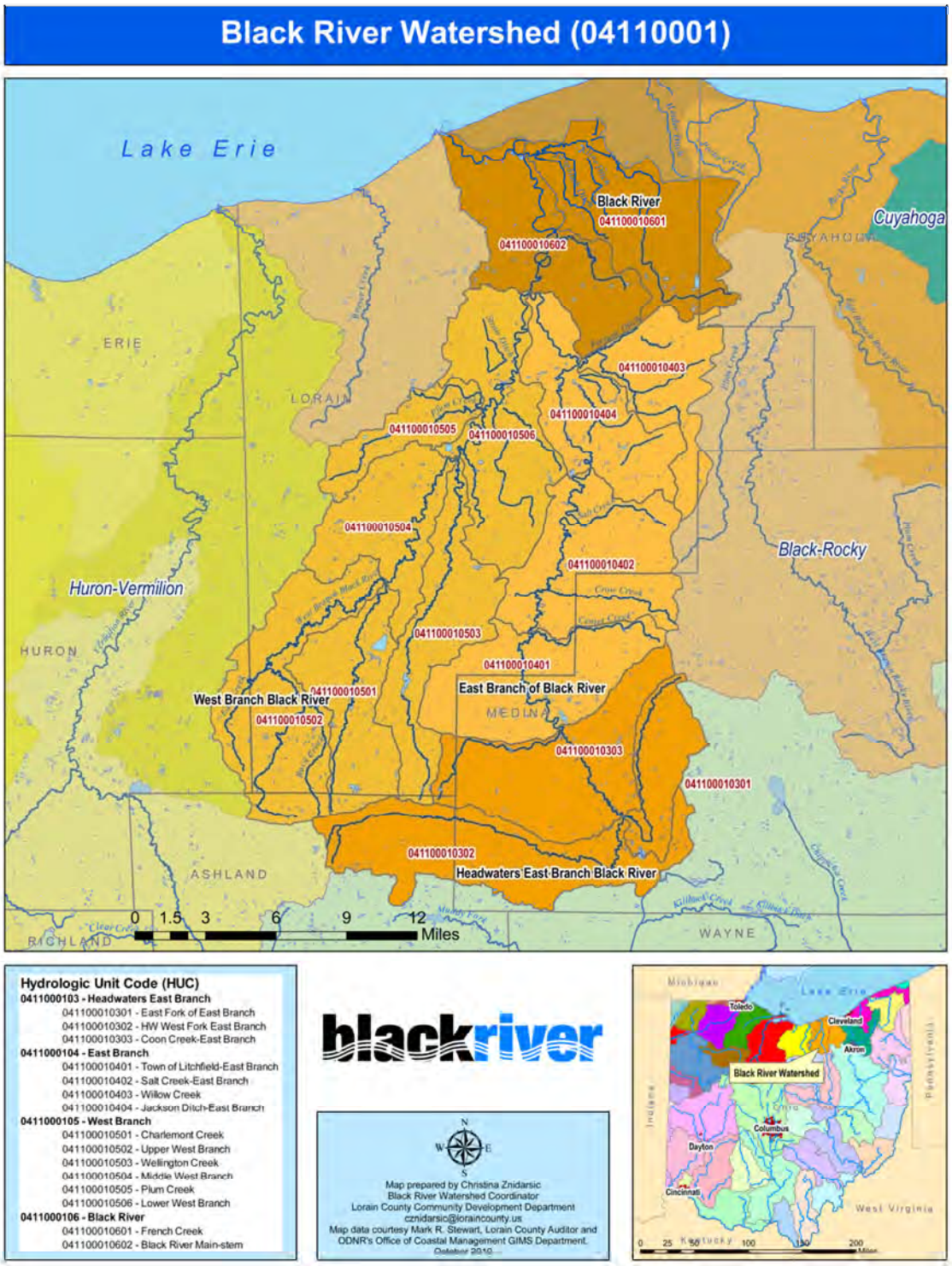
Black River Watershed Maps

Table of Maps

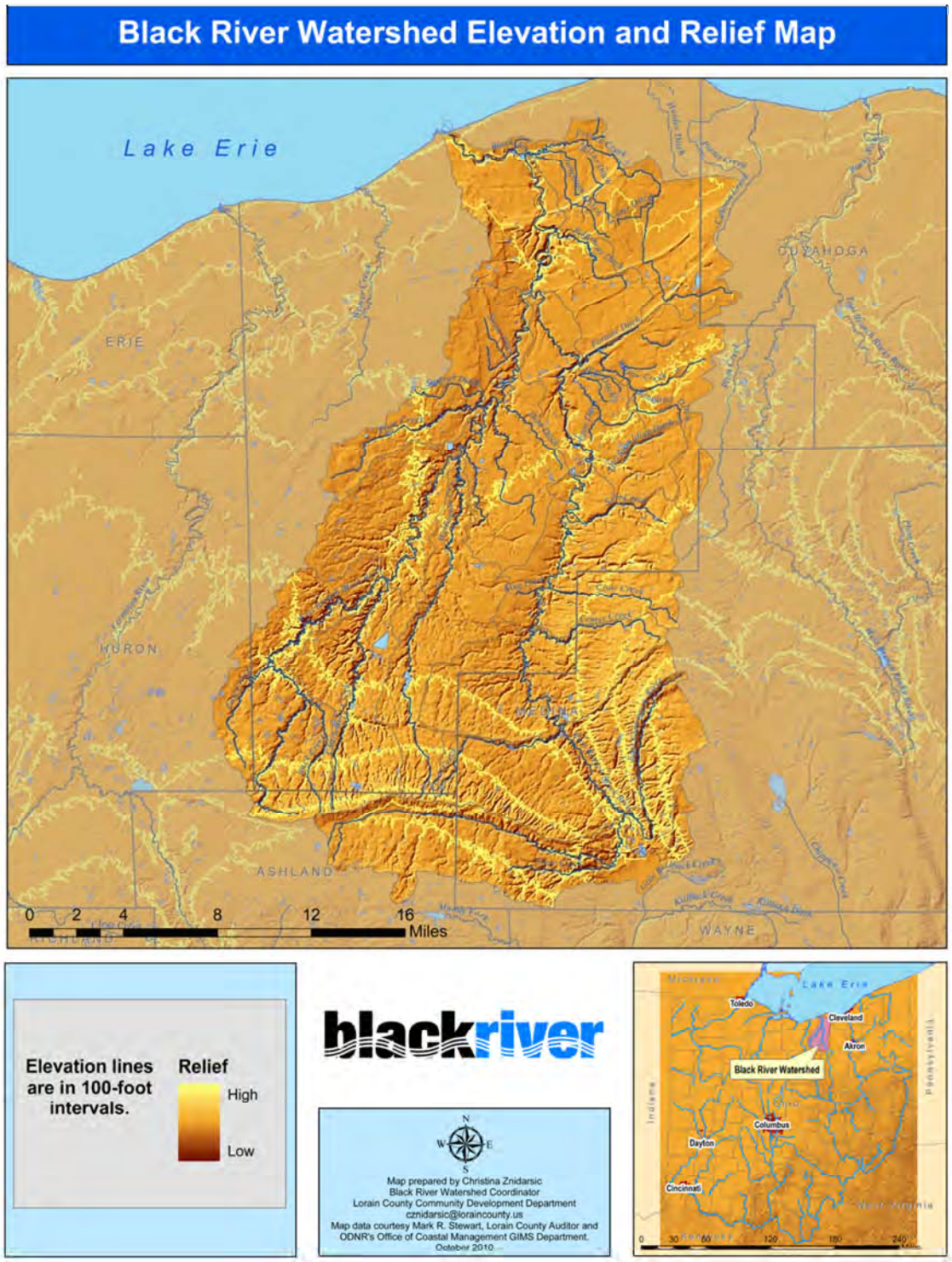
Map 1: Black River Watershed Communities. iii
Map 2: Hydrologic Unit Codes. iv
Map 3: Elevation and Shaded Relief. v
Map 4: Ecoregions. vi
Map 5: Hydric Soil Distribution. vii
Map 6: Bedrock Geology. viii
Map 7: Primary Lithology. ix
Map 8: Sensitive Species and Conservation Areas (DNAP, Audubon, The Nature Conservancy). x
Map 9: Average Precipitation. xi
Map 10: Wetlands (National Wetlands Inventory). xii
Map 11: Glacial Aquifer Distribution. xiii
Map 12: Intake Locations with Corridor Management Zones Delineated. xiv
Map 13: DRASTIC Index of Groundwater Pollution Potential. xv
Map 14: Land Use. xvi
Map 15: Prime Farmland. xvii
Map 16: Managed Areas. xviii
Map 17: Land Use Change, 2001-2006. xix
Map 18: Original Vegetation. xx
Map 19: Floodplains. xxi
Map 20: Dams by Location and Purpose. xxii
Map 21: Highly Erodible Lands. xxiii
Map 22: Potentially Eroding Banks. xxiv
Map 23: Use Designations. xxv
Map 24: Major and Minor NPDES Permit Holders. xxvi
Map 25: Black River Watershed Attainment Status xxvii
Map 26: Black River Watershed Urbanized Areas xxviii



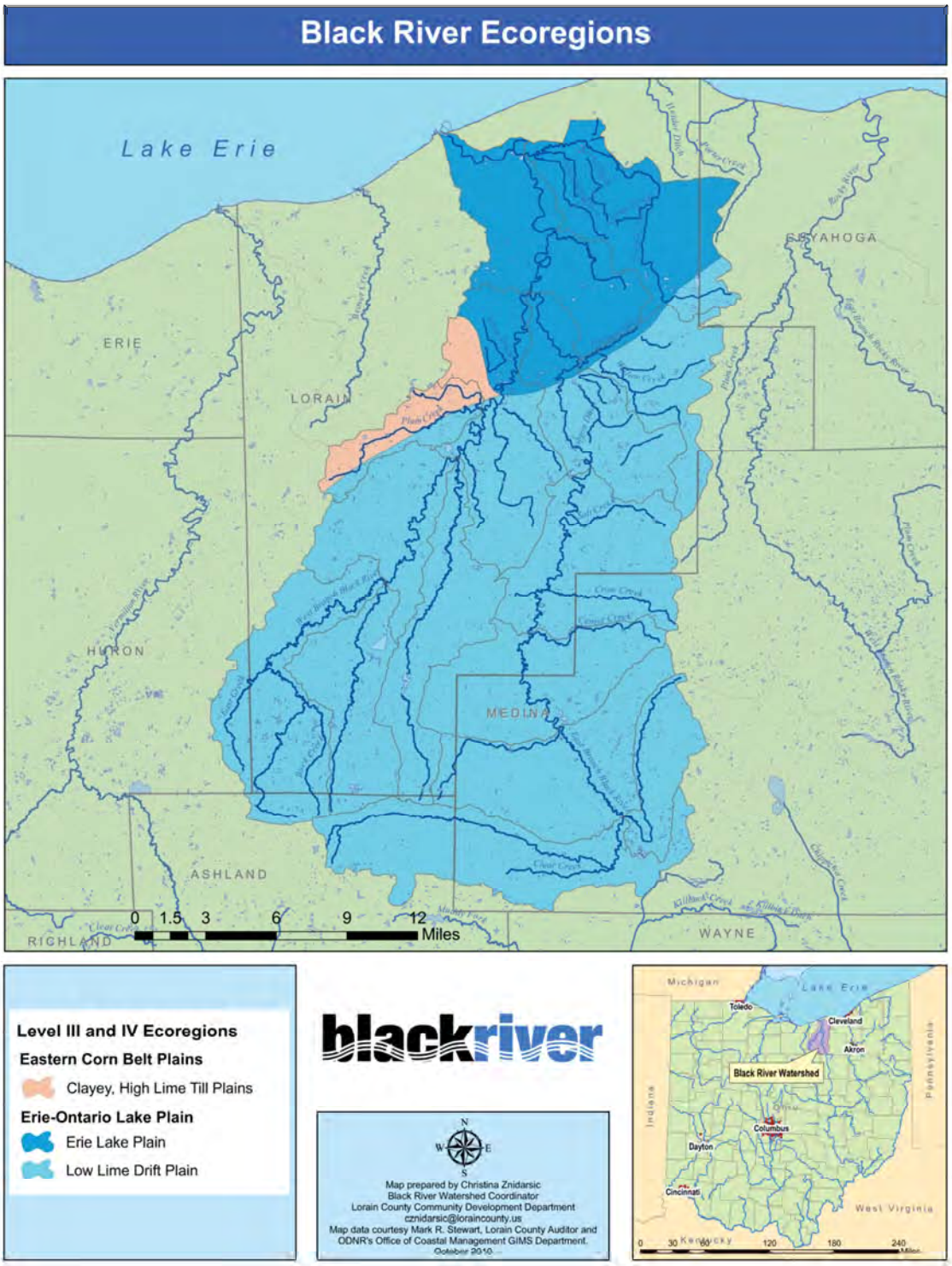
Map 1: Black River Watershed Communities.



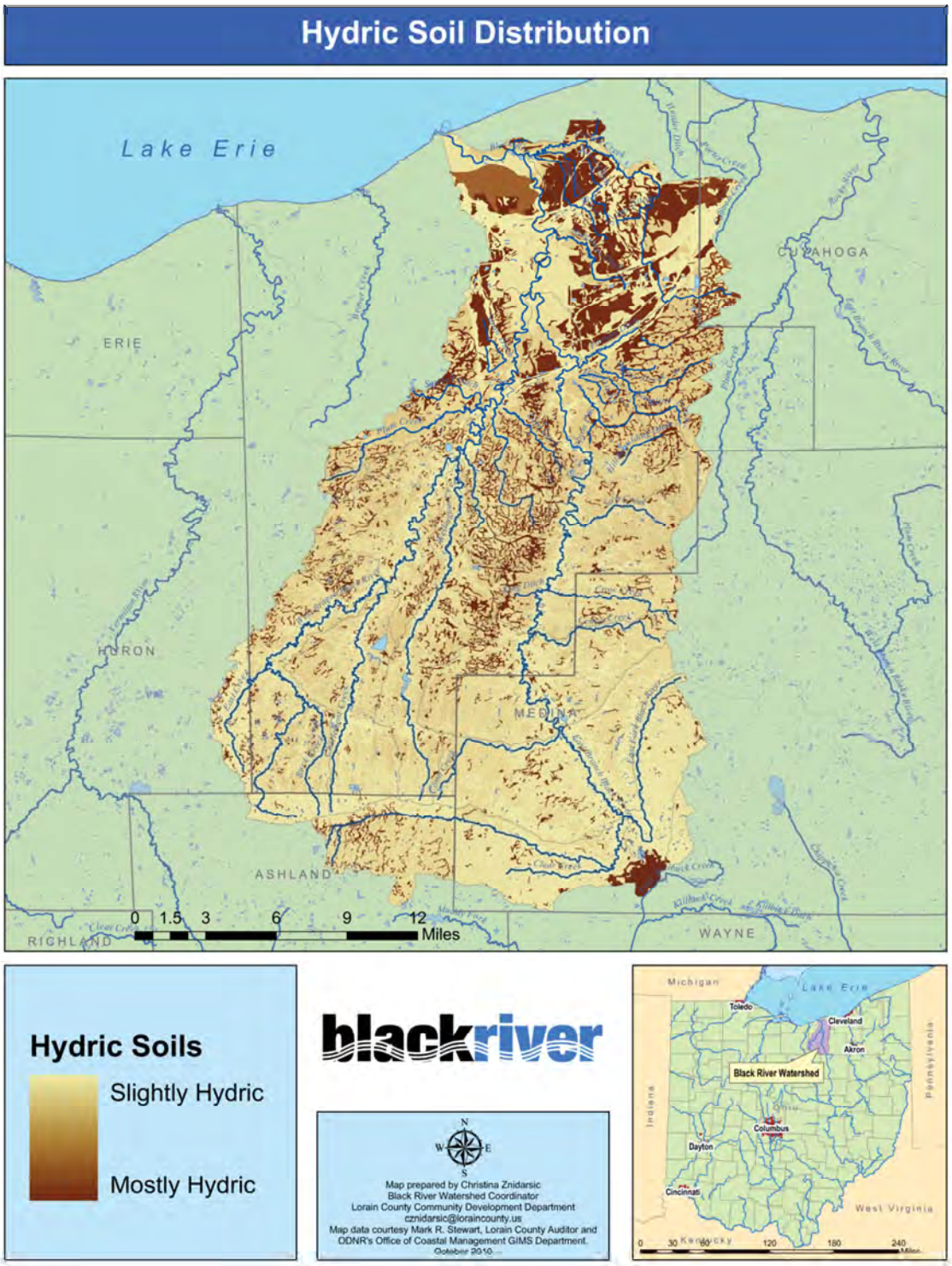
Map 2: Hydrologic Unit Codes.



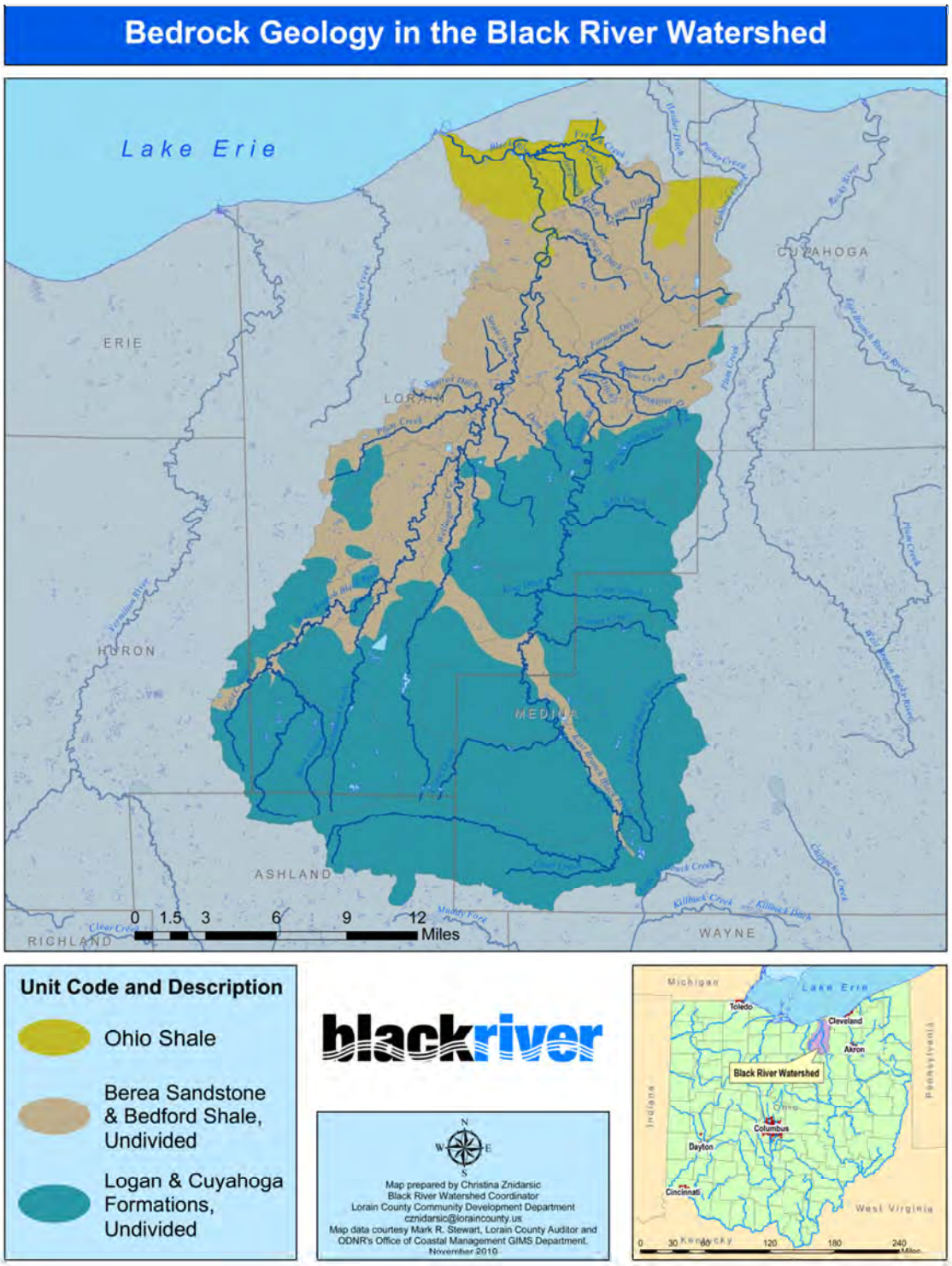
Map 3: Elevation and Shaded Relief.



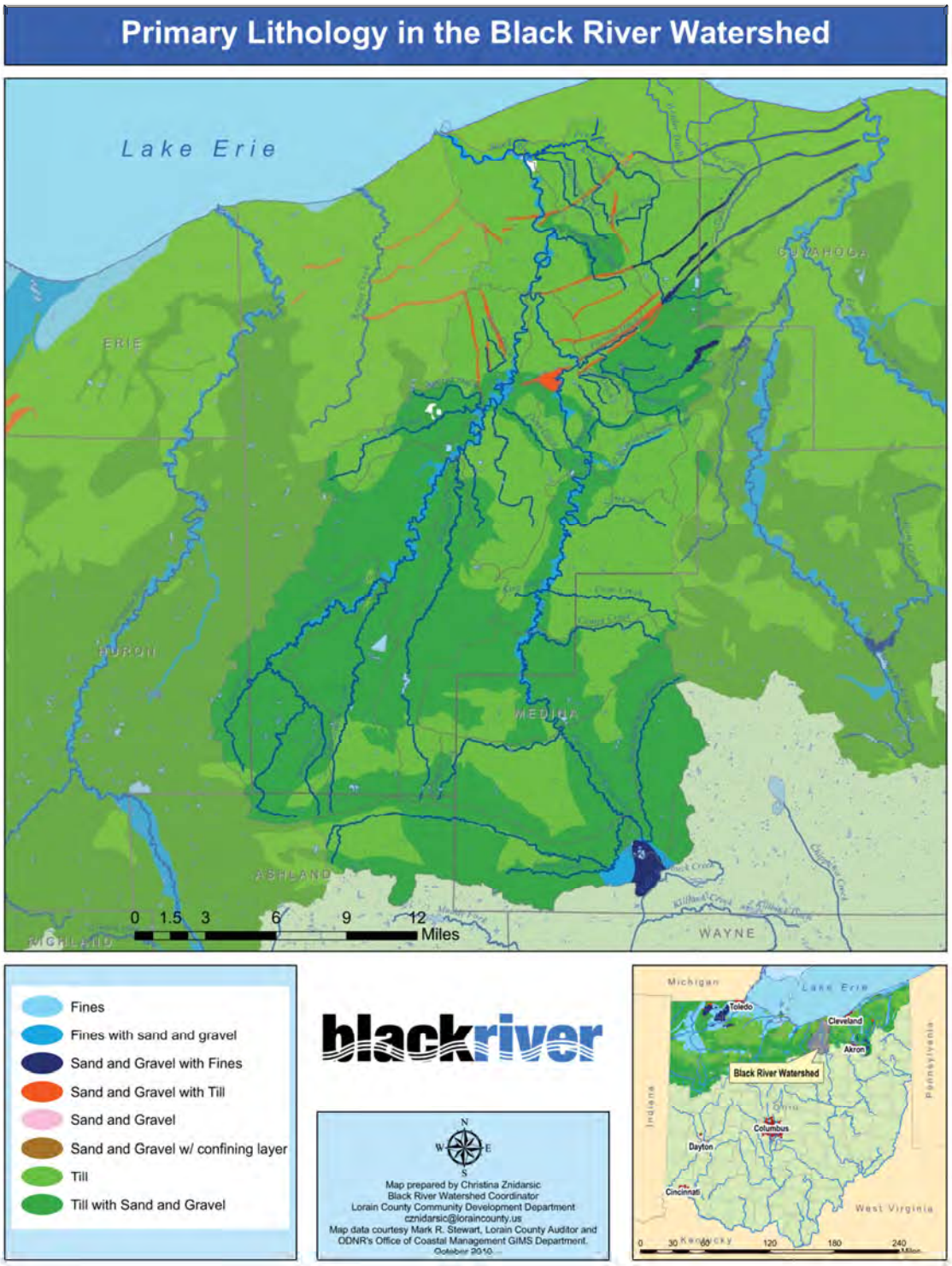
Map 4: Ecoregions.



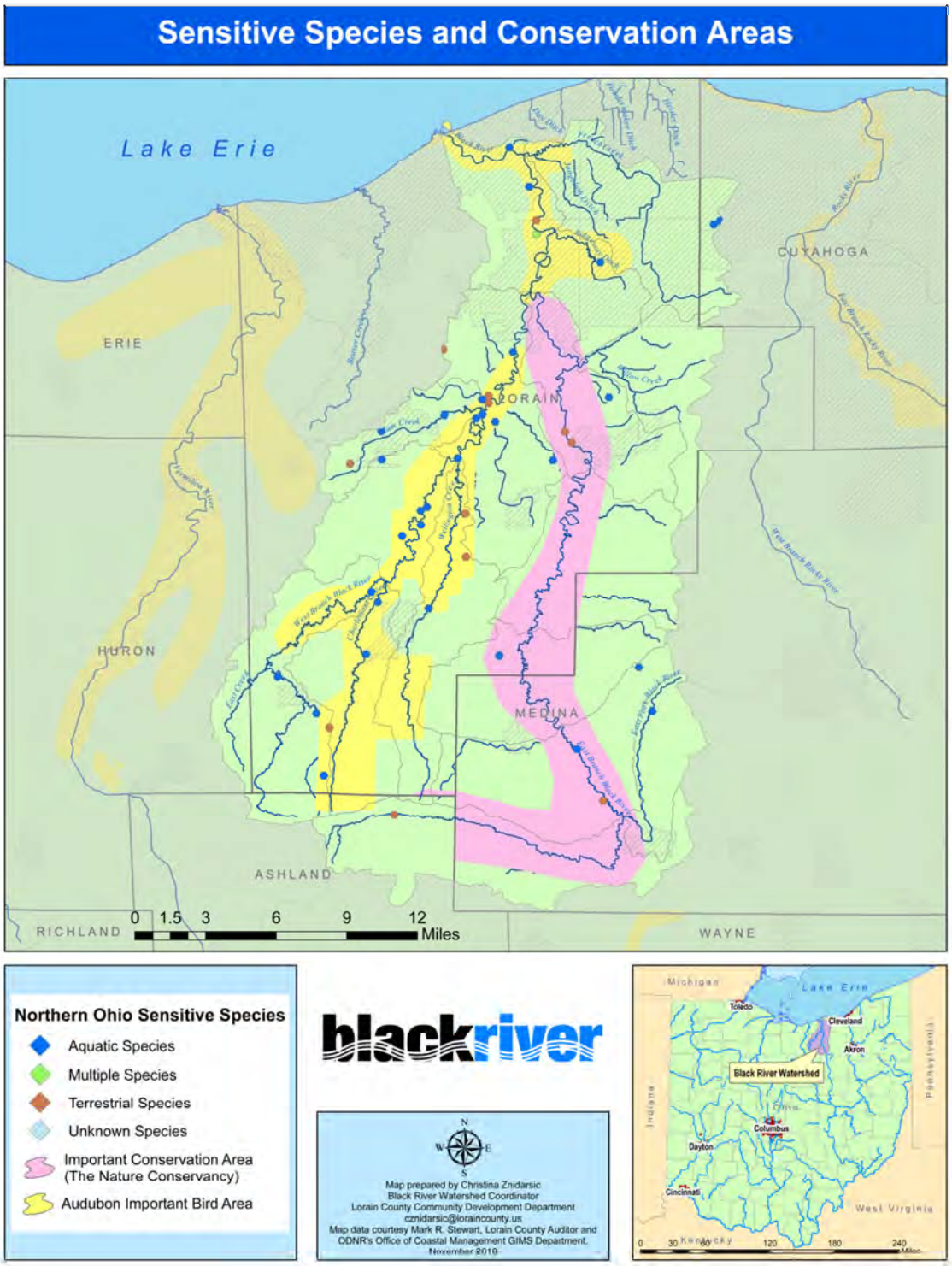
Map 5: Hydric Soil Distribution.



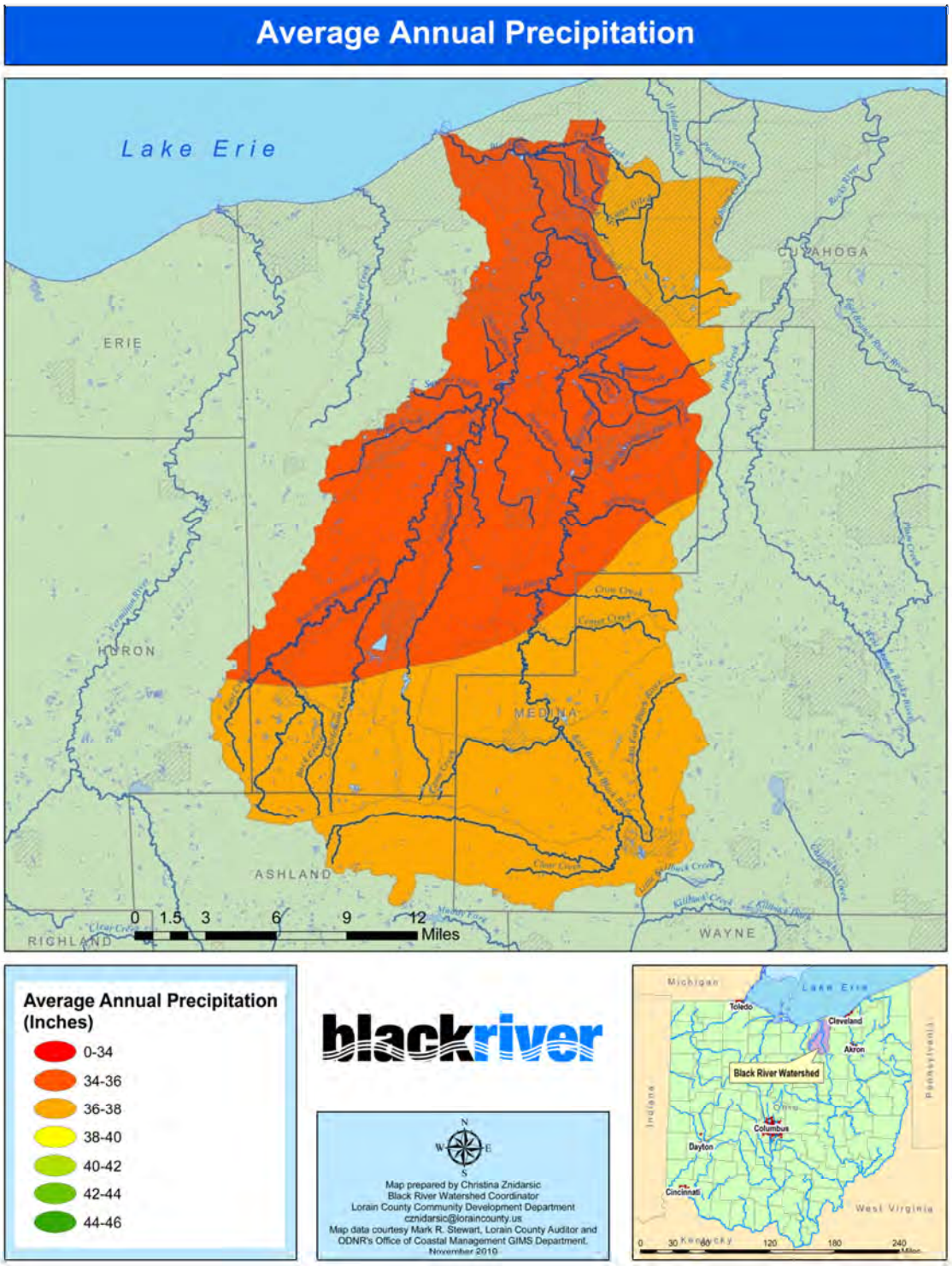
Map 6: Bedrock Geology.



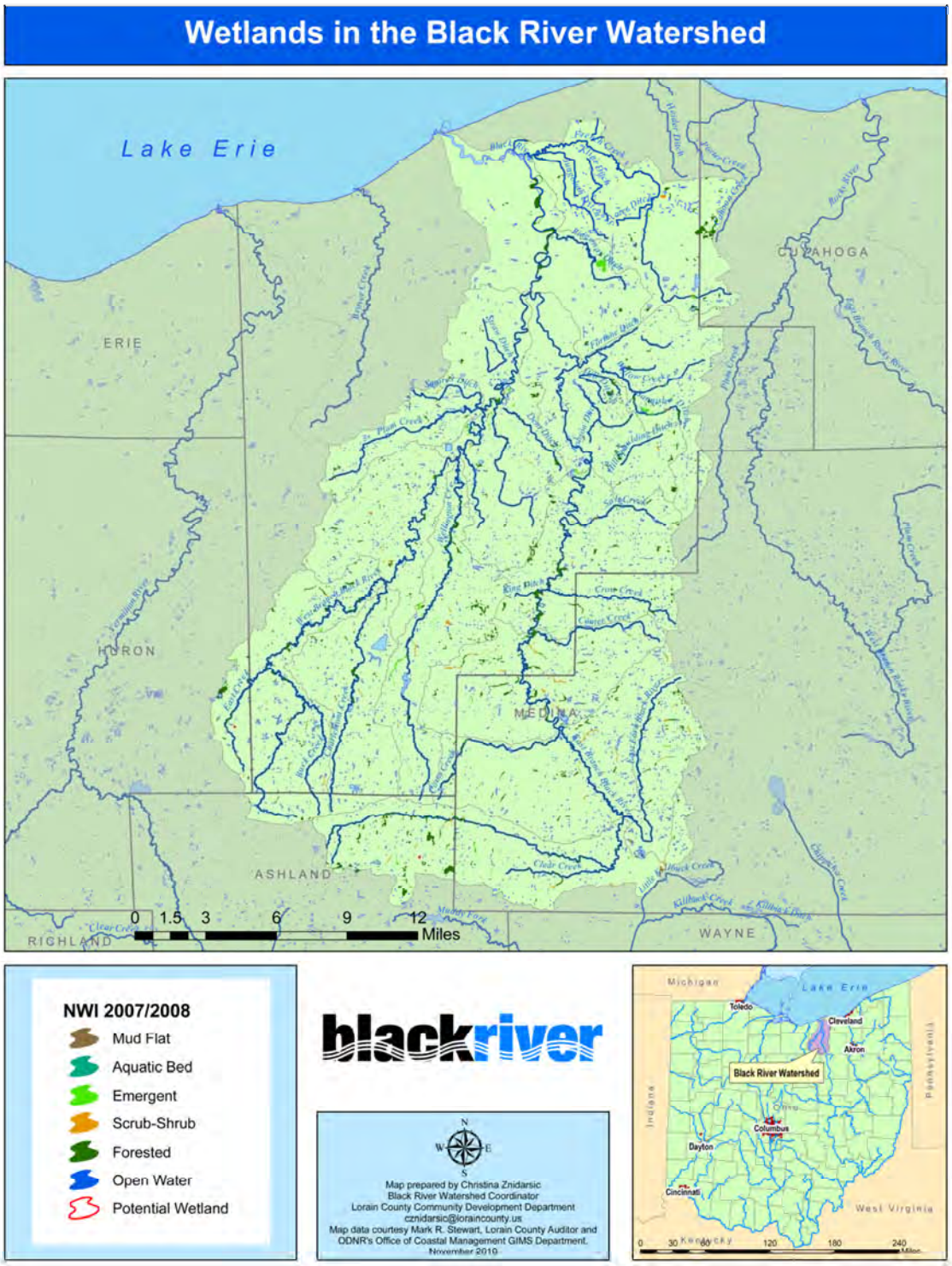
Map 7: Primary Lithology.



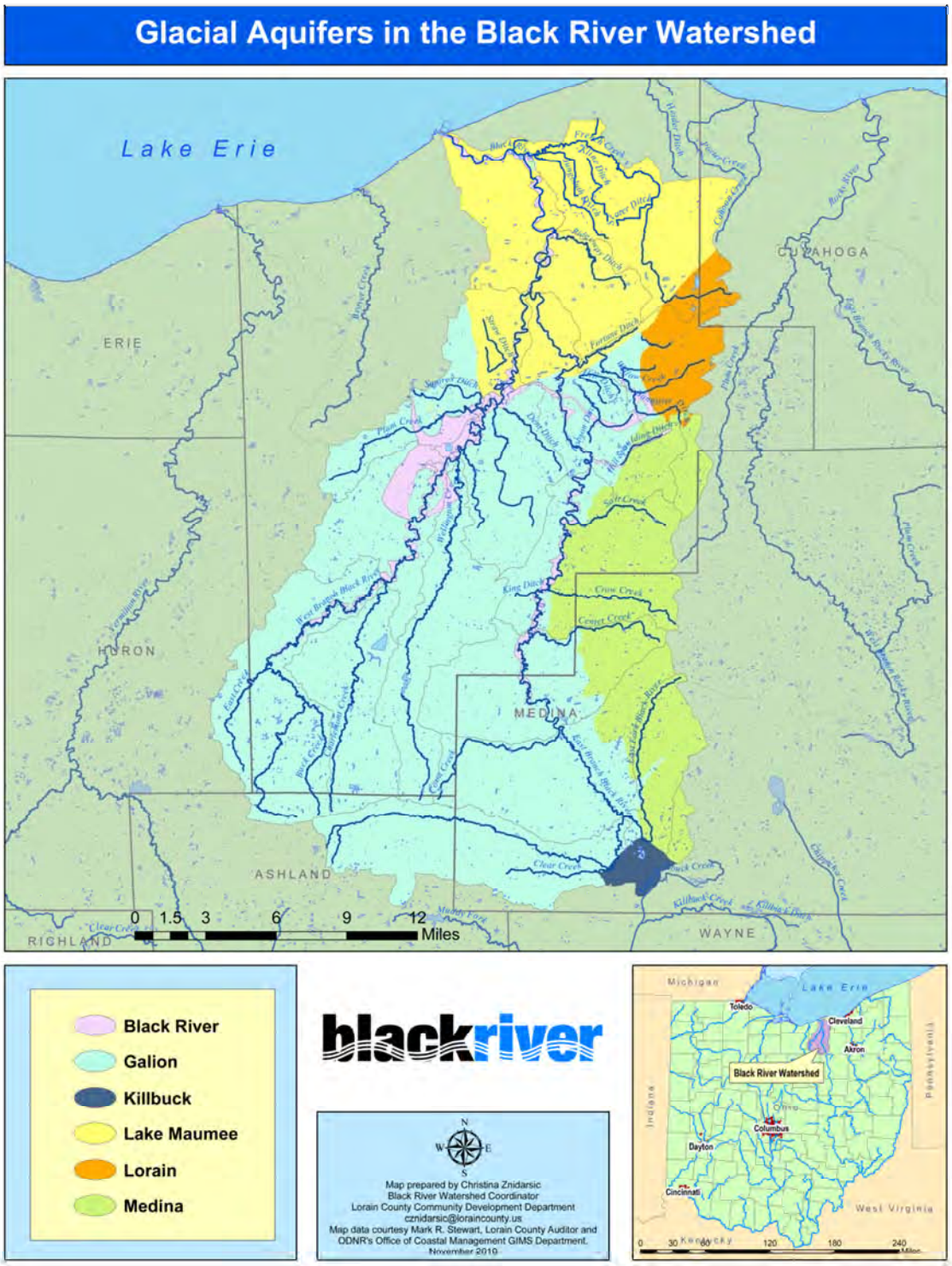
Map 8: Sensitive Species and Conservation Areas (DNAP, Audubon, The Nature Conservancy).



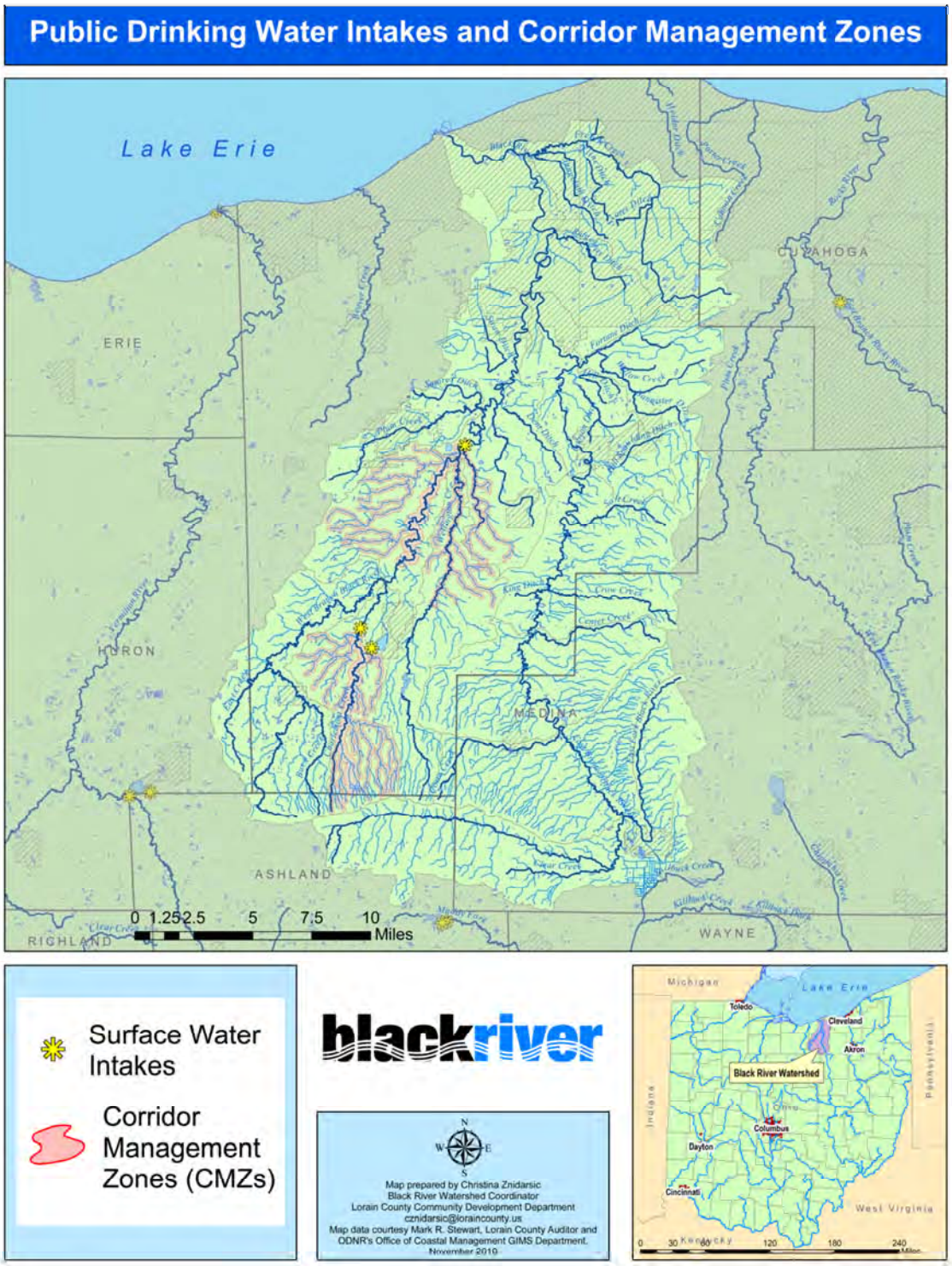
Map 9: Average Precipitation.



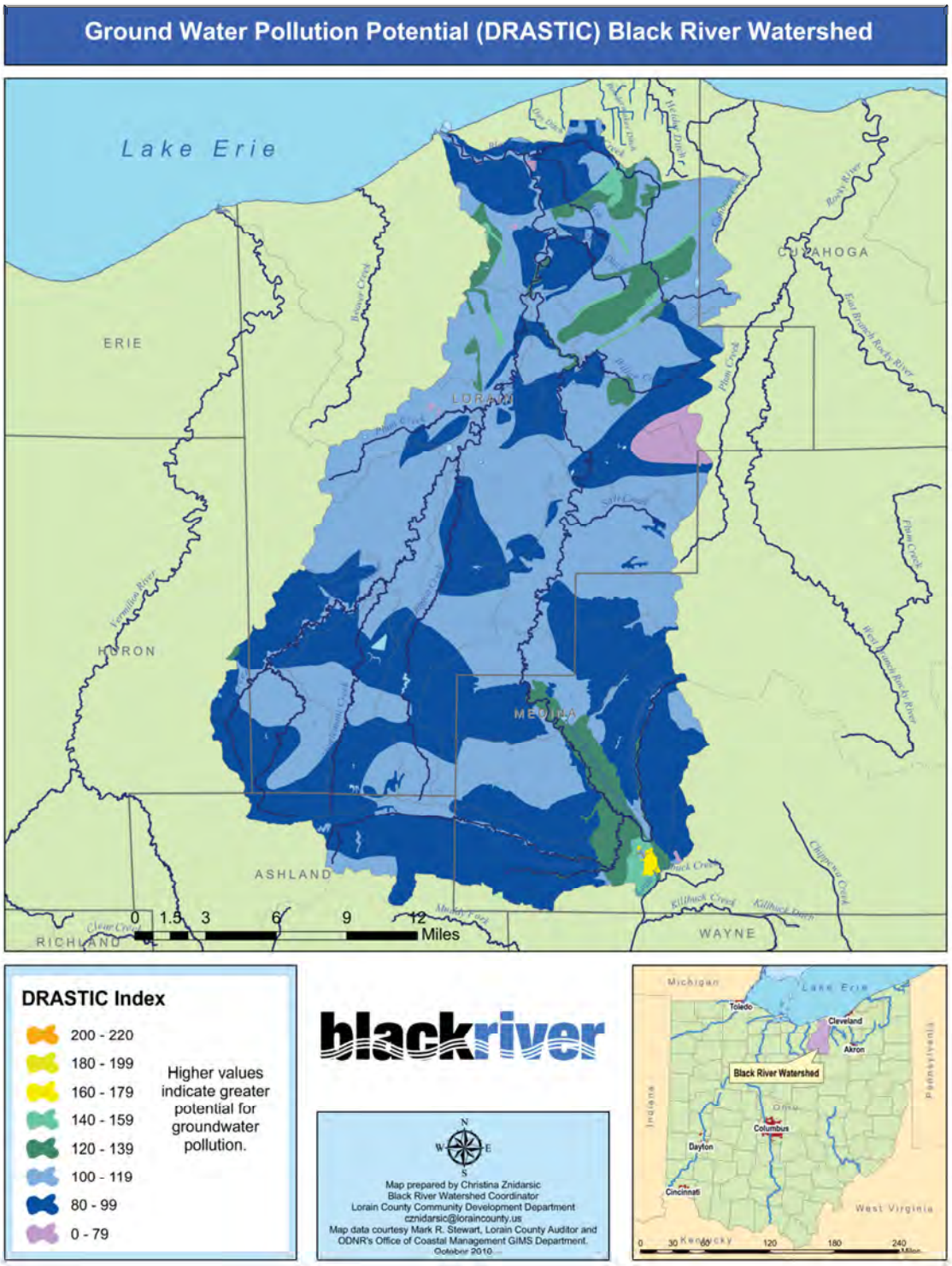
Map 10: Wetlands (National Wetlands Inventory).



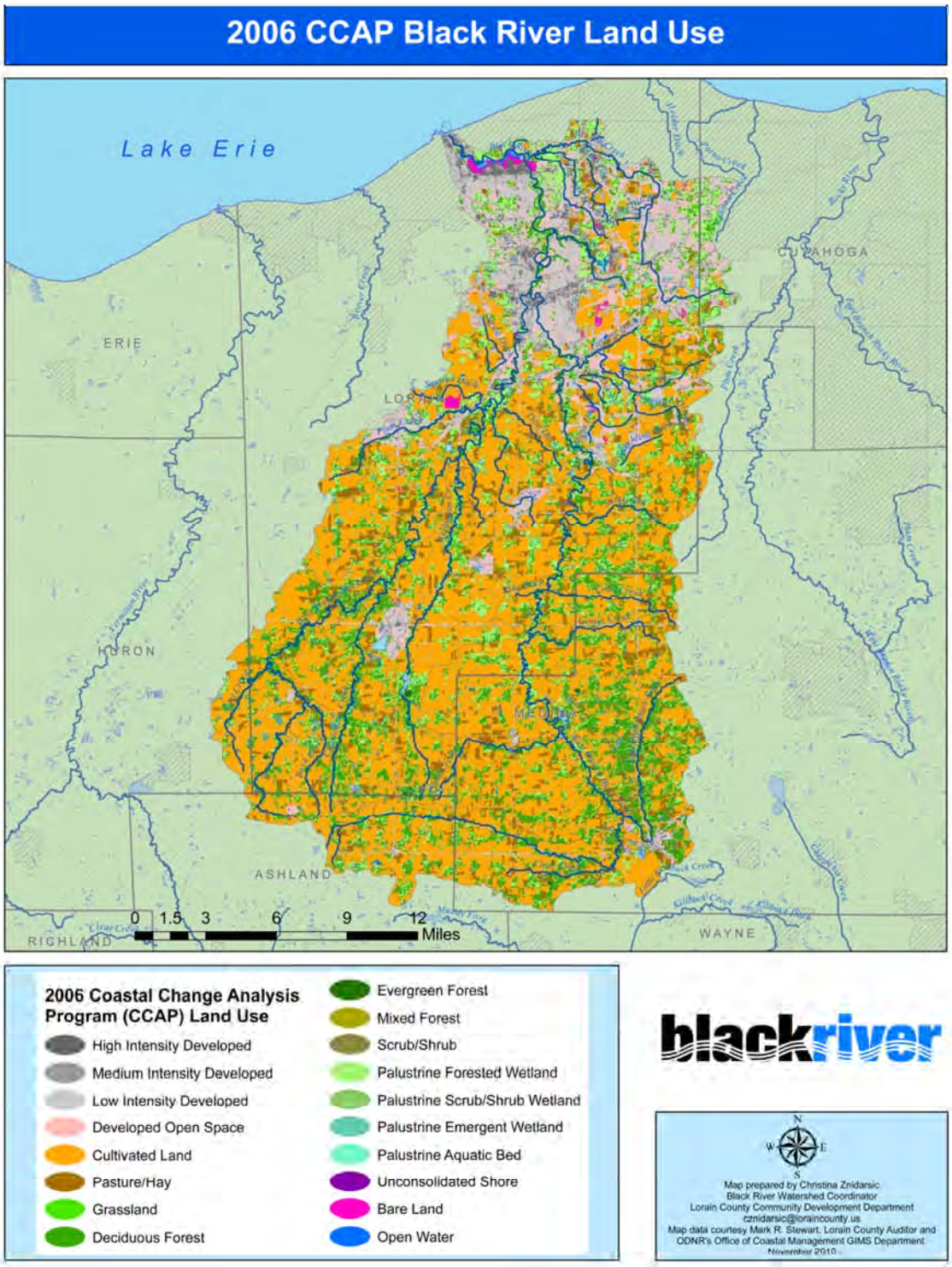
Map 11: Glacial Aquifer Distribution.



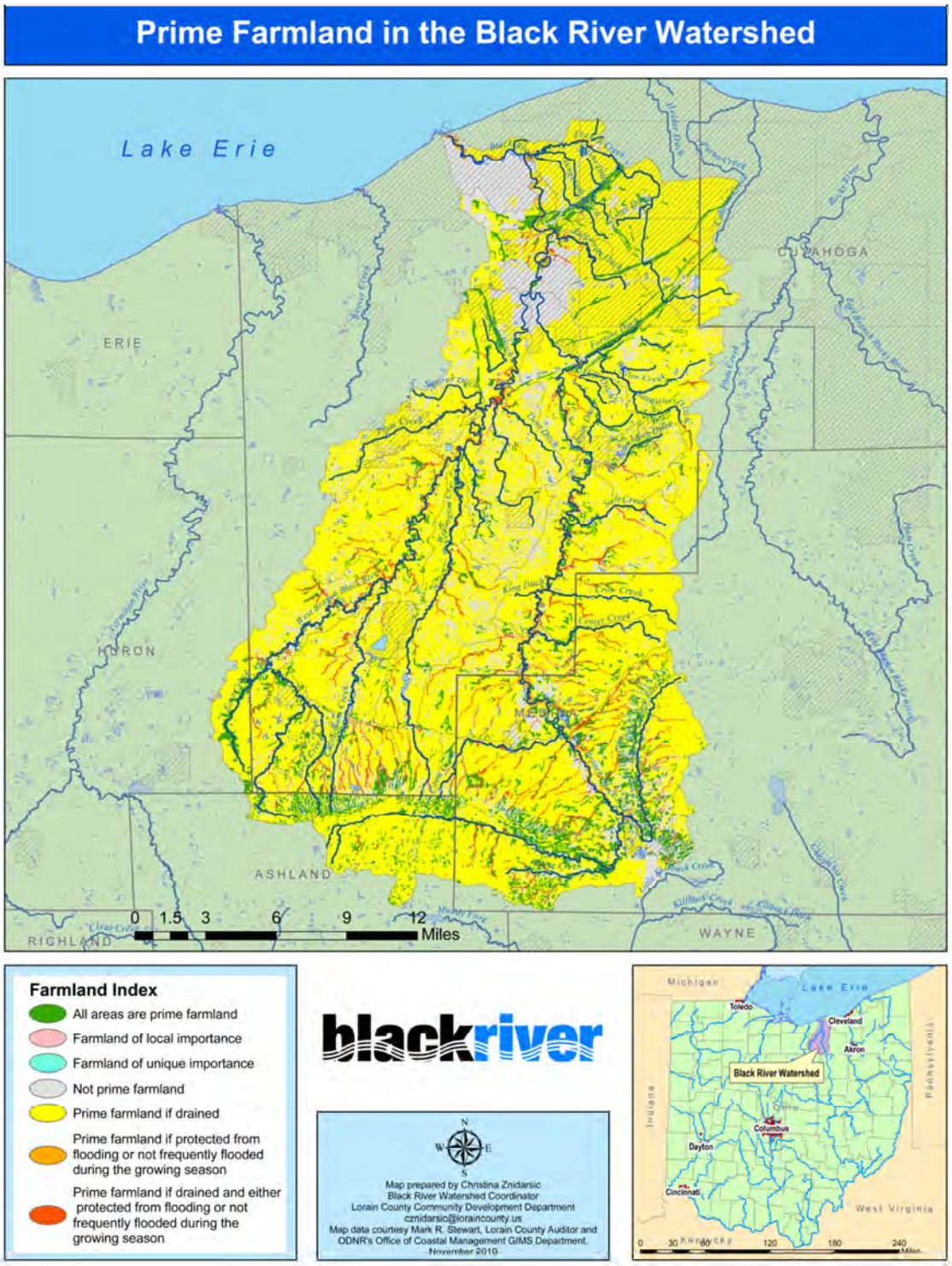
Map 12: Intake Locations with Corridor Management Zones Delineated.



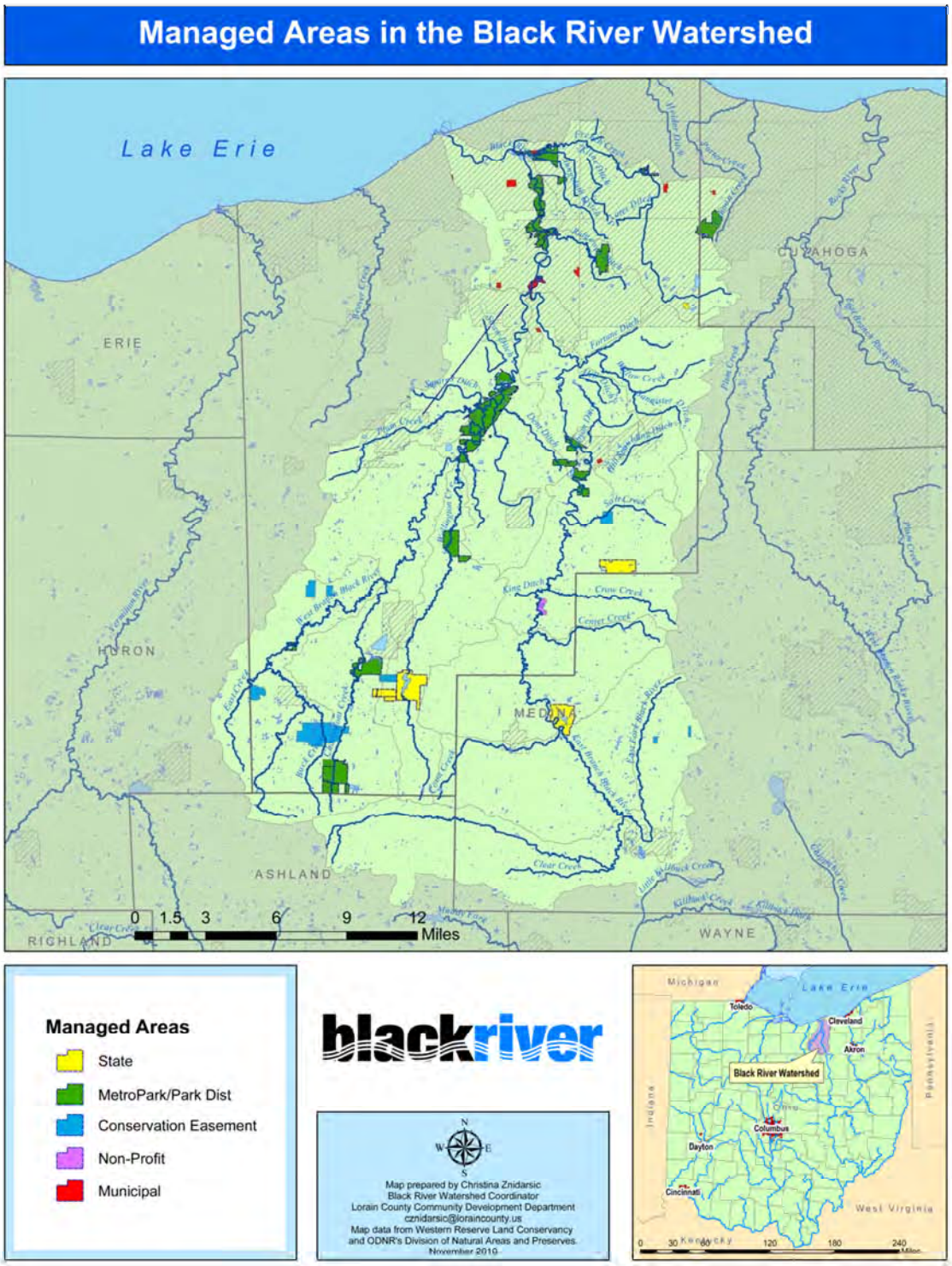
Map 13: DRASTIC Index of Groundwater Pollution Potential.



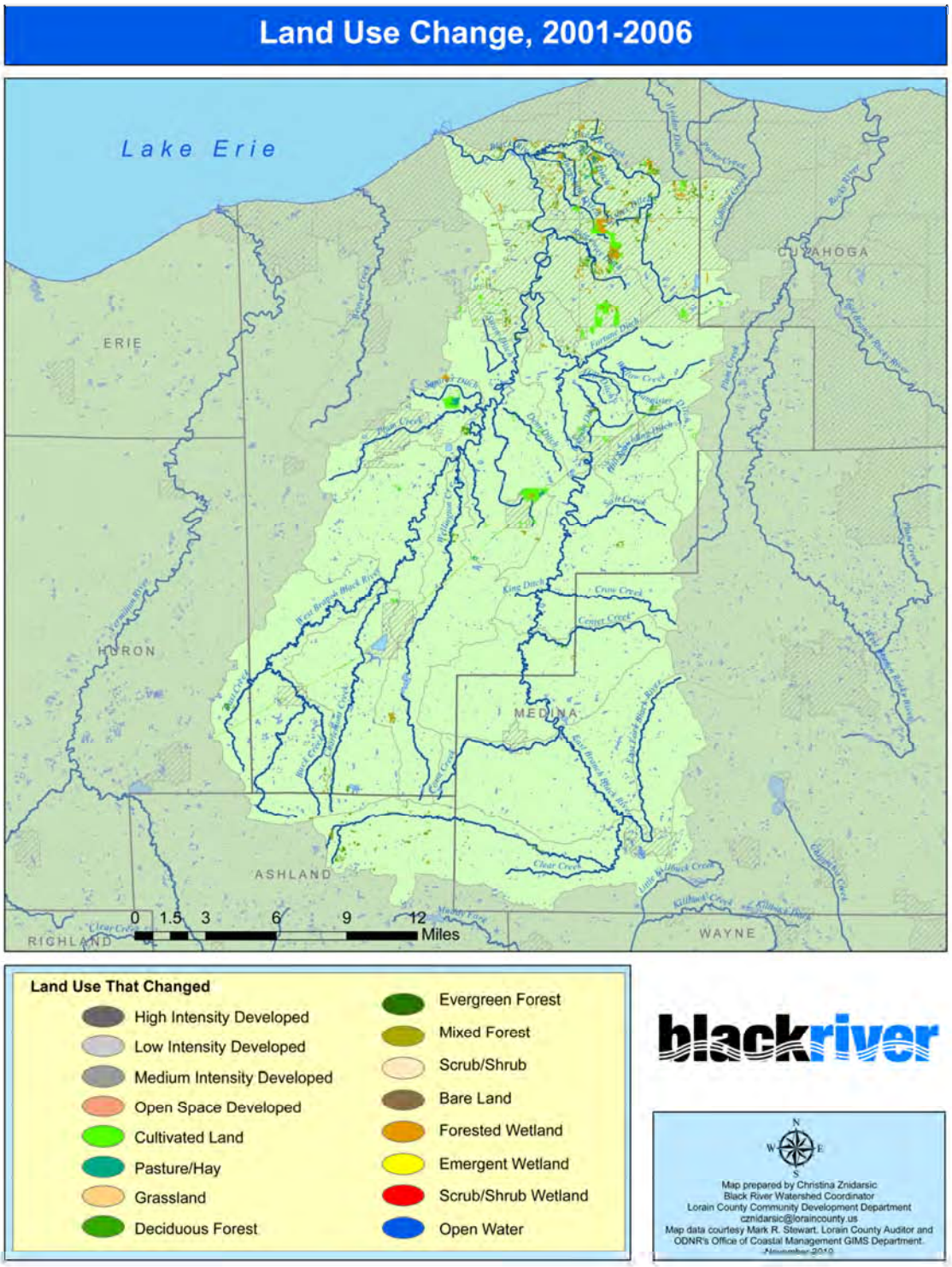
Map 14: Land Use.



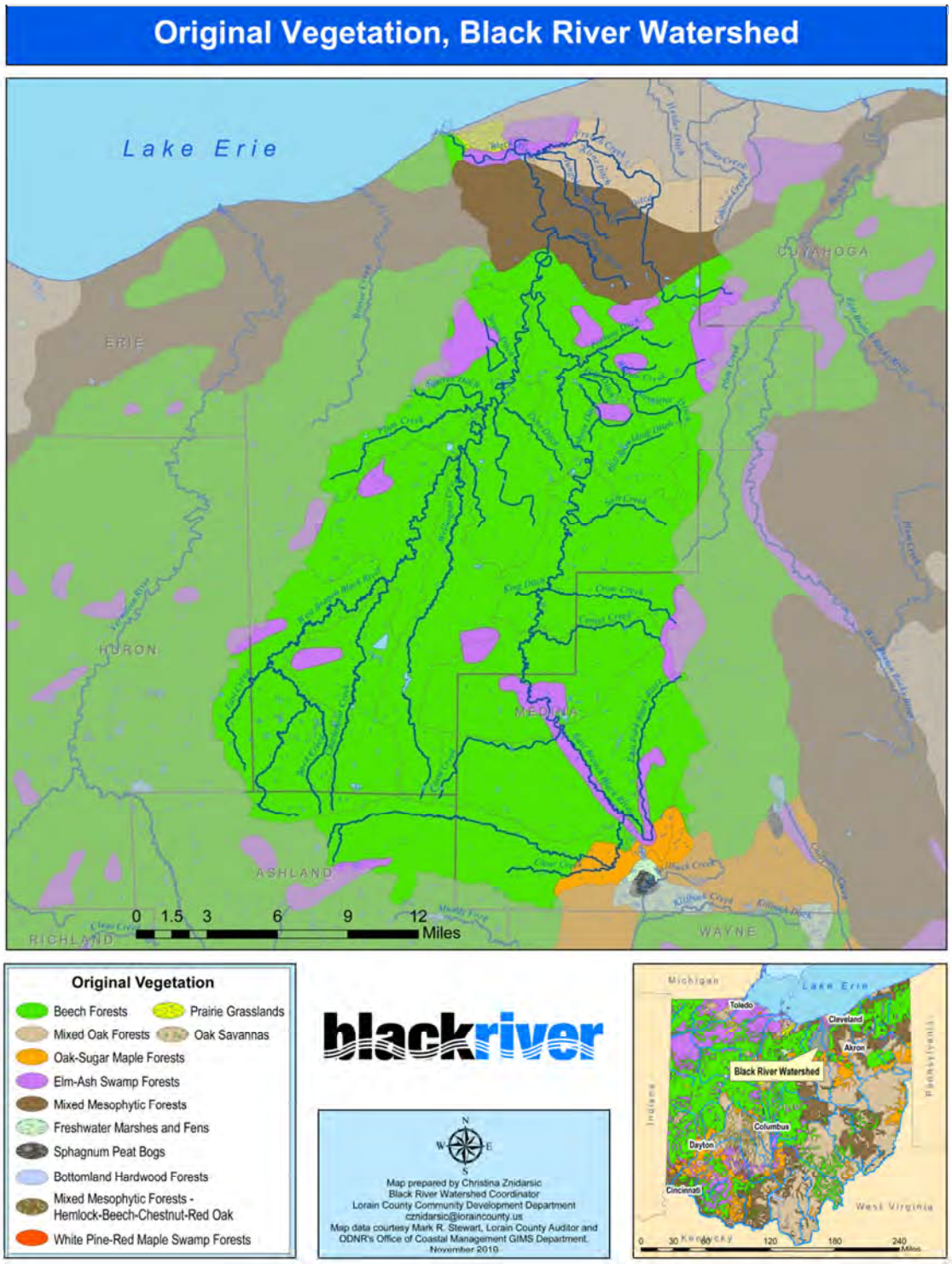
Map 15: Prime Farmland.



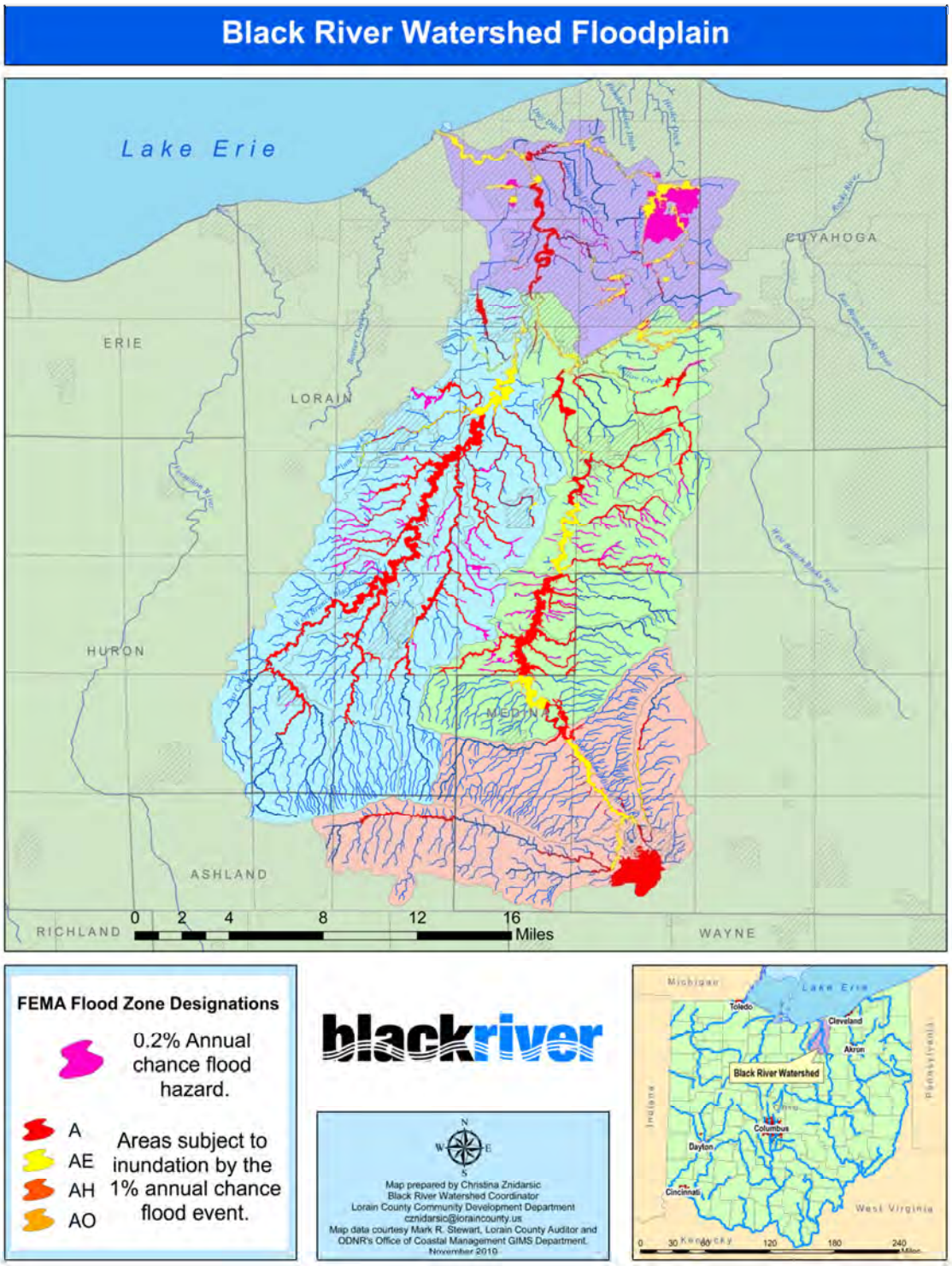
Map 16: Managed Areas.



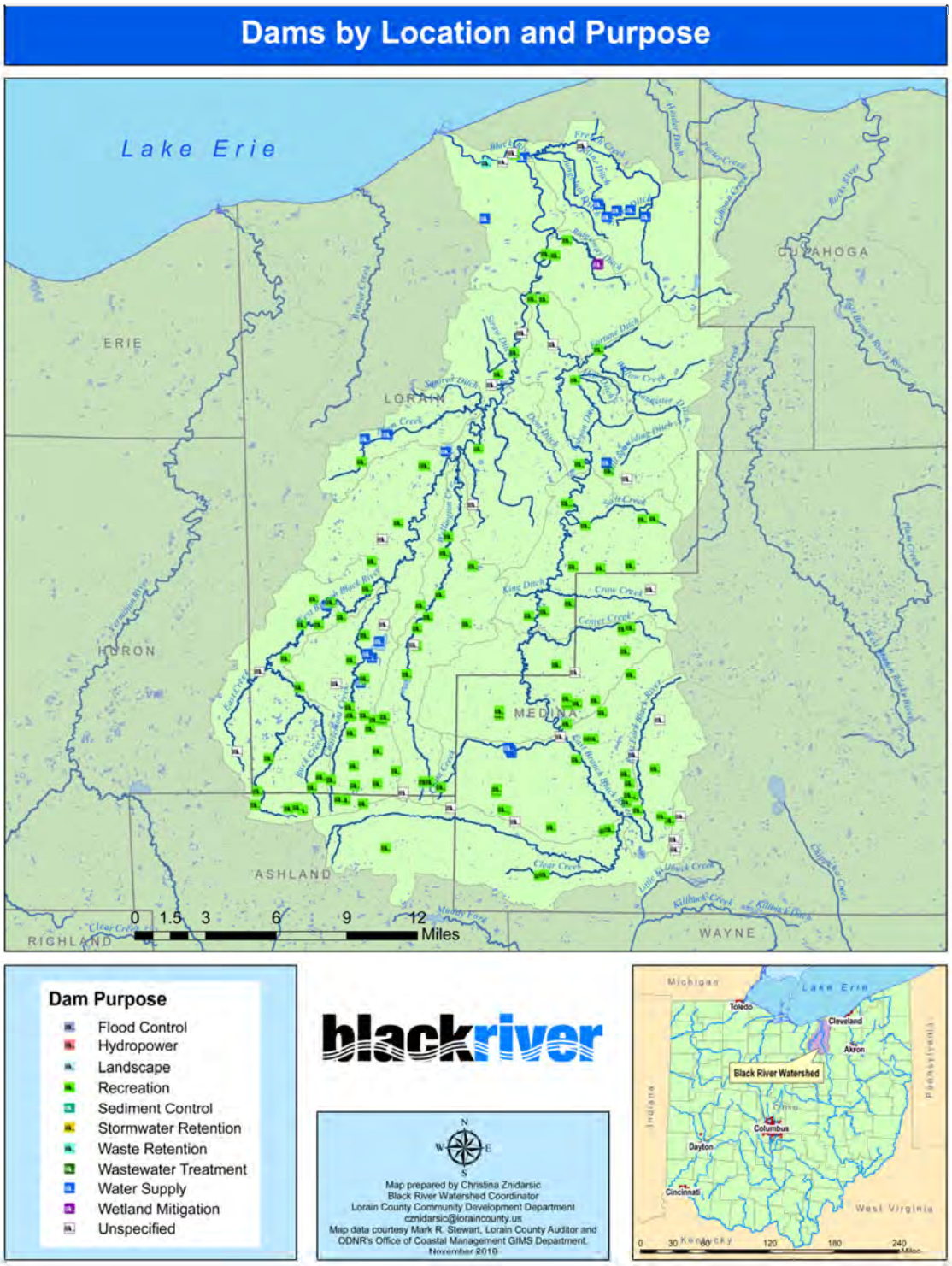
Map 17: Land Use Change, 2001-2006.



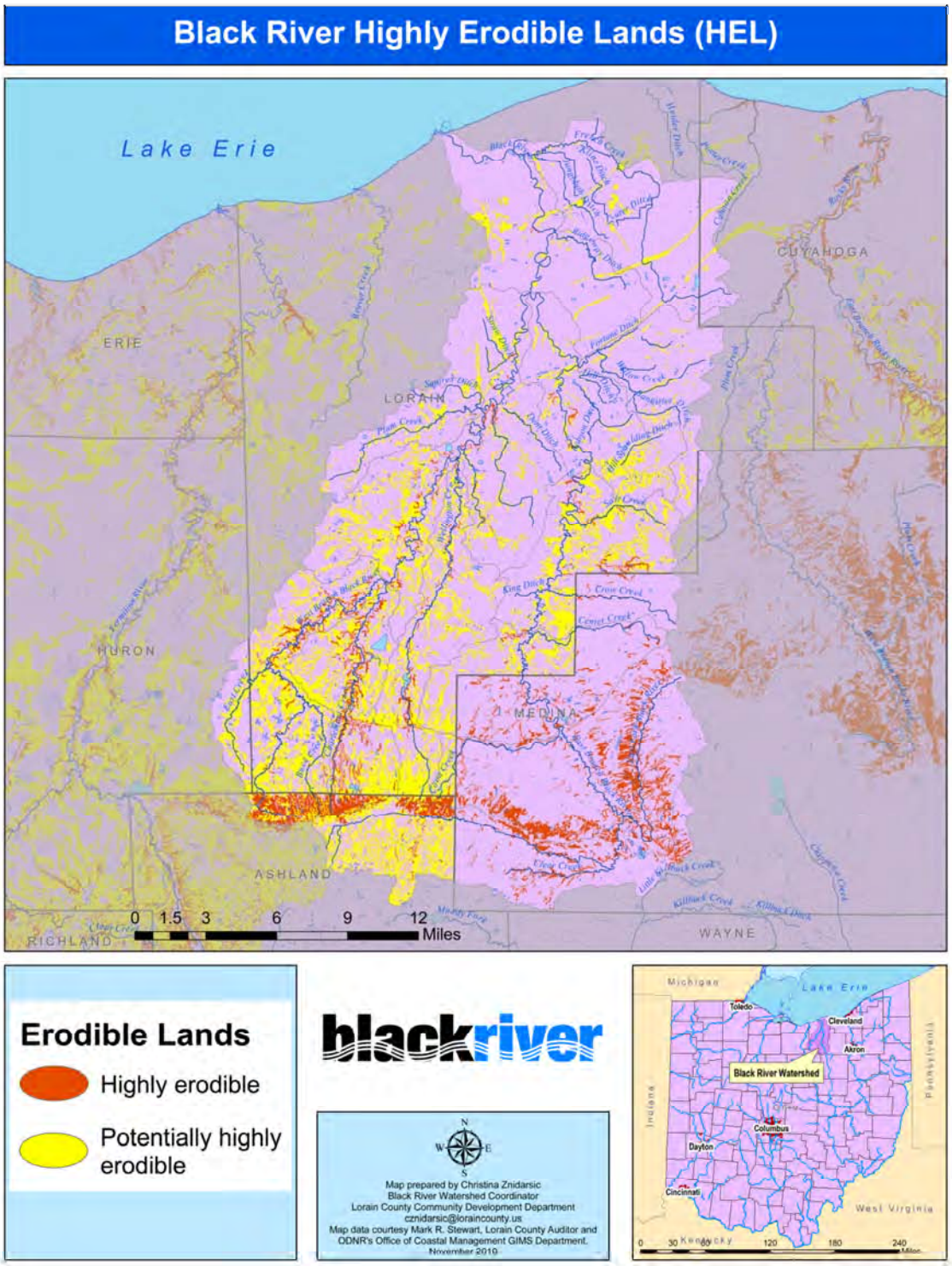
Map 18: Original Vegetation.



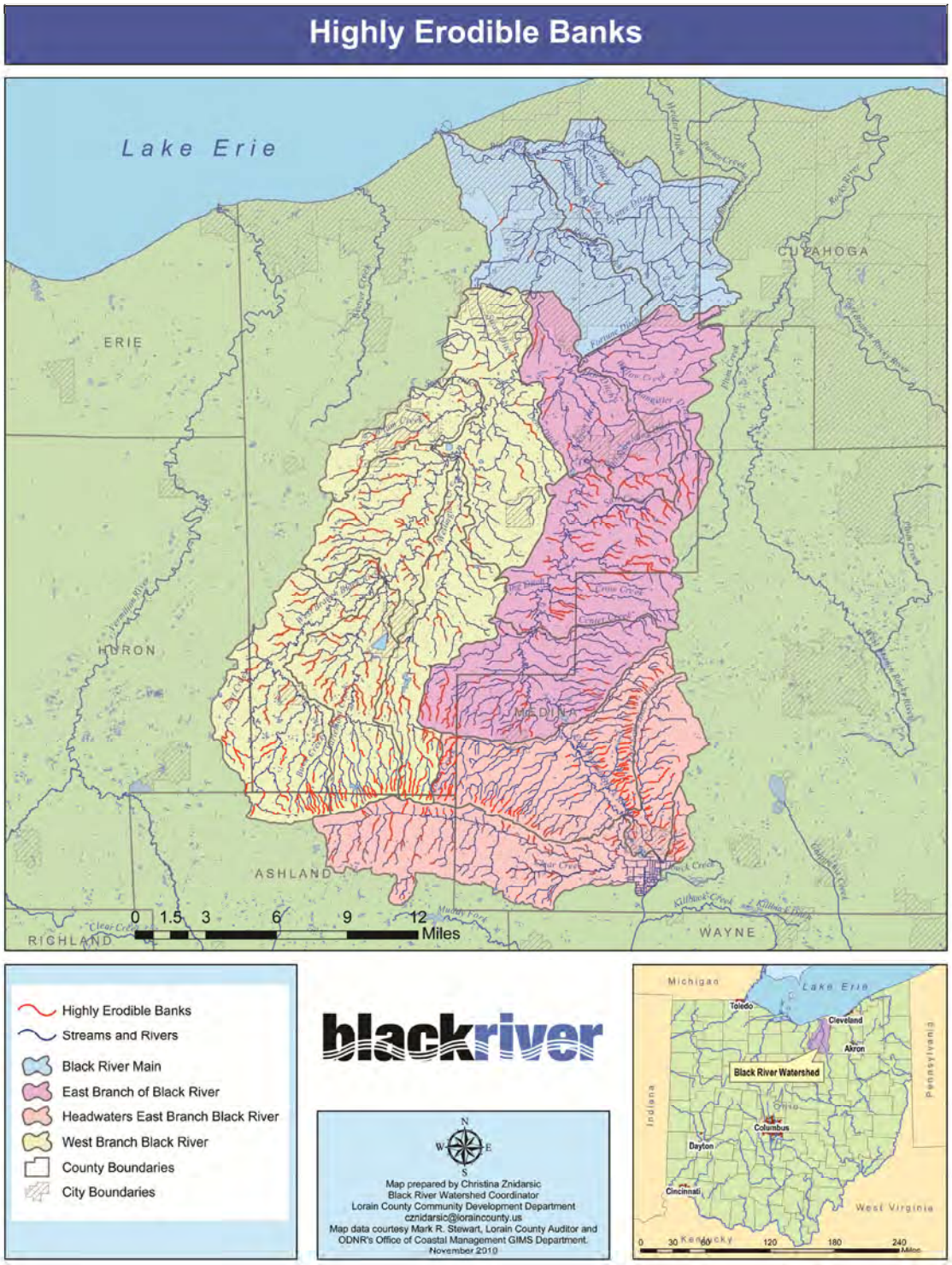
Map 19: Floodplains.



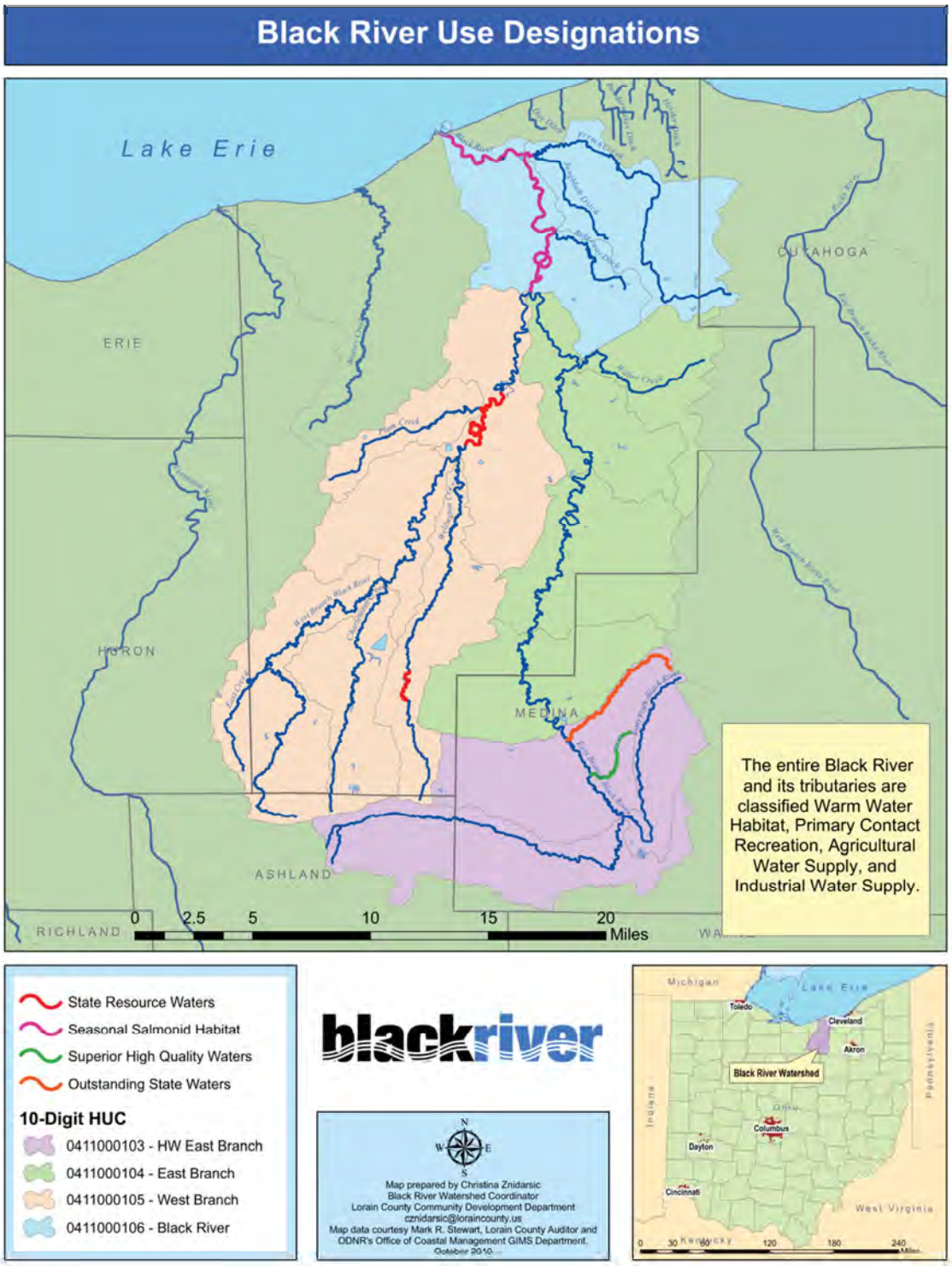
Map 20: Dams by Location and Purpose.



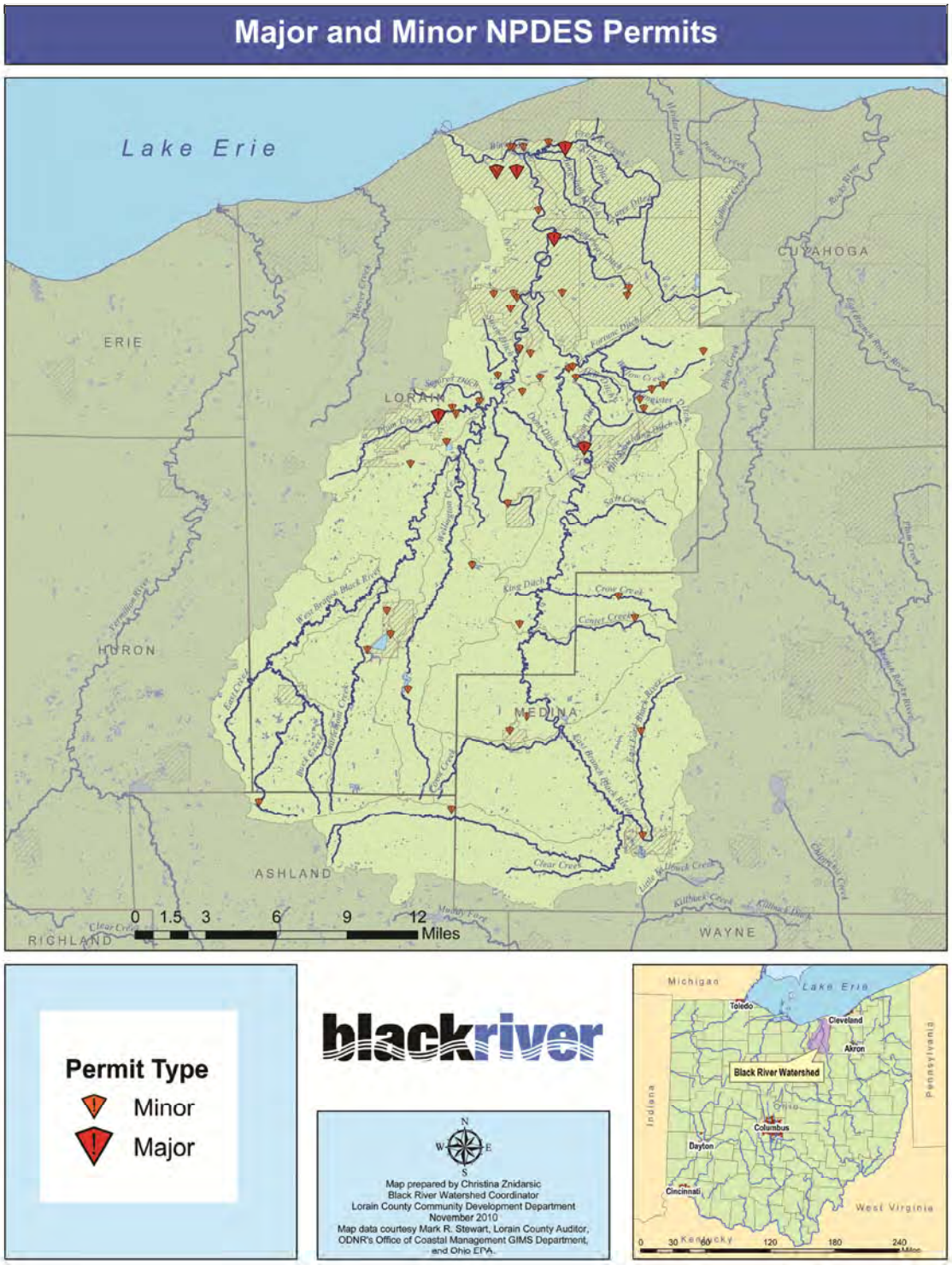
Map 21: Highly Erodible Lands.



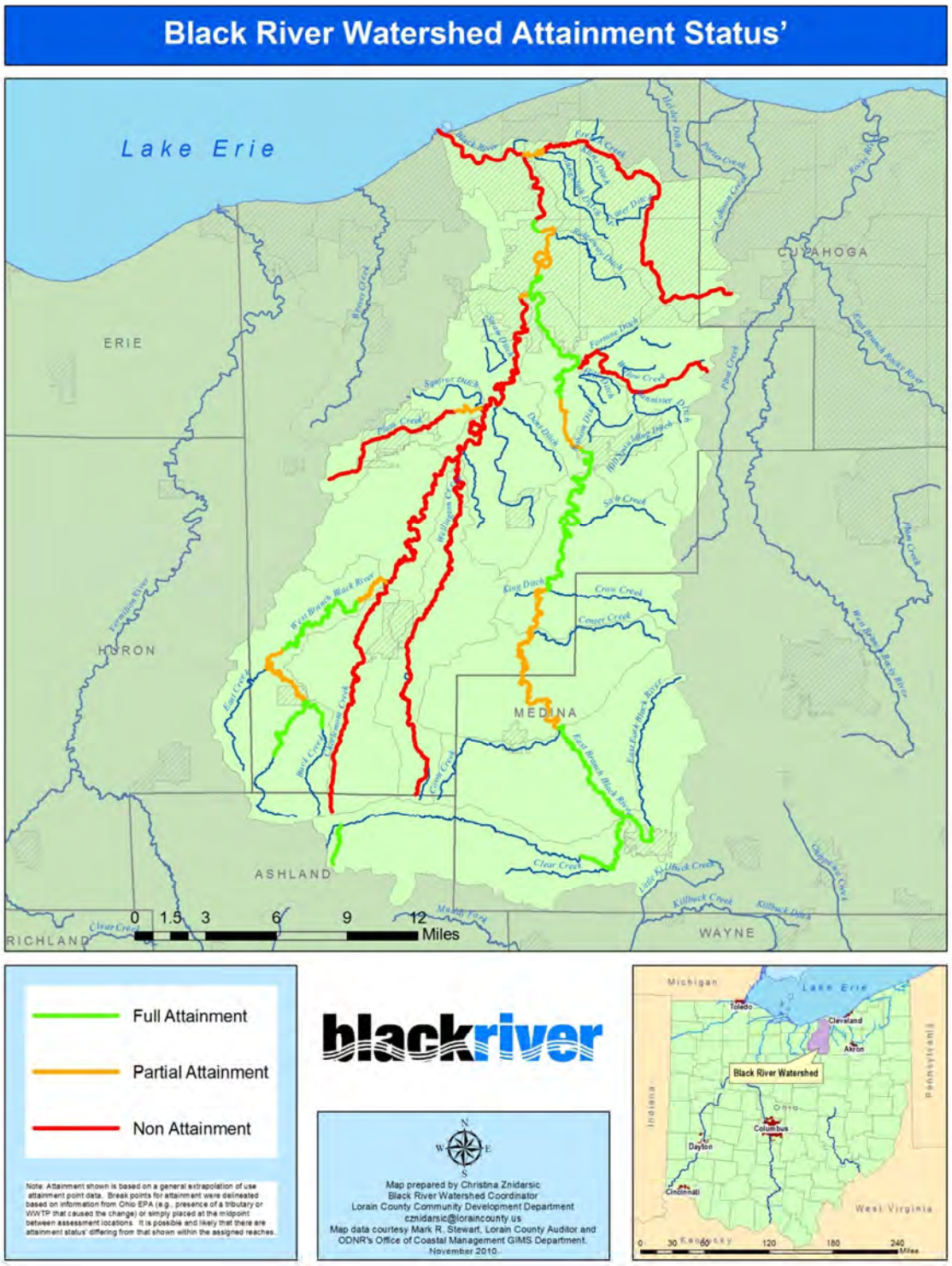
Map 22: Potentially Eroding Banks.



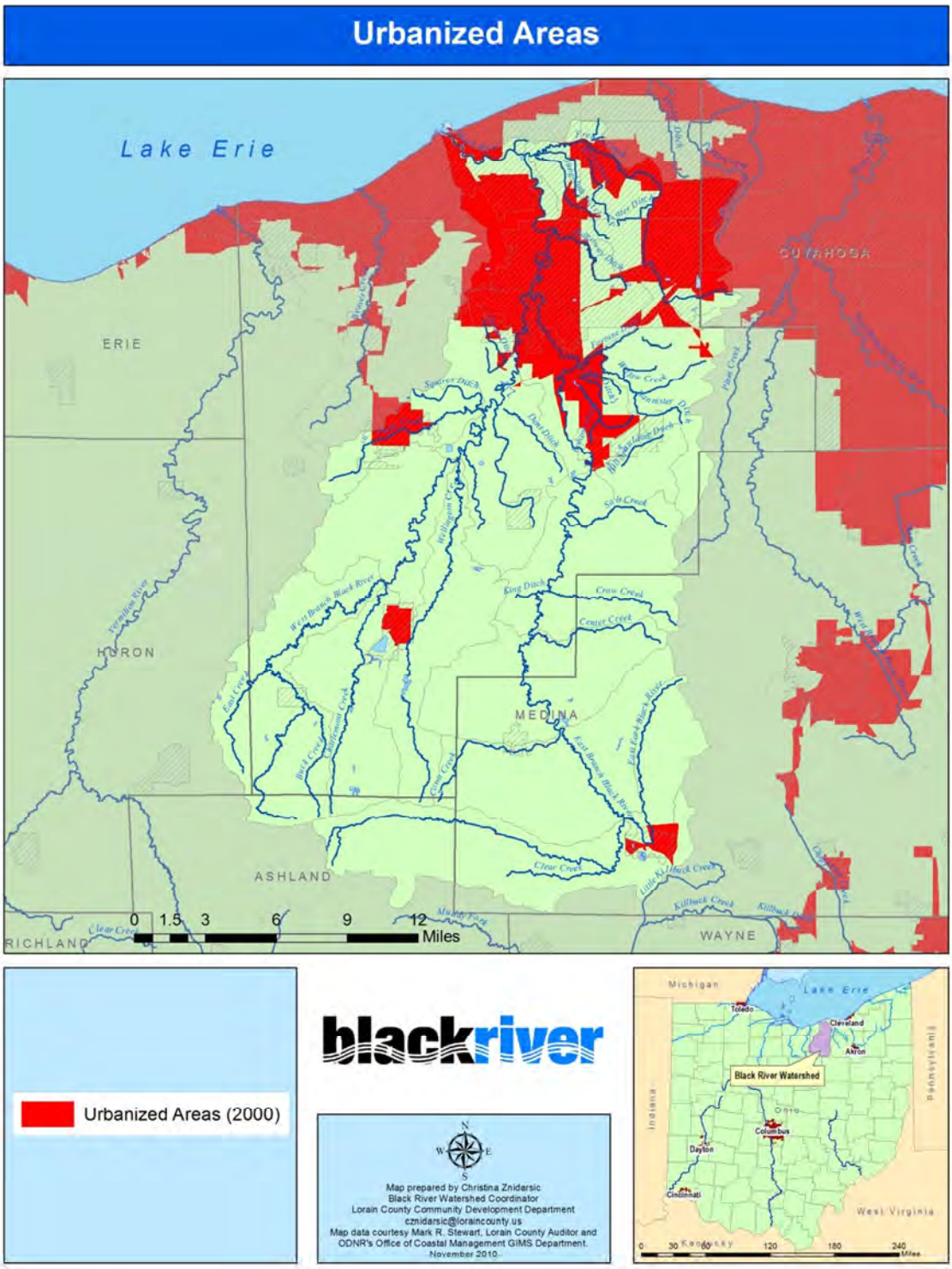
Map 23: Use Designations.



Map 24: Major and Minor NPDES Permit Holders.



Map 25: Black River Watershed Attainment Status



Map 26: Black River Watershed Urbanized Areas

Appendix B

Land Change by HUC-12

Source: 2001-2006 CCAP data-set provided by ODNR OCM's GIMS Dept.

2001-2006 Complete Land Use Change for Black River Watershed

Description		Total mi^2 Changed
04110001-Black River		***10.8093***
0411000103-Headwaters East Branch Black River		**0.5079**
041100010301-East Fork of East Branch Black River		0.0181
Cultivated Land to Deciduous Forest	0.0045	
Scrub/Shrub to Deciduous Forest	0.0129	
Scrub/Shrub to Grassland	0.0007	
041100010302-Headwaters West Fork East Branch Black River		0.4728
Cultivated Land to Deciduous Forest	0.0067	
Cultivated Land to Grassland	0.0028	
Cultivated Land to Low Intensity Developed	0.0021	
Cultivated Land to Palustrine Forested Wetland	0.0014	
Cultivated Land to Palustrine Scrub/Shrub Wetland	0.0069	
Cultivated Land to Scrub/Shrub	0.0083	
Cultivated Land to Water	0.0014	
Deciduous Forest to Grassland	0.0038	
Deciduous Forest to Low Intensity Developed	0.0222	
Deciduous Forest to Palustrine Scrub/Shrub Wetland	0.0334	
Deciduous Forest to Scrub/Shrub	0.2433	
Evergreen Forest to Deciduous Forest	0.0003	
Grassland to Scrub/Shrub	0.0017	
Palustrine Forested Wetland to Low Intensity Developed	0.0118	
Palustrine Forested Wetland to Palustrine Scrub/Shrub Wetland	0.0679	
Palustrine Forested Wetland to Scrub/Shrub	0.0267	
Palustrine Scrub/Shrub Wetland to Palustrine Forested Wetland	0.0017	
Scrub/Shrub to Deciduous Forest	0.0264	
Scrub/Shrub to Grassland	0.0038	
041100010303-Coon Creek-East Branch Black River		0.0170
Bare Land to Cultivated Land	0.0017	
Cultivated Land to Deciduous Forest	0.0017	
Grassland to Deciduous Forest	0.0028	
Palustrine Forested Wetland to Cultivated Land	0.0007	
Palustrine Scrub/Shrub Wetland to Palustrine Forested Wetland	0.0017	
Scrub/Shrub to Deciduous Forest	0.0076	
Scrub/Shrub to Grassland	0.0007	
0411000104-East Branch Black River		**0.5734**
041100010401-Town of Litchfield-East Branch Black River		0.0580
Cultivated Land to Deciduous Forest	0.0028	
Cultivated Land to Grassland	0.0028	
Deciduous Forest to Grassland	0.0292	
Grassland to Deciduous Forest	0.0021	
Palustrine Forested Wetland to Grassland	0.0066	
Pasture/Hay to Deciduous Forest	0.0010	

Scrub/Shrub to Deciduous Forest	0.0056	
Scrub/Shrub to Grassland	0.0080	
041100010402-Salt Creek-East Branch Black River		0.0720
Cultivated Land to Deciduous Forest	0.0014	
Cultivated Land to Low Intensity Developed	0.0062	
Cultivated Land to Open Space Developed	0.0120	
Cultivated Land to Water	0.0028	
Deciduous Forest to Low Intensity Developed	0.0282	
Deciduous Forest to Medium Intensity Developed	0.0004	
Grassland to Deciduous Forest	0.0066	
Low Intensity Developed to Water	0.0003	
Medium Intensity Developed to Low Intensity Developed	0.0004	
Palustrine Forested Wetland to Low Intensity Developed	0.0101	
Palustrine Forested Wetland to Medium Intensity Developed	0.0020	
Pasture/Hay to Deciduous Forest	0.0017	
041100010403-Willow Creek		0.1565
Cultivated Land to Bare Land	0.0004	
Cultivated Land to Deciduous Forest	0.0013	
Cultivated Land to Grassland	0.0003	
Cultivated Land to Low Intensity Developed	0.0449	
Cultivated Land to Medium Intensity Developed	0.0242	
Deciduous Forest to Grassland	0.0003	
Deciduous Forest to High Intensity Developed	0.0000	
Deciduous Forest to Low Intensity Developed	0.0010	
Deciduous Forest to Medium Intensity Developed	0.0016	
Deciduous Forest to Open Space Developed	0.0007	
Deciduous Forest to Palustrine Scrub/Shrub Wetland	0.0038	
Deciduous Forest to Scrub/Shrub	0.0288	
Grassland to Deciduous Forest	0.0003	
High Intensity Developed to Low Intensity Developed	0.0003	
Low Intensity Developed to Bare Land	0.0003	
Low Intensity Developed to High Intensity Developed	0.0003	
Low Intensity Developed to Medium Intensity Developed	0.0014	
Medium Intensity Developed to Low Intensity Developed	0.0049	
Open Space Developed to Low Intensity Developed	0.0059	
Palustrine Forested Wetland to High Intensity Developed	0.0017	
Palustrine Forested Wetland to Low Intensity Developed	0.0211	
Palustrine Forested Wetland to Medium Intensity Developed	0.0016	
Palustrine Forested Wetland to Open Space Developed	0.0007	
Palustrine Forested Wetland to Palustrine Scrub/Shrub Wetland	0.0017	
Palustrine Forested Wetland to Scrub/Shrub	0.0024	
Pasture/Hay to Bare Land	0.0002	
Pasture/Hay to Deciduous Forest	0.0013	
Pasture/Hay to Low Intensity Developed	0.0028	
Pasture/Hay to Medium Intensity Developed	0.0021	
041100010404-Jackson Ditch-East Branch Black River		0.2868
Cultivated Land to Bare Land	0.0393	
Cultivated Land to High Intensity Developed	0.0031	
Cultivated Land to Low Intensity Developed	0.0657	
Cultivated Land to Medium Intensity Developed	0.0024	

Deciduous Forest to Bare Land	0.0017	
Deciduous Forest to Grassland	0.0003	
Deciduous Forest to High Intensity Developed	0.0135	
Deciduous Forest to Low Intensity Developed	0.0097	
Deciduous Forest to Medium Intensity Developed	0.0199	
Deciduous Forest to Palustrine Scrub/Shrub Wetland	0.0007	
Deciduous Forest to Scrub/Shrub	0.0042	
High Intensity Developed to Bare Land	0.0024	
High Intensity Developed to Low Intensity Developed	0.0014	
Low Intensity Developed to Bare Land	0.0028	
Low Intensity Developed to High Intensity Developed	0.0017	
Low Intensity Developed to Medium Intensity Developed	0.0045	
Medium Intensity Developed to Bare Land	0.0132	
Medium Intensity Developed to Low Intensity Developed	0.0090	
Open Space Developed to Bare Land	0.0035	
Open Space Developed to High Intensity Developed	0.0010	
Open Space Developed to Low Intensity Developed	0.0031	
Open Space Developed to Medium Intensity Developed	0.0028	
Palustrine Forested Wetland to Bare Land	0.0024	
Palustrine Forested Wetland to High Intensity Developed	0.0163	
Palustrine Forested Wetland to Low Intensity Developed	0.0167	
Palustrine Forested Wetland to Medium Intensity Developed	0.0292	
Palustrine Forested Wetland to Palustrine Scrub/Shrub Wetland	0.0021	
Palustrine Forested Wetland to Scrub/Shrub	0.0031	
Pasture/Hay to High Intensity Developed	0.0010	
Pasture/Hay to Low Intensity Developed	0.0017	
Pasture/Hay to Medium Intensity Developed	0.0003	
Scrub/Shrub to High Intensity Developed	0.0010	
Scrub/Shrub to Low Intensity Developed	0.0014	
Scrub/Shrub to Medium Intensity Developed	0.0024	
Water to Low Intensity Developed	0.0028	
0411000105-West Branch Black River		**2.1234**
041100010501-Charlemont Creek		0.1400
Pasture/Hay to Low Intensity Developed	0.0066	
Scrub/Shrub to Deciduous Forest	0.0056	
Scrub/Shrub to Grassland	0.0051	
Scrub/Shrub to Low Intensity Developed	0.0003	
Cultivated Land to Bare Land	0.0136	
Cultivated Land to Deciduous Forest	0.0027	
Cultivated Land to Grassland	0.0032	
Cultivated Land to Low Intensity Developed	0.0403	
Cultivated Land to Scrub/Shrub	0.0014	
Deciduous Forest to Grassland	0.0276	
Deciduous Forest to Low Intensity Developed	0.0142	
Deciduous Forest to Scrub/Shrub	0.0011	
Low Intensity Developed to Medium Intensity Developed	0.0003	
Medium Intensity Developed to Low Intensity Developed	0.0007	
Palustrine Forested Wetland to Cultivated Land	0.0003	
Palustrine Forested Wetland to Grassland	0.0047	
Palustrine Forested Wetland to Low Intensity Developed	0.0063	

Pasture/Hay to Bare Land	0.0052	
Pasture/Hay to High Intensity Developed	0.0007	
041100010502-Upper West Branch Black River		0.2267
Cultivated Land to Deciduous Forest	0.0042	
Cultivated Land to Grassland	0.0051	
Cultivated Land to Low Intensity Developed	0.0479	
Deciduous Forest to Grassland	0.0776	
Deciduous Forest to Low Intensity Developed	0.0059	
Deciduous Forest to Palustrine Scrub/Shrub Wetland	0.0010	
Deciduous Forest to Scrub/Shrub	0.0068	
Medium Intensity Developed to Low Intensity Developed	0.0017	
Open Space Developed to Low Intensity Developed	0.0003	
Palustrine Forested Wetland to Grassland	0.0158	
Palustrine Forested Wetland to Low Intensity Developed	0.0203	
Palustrine Forested Wetland to Palustrine Scrub/Shrub Wetland	0.0023	
Palustrine Forested Wetland to Scrub/Shrub	0.0018	
Pasture/Hay to Low Intensity Developed	0.0021	
Scrub/Shrub to Deciduous Forest	0.0097	
Scrub/Shrub to Grassland	0.0192	
Scrub/Shrub to Low Intensity Developed	0.0049	
041100010503-Wellington Creek		0.2100
Cultivated Land to Bare Land	0.0010	
Cultivated Land to Grassland	0.0028	
Cultivated Land to Low Intensity Developed	0.0330	
Cultivated Land to Pasture/Hay	0.0017	
Deciduous Forest to Grassland	0.0431	
Deciduous Forest to Low Intensity Developed	0.0024	
Deciduous Forest to Palustrine Forested Wetland	0.0007	
Deciduous Forest to Pasture/Hay	0.0243	
Medium Intensity Developed to Low Intensity Developed	0.0007	
Open Space Developed to Low Intensity Developed	0.0007	
Palustrine Forested Wetland to Grassland	0.0108	
Palustrine Forested Wetland to Low Intensity Developed	0.0212	
Palustrine Forested Wetland to Pasture/Hay	0.0521	
Palustrine Scrub/Shrub Wetland to Deciduous Forest	0.0010	
Palustrine Scrub/Shrub Wetland to Palustrine Forested Wetland	0.0017	
Pasture/Hay to Low Intensity Developed	0.0055	
Pasture/Hay to Medium Intensity Developed	0.0007	
Scrub/Shrub to Deciduous Forest	0.0021	
Scrub/Shrub to Grassland	0.0042	
Scrub/Shrub to Low Intensity Developed	0.0002	
041100010504-Middle West Branch Black River		0.0720
Cultivated Land to Bare Land	0.0129	
Cultivated Land to Grassland	0.0003	
Cultivated Land to High Intensity Developed	0.0035	
Cultivated Land to Low Intensity Developed	0.0223	
Deciduous Forest to Low Intensity Developed	0.0007	
Grassland to Deciduous Forest	0.0153	
Low Intensity Developed to Bare Land	0.0003	
Low Intensity Developed to Medium Intensity Developed	0.0007	

Medium Intensity Developed to Low Intensity Developed	0.0003	
Open Space Developed to Low Intensity Developed	0.0003	
Palustrine Forested Wetland to Low Intensity Developed	0.0017	
Pasture/Hay to Bare Land	0.0045	
Pasture/Hay to Deciduous Forest	0.0073	
Pasture/Hay to High Intensity Developed	0.0014	
Pasture/Hay to Low Intensity Developed	0.0003	
041100010505-Plum Creek		0.3357
Cultivated Land to Bare Land	0.2241	
Cultivated Land to Deciduous Forest	0.0003	
Deciduous Forest to Medium Intensity Developed	0.0000	
Deciduous Forest to Palustrine Scrub/Shrub Wetland	0.0021	
Deciduous Forest to Scrub/Shrub	0.0129	
Palustrine Forested Wetland to Palustrine Scrub/Shrub Wetland	0.0009	
Palustrine Forested Wetland to Scrub/Shrub	0.0016	
Pasture/Hay to Bare Land	0.0921	
Pasture/Hay to Water	0.0003	
Scrub/Shrub to Deciduous Forest	0.0014	
041100010506-Lower West Branch Black River		1.1388
Bare Land to High Intensity Developed	0.0007	
Bare Land to Medium Intensity Developed	0.0003	
Cultivated Land to Bare Land	0.0184	
Cultivated Land to Deciduous Forest	0.0024	
Cultivated Land to Low Intensity Developed	0.2987	
Cultivated Land to Medium Intensity Developed	0.1209	
Cultivated Land to Open Space Developed	0.1336	
Cultivated Land to Water	0.0292	
Deciduous Forest to Grassland	0.0003	
Deciduous Forest to High Intensity Developed	0.0031	
Deciduous Forest to Low Intensity Developed	0.0166	
Deciduous Forest to Medium Intensity Developed	0.0420	
Deciduous Forest to Open Space Developed	0.0621	
Deciduous Forest to Palustrine Scrub/Shrub Wetland	0.0055	
Deciduous Forest to Scrub/Shrub	0.0580	
Deciduous Forest to Water	0.0003	
Grassland to Deciduous Forest	0.0024	
Grassland to Medium Intensity Developed	0.0024	
High Intensity Developed to Low Intensity Developed	0.0010	
Low Intensity Developed to Bare Land	0.0014	
Low Intensity Developed to High Intensity Developed	0.0024	
Low Intensity Developed to Medium Intensity Developed	0.0261	
Low Intensity Developed to Open Space Developed	0.0069	
Low Intensity Developed to Water	0.0038	
Medium Intensity Developed to High Intensity Developed	0.0069	
Medium Intensity Developed to Low Intensity Developed	0.0142	
Open Space Developed to High Intensity Developed	0.0007	
Open Space Developed to Low Intensity Developed	0.0038	
Open Space Developed to Medium Intensity Developed	0.0021	
Palustrine Forested Wetland to High Intensity Developed	0.0035	
Palustrine Forested Wetland to Low Intensity Developed	0.0219	

Palustrine Forested Wetland to Medium Intensity Developed	0.0442	
Palustrine Forested Wetland to Open Space Developed	0.0505	
Palustrine Forested Wetland to Palustrine Scrub/Shrub Wetland	0.0603	
Palustrine Forested Wetland to Scrub/Shrub	0.0068	
Palustrine Forested Wetland to Water	0.0003	
Pasture/Hay to Bare Land	0.0031	
Pasture/Hay to Deciduous Forest	0.0010	
Pasture/Hay to High Intensity Developed	0.0003	
Pasture/Hay to Low Intensity Developed	0.0376	
Pasture/Hay to Medium Intensity Developed	0.0003	
Pasture/Hay to Open Space Developed	0.0341	
Scrub/Shrub to Deciduous Forest	0.0021	
Scrub/Shrub to Grassland	0.0003	
Scrub/Shrub to Low Intensity Developed	0.0026	
Scrub/Shrub to Medium Intensity Developed	0.0007	
Scrub/Shrub to Open Space Developed	0.0021	
Scrub/Shrub to Water	0.0003	
0411000106-Black River		**7.6046**
041100010601-French Creek		3.5793
Bare Land to High Intensity Developed	0.0010	
Bare Land to Water	0.0003	
Cultivated Land to Bare Land	0.1187	
Cultivated Land to Deciduous Forest	0.0014	
Cultivated Land to Grassland	0.0003	
Cultivated Land to High Intensity Developed	0.0381	
Cultivated Land to Low Intensity Developed	0.1672	
Cultivated Land to Medium Intensity Developed	0.2806	
Cultivated Land to Open Space Developed	0.1353	
Deciduous Forest to Bare Land	0.0031	
Deciduous Forest to Grassland	0.0010	
Deciduous Forest to High Intensity Developed	0.1392	
Deciduous Forest to Low Intensity Developed	0.0664	
Deciduous Forest to Medium Intensity Developed	0.4597	
Deciduous Forest to Open Space Developed	0.5125	
Evergreen Forest to High Intensity Developed	0.0028	
Evergreen Forest to Low Intensity Developed	0.0003	
Evergreen Forest to Medium Intensity Developed	0.0052	
Evergreen Forest to Open Space Developed	0.0024	
Grassland to Deciduous Forest	0.0035	
Grassland to High Intensity Developed	0.0022	
Grassland to Low Intensity Developed	0.0003	
Grassland to Medium Intensity Developed	0.0026	
Low Intensity Developed to Bare Land	0.0024	
Low Intensity Developed to Deciduous Forest	0.0014	
Low Intensity Developed to High Intensity Developed	0.0066	
Low Intensity Developed to Medium Intensity Developed	0.0294	
Low Intensity Developed to Open Space Developed	0.0028	
Medium Intensity Developed to High Intensity Developed	0.0094	
Open Space Developed to Bare Land	0.0017	
Open Space Developed to Deciduous Forest	0.0010	

Open Space Developed to Grassland	0.0003	
Open Space Developed to High Intensity Developed	0.0079	
Open Space Developed to Low Intensity Developed	0.0024	
Open Space Developed to Medium Intensity Developed	0.0121	
Palustrine Forested Wetland to Bare Land	0.0048	
Palustrine Forested Wetland to High Intensity Developed	0.2648	
Palustrine Forested Wetland to Low Intensity Developed	0.0698	
Palustrine Forested Wetland to Medium Intensity Developed	0.5741	
Palustrine Forested Wetland to Open Space Developed	0.5265	
Pasture/Hay to Bare Land	0.0247	
Pasture/Hay to Deciduous Forest	0.0007	
Pasture/Hay to High Intensity Developed	0.0046	
Pasture/Hay to Low Intensity Developed	0.0024	
Pasture/Hay to Medium Intensity Developed	0.0479	
Pasture/Hay to Open Space Developed	0.0007	
Scrub/Shrub to Bare Land	0.0003	
Scrub/Shrub to Deciduous Forest	0.0082	
Scrub/Shrub to High Intensity Developed	0.0087	
Scrub/Shrub to Low Intensity Developed	0.0028	
Scrub/Shrub to Medium Intensity Developed	0.0134	
Scrub/Shrub to Open Space Developed	0.0028	
041100010602-Black River		1.7890
Bare Land to High Intensity Developed	0.0017	
Bare Land to Medium Intensity Developed	0.0015	
Bare Land to Open Space Developed	0.0063	
Cultivated Land to Bare Land	0.2211	
Cultivated Land to High Intensity Developed	0.0067	
Cultivated Land to Low Intensity Developed	0.0637	
Cultivated Land to Medium Intensity Developed	0.2145	
Cultivated Land to Open Space Developed	0.1490	
Deciduous Forest to Bare Land	0.0028	
Deciduous Forest to Grassland	0.0003	
Deciduous Forest to High Intensity Developed	0.0325	
Deciduous Forest to Low Intensity Developed	0.0377	
Deciduous Forest to Medium Intensity Developed	0.1160	
Deciduous Forest to Open Space Developed	0.3601	
Deciduous Forest to Palustrine Scrub/Shrub Wetland	0.0003	
Deciduous Forest to Scrub/Shrub	0.0013	
Deciduous Forest to Water	0.0003	
Evergreen Forest to Low Intensity Developed	0.0003	
Evergreen Forest to Medium Intensity Developed	0.0003	
Evergreen Forest to Open Space Developed	0.0014	
Grassland to Deciduous Forest	0.0003	
Grassland to High Intensity Developed	0.0027	
Grassland to Medium Intensity Developed	0.0033	
High Intensity Developed to Medium Intensity Developed	0.0003	
Low Intensity Developed to Bare Land	0.0007	
Low Intensity Developed to High Intensity Developed	0.0125	
Low Intensity Developed to Medium Intensity Developed	0.0097	
Low Intensity Developed to Open Space Developed	0.0021	

Medium Intensity Developed to Bare Land	0.0003	
Medium Intensity Developed to High Intensity Developed	0.0148	
Open Space Developed to High Intensity Developed	0.0035	
Open Space Developed to Medium Intensity Developed	0.0024	
Palustrine Emergent Wetland to High Intensity Developed	0.0003	
Palustrine Emergent Wetland to Medium Intensity Developed	0.0010	
Palustrine Emergent Wetland to Open Space Developed	0.0003	
Palustrine Emergent Wetland to Palustrine Forested Wetland	0.0042	
Palustrine Forested Wetland to Bare Land	0.0005	
Palustrine Forested Wetland to High Intensity Developed	0.0402	
Palustrine Forested Wetland to Low Intensity Developed	0.0328	
Palustrine Forested Wetland to Medium Intensity Developed	0.1242	
Palustrine Forested Wetland to Open Space Developed	0.2984	
Palustrine Forested Wetland to Palustrine Scrub/Shrub Wetland	0.0011	
Palustrine Forested Wetland to Water	0.0003	
Pasture/Hay to High Intensity Developed	0.0014	
Pasture/Hay to Medium Intensity Developed	0.0024	
Scrub/Shrub to Bare Land	0.0010	
Scrub/Shrub to Grassland	0.0007	
Scrub/Shrub to High Intensity Developed	0.0024	
Scrub/Shrub to Medium Intensity Developed	0.0059	
Scrub/Shrub to Open Space Developed	0.0007	
Water to Bare Land	0.0003	
041100010603-Heider Ditch-Frontal Lake Erie		2.2362
Bare Land to High Intensity Developed	0.0007	
Bare Land to Medium Intensity Developed	0.0002	
Cultivated Land to Bare Land	0.0295	
Cultivated Land to High Intensity Developed	0.0090	
Cultivated Land to Low Intensity Developed	0.0398	
Cultivated Land to Medium Intensity Developed	0.0053	
Deciduous Forest to Bare Land	0.0007	
Deciduous Forest to Grassland	0.0028	
Deciduous Forest to High Intensity Developed	0.0731	
Deciduous Forest to Low Intensity Developed	0.0379	
Deciduous Forest to Medium Intensity Developed	0.3744	
Deciduous Forest to Open Space Developed	0.4499	
Evergreen Forest to High Intensity Developed	0.0063	
Evergreen Forest to Medium Intensity Developed	0.0021	
Evergreen Forest to Open Space Developed	0.0042	
Grassland to Deciduous Forest	0.0007	
Grassland to High Intensity Developed	0.0024	
Grassland to Low Intensity Developed	0.0003	
Grassland to Medium Intensity Developed	0.0031	
Grassland to Open Space Developed	0.0003	
Low Intensity Developed to Grassland	0.0010	
Low Intensity Developed to High Intensity Developed	0.0198	
Low Intensity Developed to Medium Intensity Developed	0.0293	
Low Intensity Developed to Open Space Developed	0.0028	
Medium Intensity Developed to Bare Land	0.0003	
Medium Intensity Developed to High Intensity Developed	0.0105	

Medium Intensity Developed to Low Intensity Developed	0.0021
Medium Intensity Developed to Open Space Developed	0.0007
Open Space Developed to Grassland	0.0003
Open Space Developed to High Intensity Developed	0.0063
Open Space Developed to Low Intensity Developed	0.0007
Open Space Developed to Medium Intensity Developed	0.0094
Palustrine Forested Wetland to Grassland	0.0007
Palustrine Forested Wetland to High Intensity Developed	0.1476
Palustrine Forested Wetland to Low Intensity Developed	0.0460
Palustrine Forested Wetland to Medium Intensity Developed	0.3455
Palustrine Forested Wetland to Open Space Developed	0.5438
Pasture/Hay to Bare Land	0.0024
Pasture/Hay to High Intensity Developed	0.0033
Pasture/Hay to Low Intensity Developed	0.0066
Pasture/Hay to Medium Intensity Developed	0.0042
Pasture/Hay to Open Space Developed	0.0010
Scrub/Shrub to High Intensity Developed	0.0062
Scrub/Shrub to Medium Intensity Developed	0.0021
Scrub/Shrub to Open Space Developed	0.0007

Appendix C

Known HSTS Location Maps

Table of Figures

Figure 1: City of Avon. iii
Figure 2: Carlisle Township. iv
Figure 3: Eaton Township. v
Figure 4: Elyria Township. vi
Figure 5: Grafton Township. vii
Figure 6: City of North Ridgeville. viii
Figure 7: Sheffield Township. ix
Figure 8: Sheffield Village. x

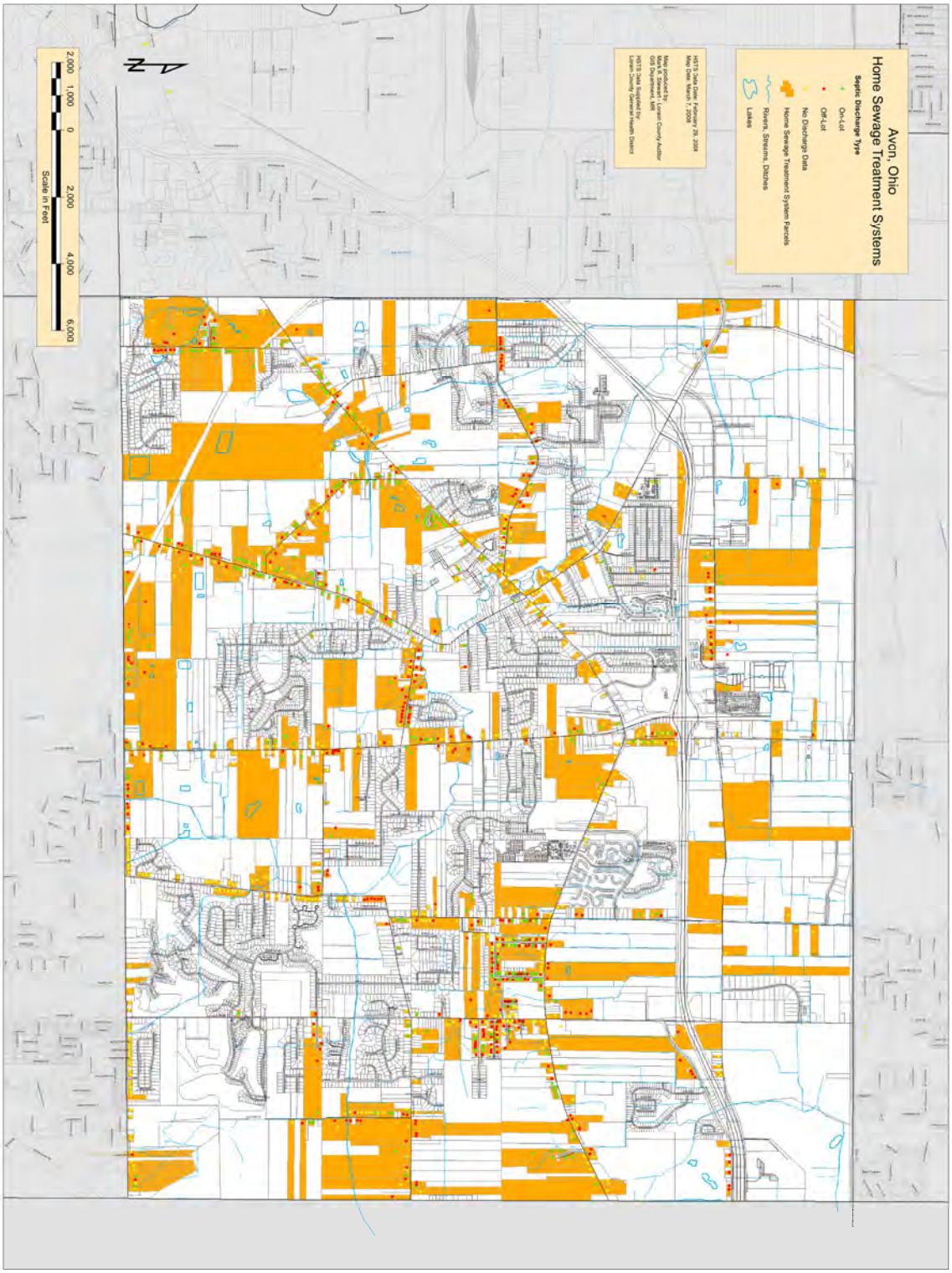


Figure 1: City of Avon.

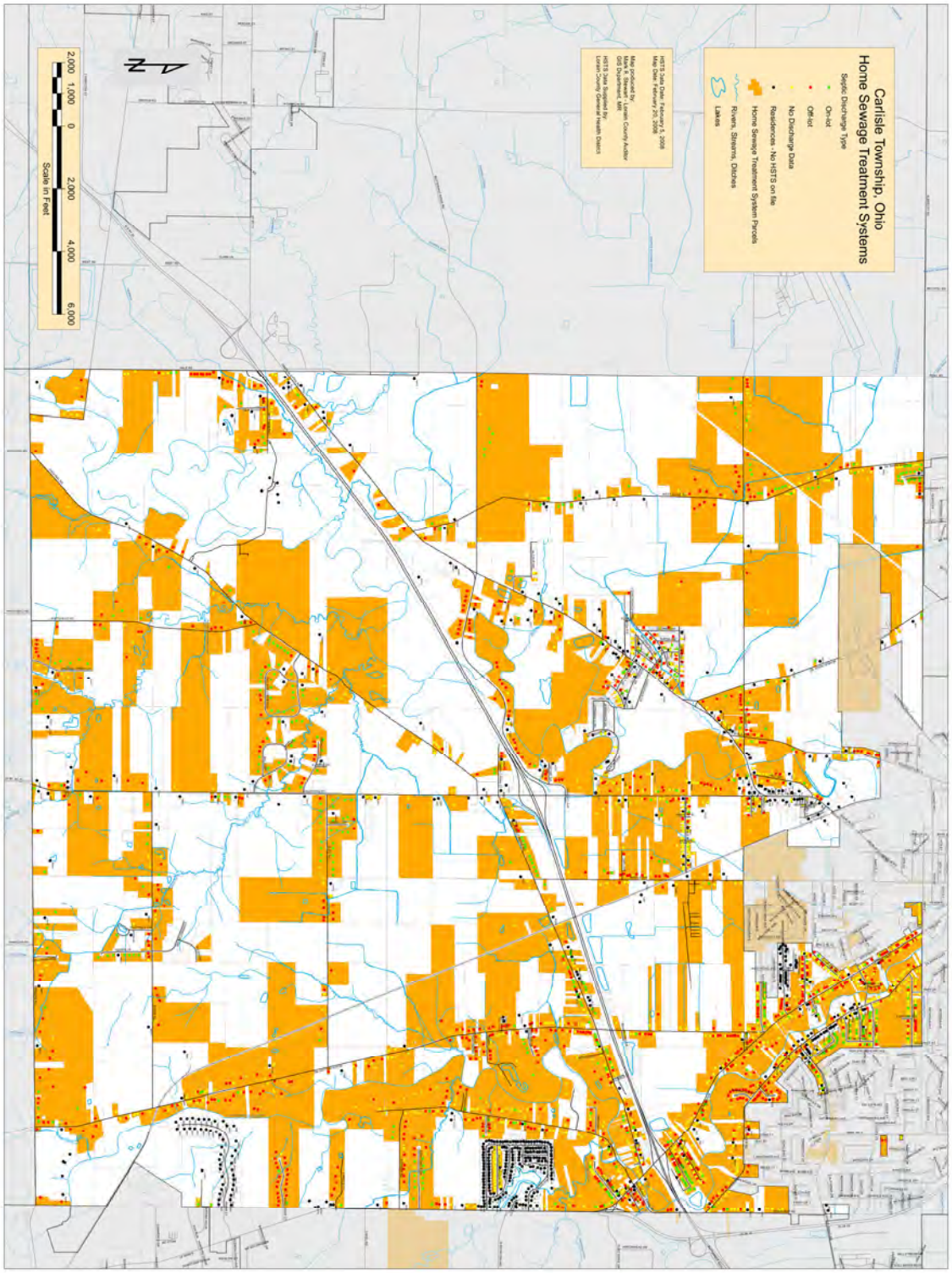


Figure 2: Carlisle Township.

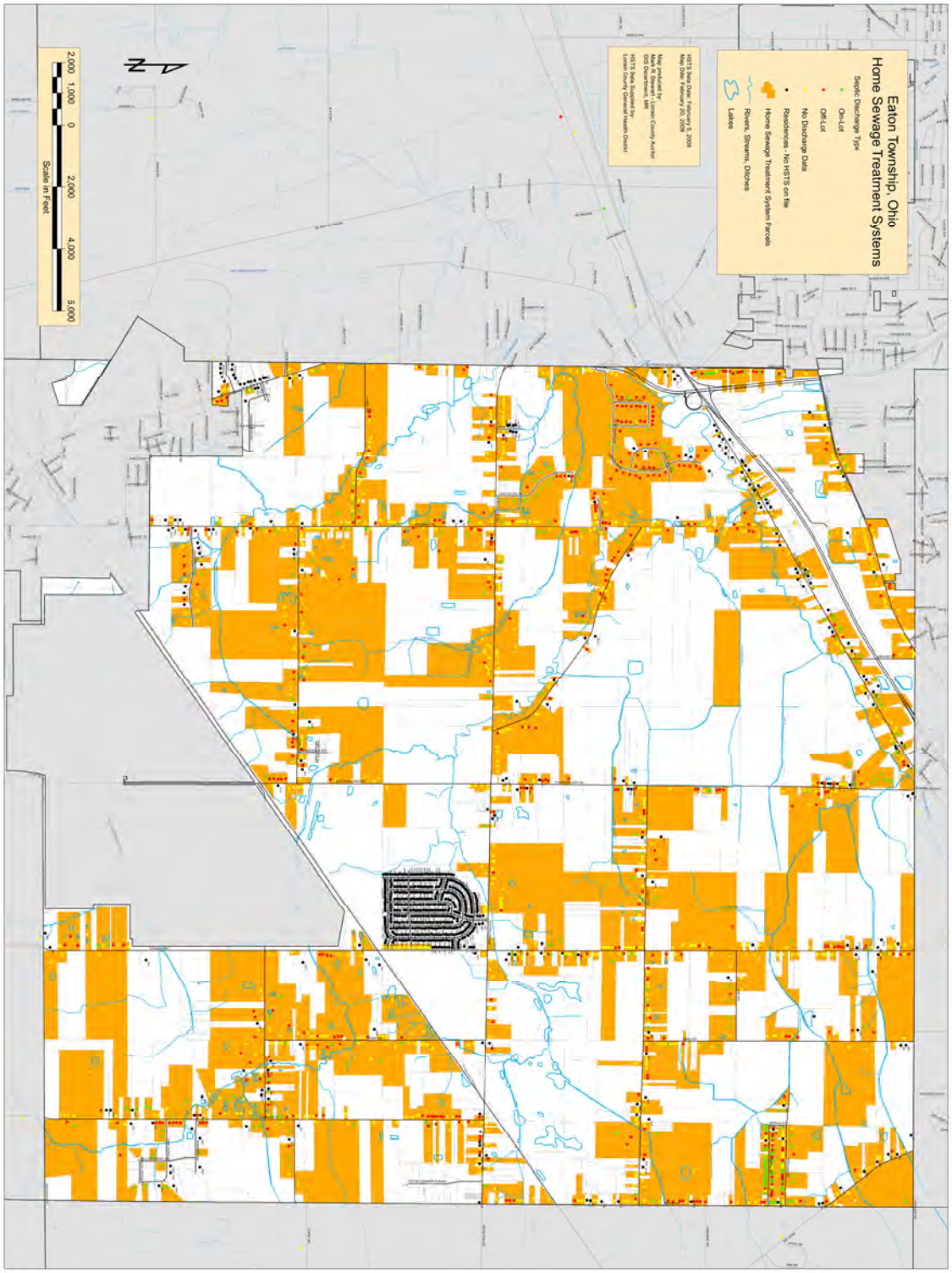


Figure 3: Eaton Township.

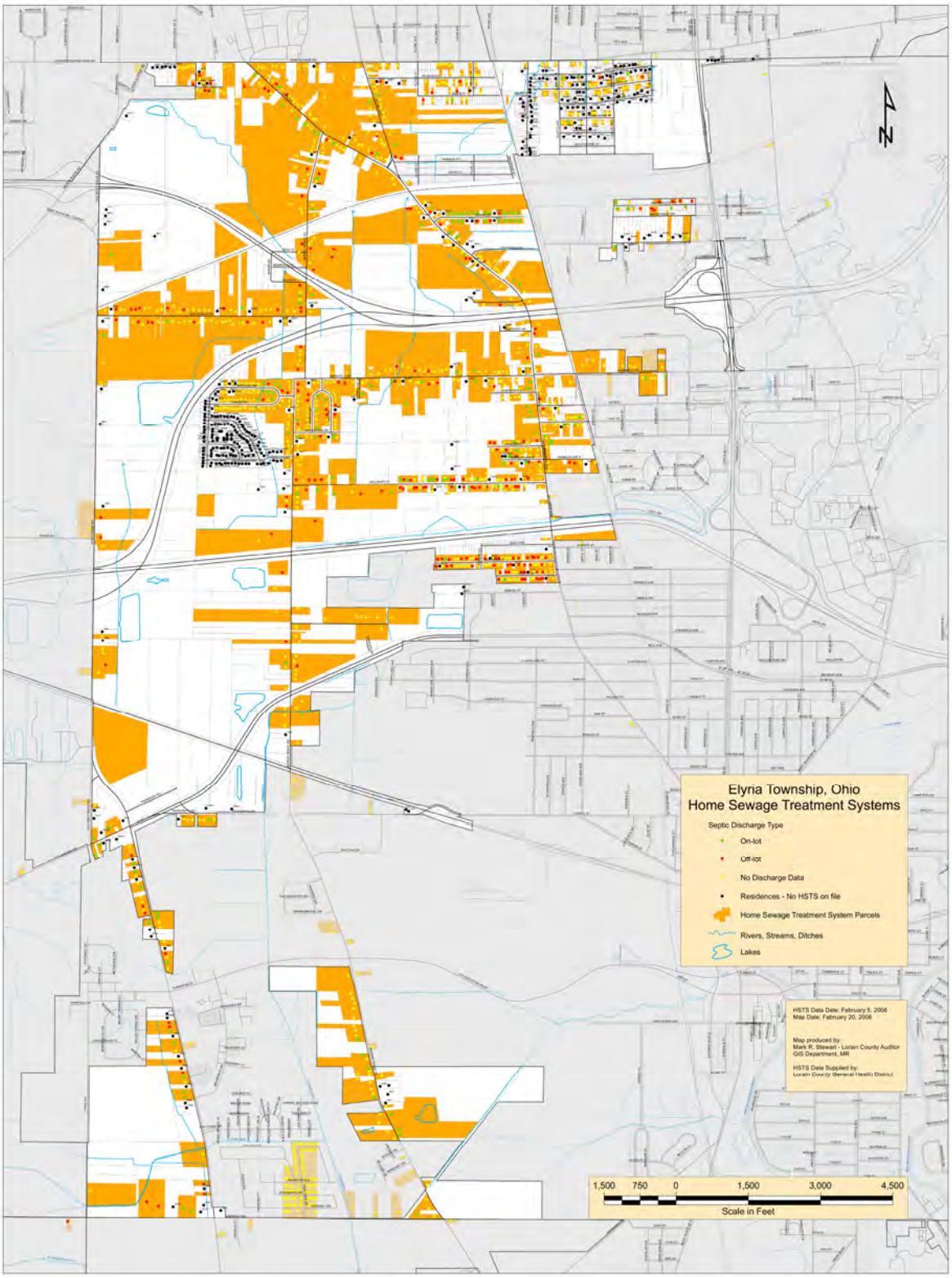


Figure 4: Elyria Township.

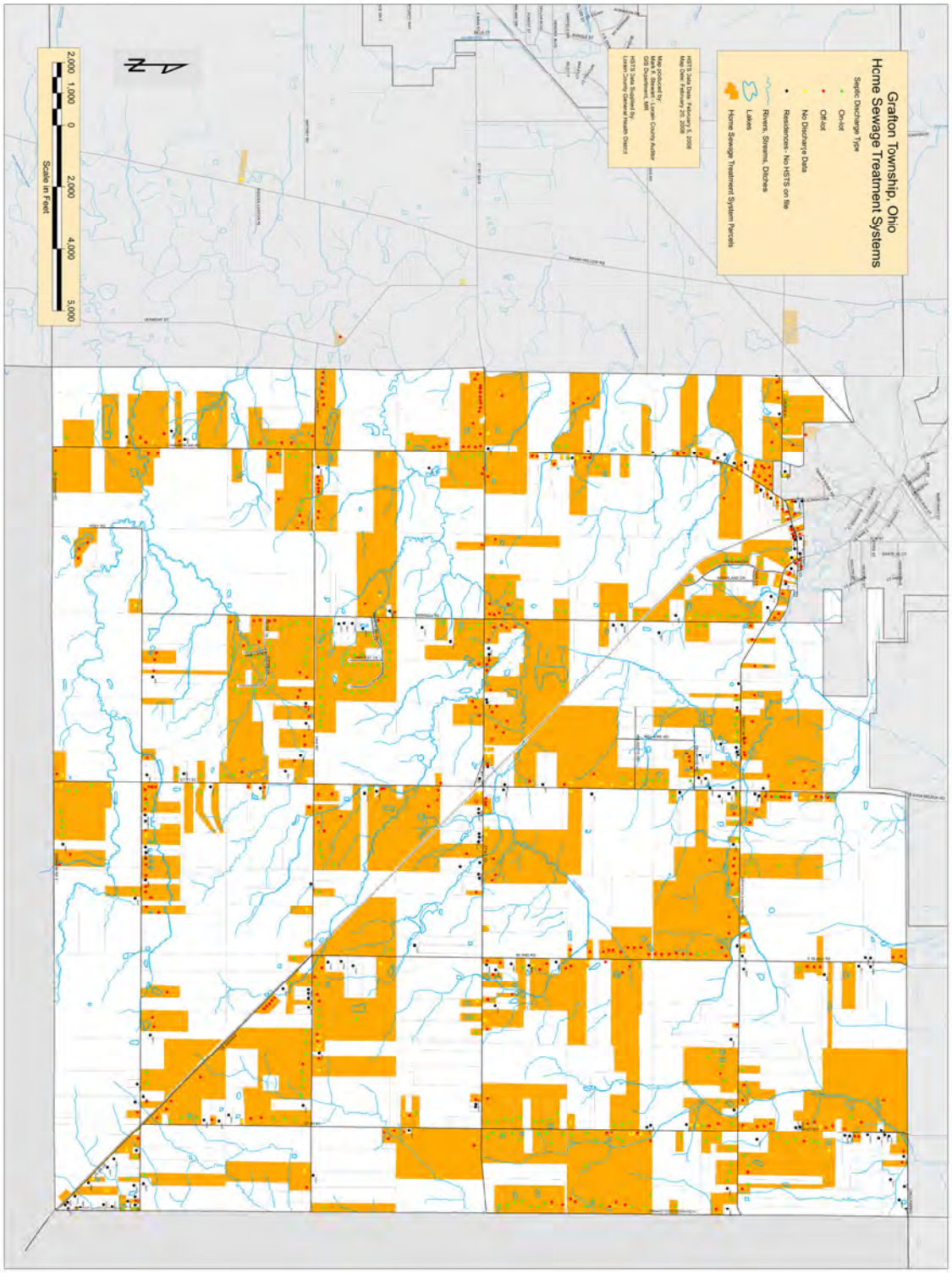


Figure 5: Grafton Township.

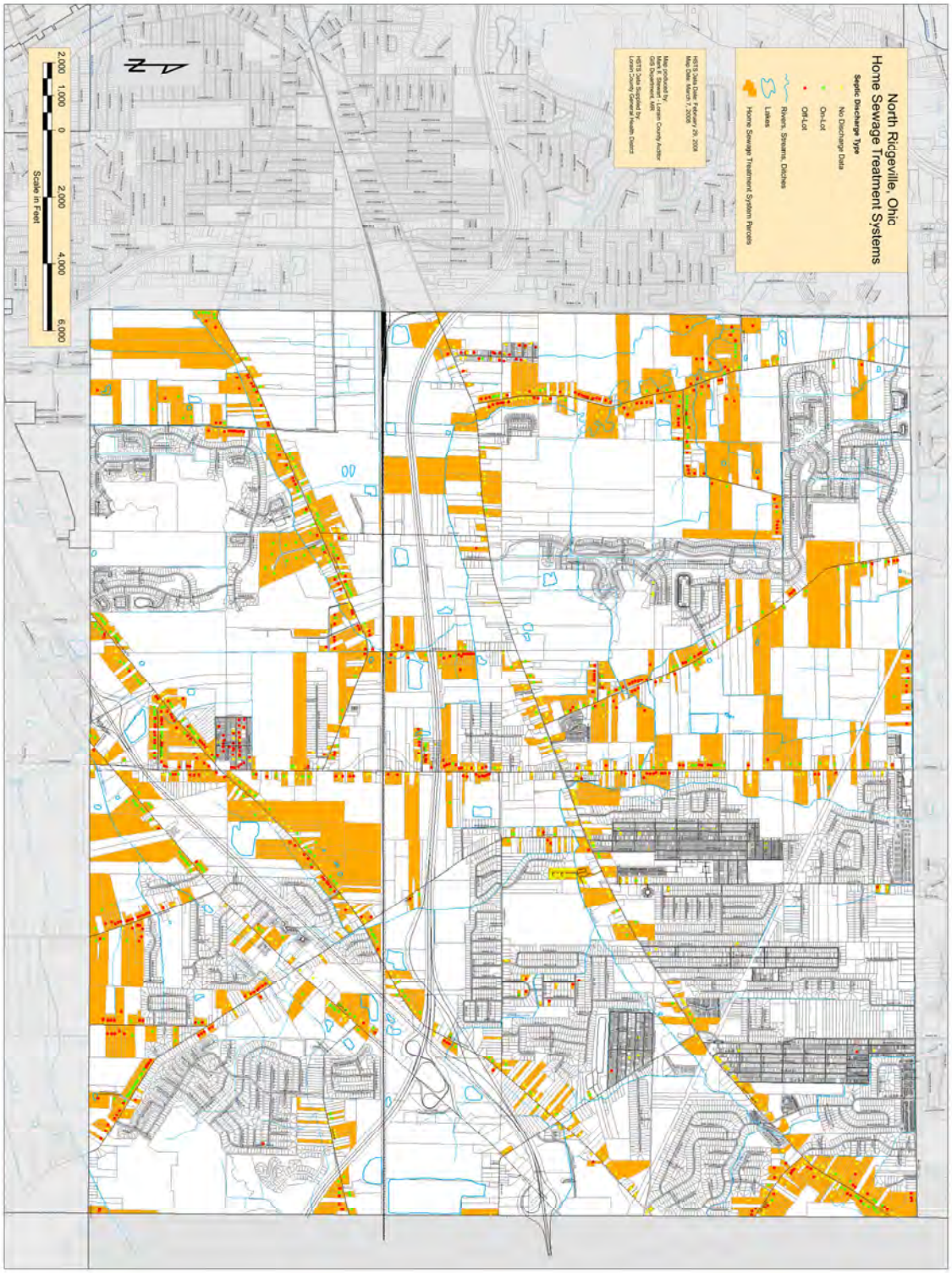


Figure 6: City of North Ridgeville.

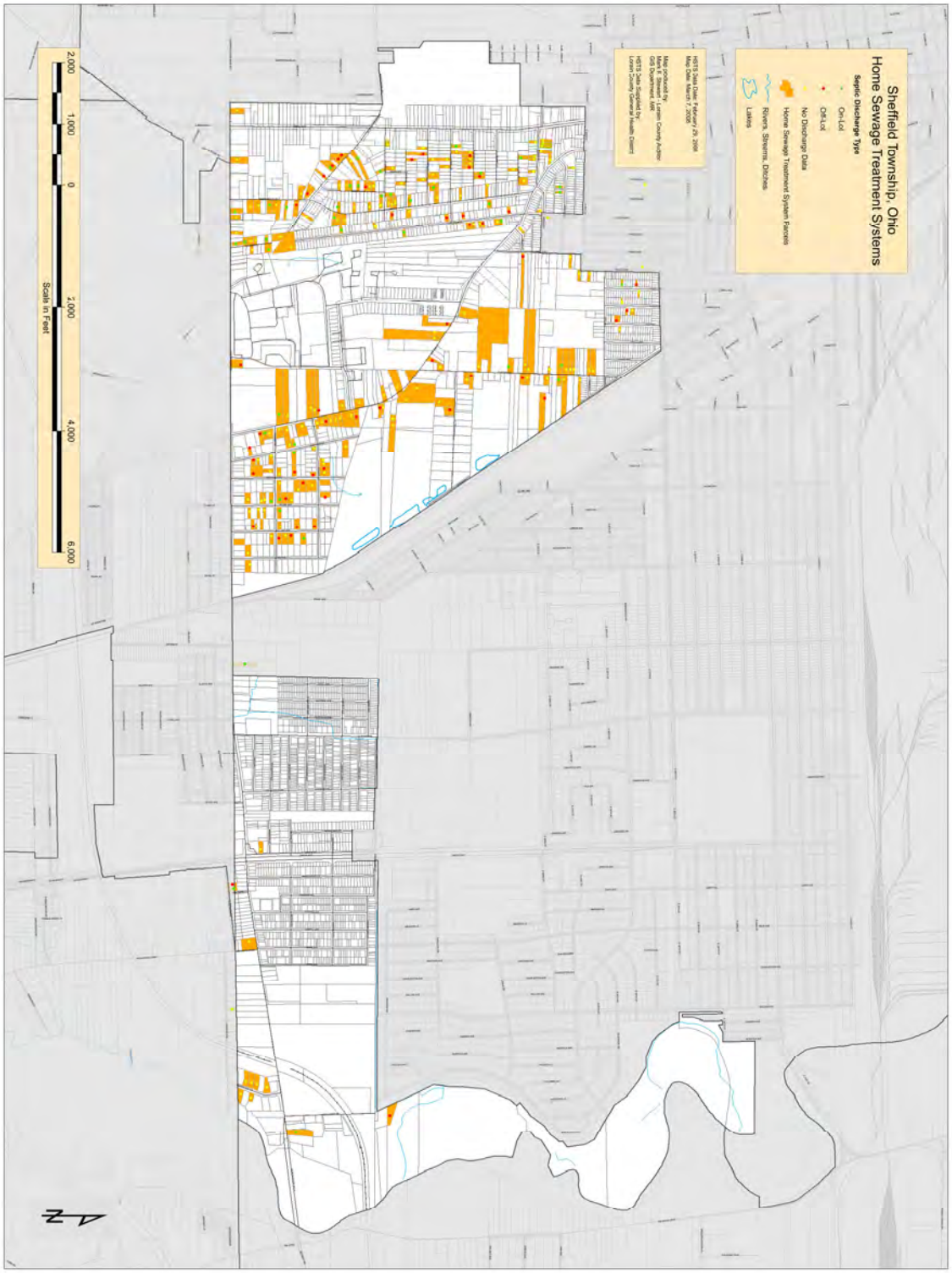


Figure 7: Sheffield Township.

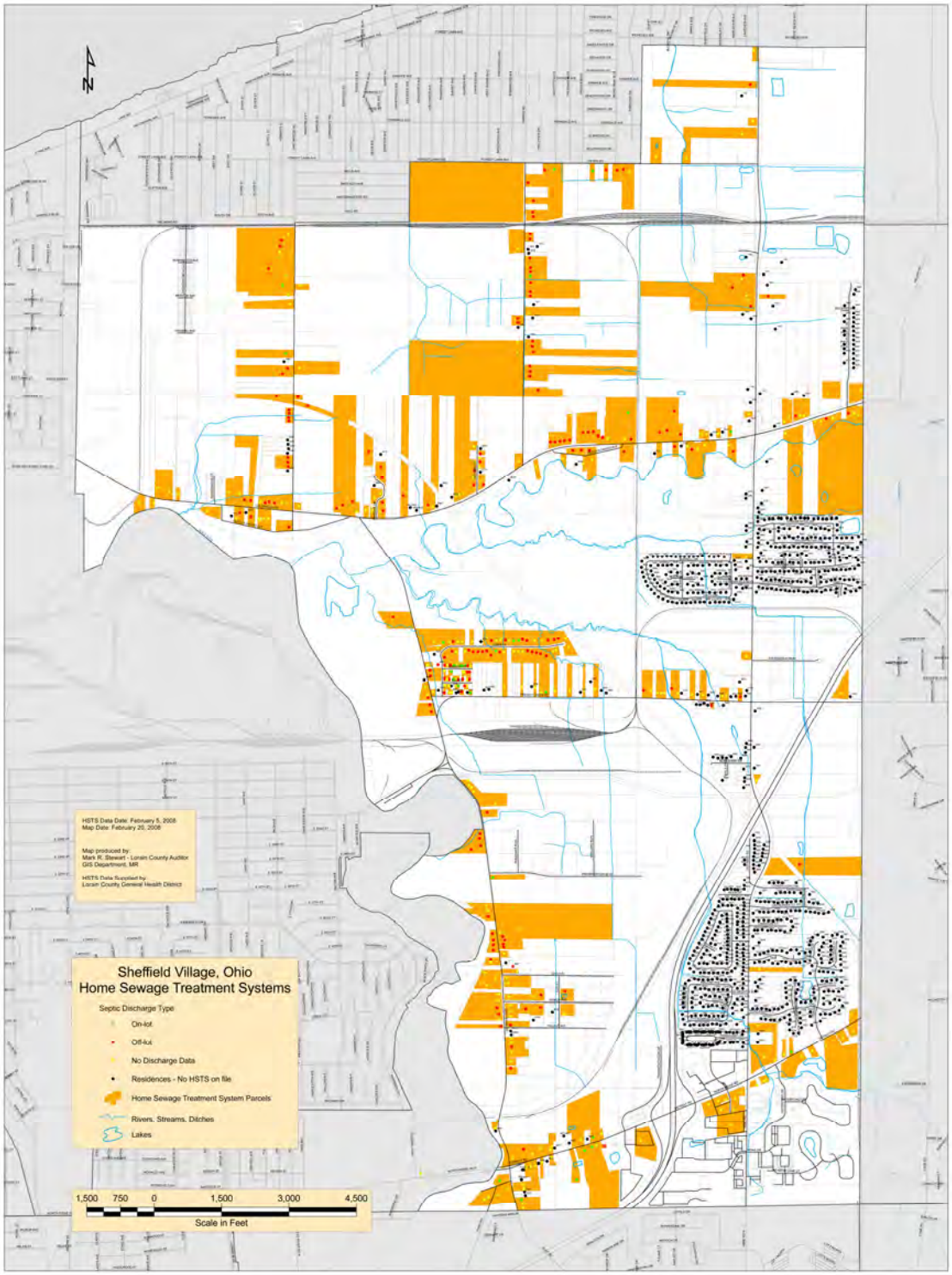


Figure 8: Sheffield Village.

Appendix D

Table of Links (recent as of December, 2010)

Lorain County Rural Wastewater District (LORCO)- http://www.lorco.org/
Lorain County School Districts: http://www.puc.state.oh.us/pucogis/newcntymaps/sd093.pdf
Lorain County Metroparks: http://www.metroparks.cc/

- French Creek Reservation: http://www.metroparks.cc/reservation-french-creek.php
- Black River Reservation: http://www.metroparks.cc/reservation-black-river.php
- Miller Nature Preserve: http://www.metroparks.cc/reservation-miller-nature-preserve.php
- Sandy Ridge Reservation: http://www.metroparks.cc/reservation-sandy-ridge.php
- Forest Hills Golf Course: http://www.metroparks.cc/forest-hills-golf-course.php
- Carlisle Reservation: http://www.metroparks.cc/reservation-carlisle.php
- Indian Hollow Reservation: http://www.metroparks.cc/reservation-indian-hollow.php
- Splash Zone: http://www.metroparks.cc/splash-zone-aquatic-center.php
- Caley Reservation: http://www.metroparks.cc/reservation-caley.php
- Wellington Reservation: http://www.metroparks.cc/reservation-wellington.php
- Charlemont Reservation: http://www.metroparks.cc/reservation-charlemont.php

Lorain County Sanitary Engineers: http://www.loraincounty.com/engineer/sanitary-dept.shtml
Northeast Ohio Regional Sewer District (NEORSD): http://neorsd.org
Lorain Soil and Water Conservation District: http://www.lorainswcd.com/
Lorain County Community College: http://www.loraincccc.edu/
Oberlin College: http://new.oberlin.edu/
Lorain County JVS: http://www.lcjvs.com/
Ohio Business College: http://www.ohiobusinesscollege.edu/Default.asp
Medina County Park District: http://www.medinacountyparks.com/

- Letha House Park: http://www.medinacountyparks.com/Pages/LethaHouse.html
- Hidden Hollow Camp: http://www.medinacountyparks.com/Pages/HiddenHollow.html

Medina County School Districts: http://www.puc.state.oh.us/pucogis/newcntymaps/sd103.pdf
Medina County Sanitary Engineers: http://www.sanitaryengineer.co.medina.oh.us/sewer/sewer.html
Medina SWCD: http://www.medinaswcd.org/
Medina County Planning Commission: http://www.planning.co.medina.oh.us/New Web Site/website/Planning_commission.html
Cleveland Metroparks: http://www.clemetparks.com/
Cuyahoga County School Districts: http://www.puc.state.oh.us/pucogis/newcntymaps/sd035.pdf
Cuyahoga County Sanitary Engineer: http://sanitaryeng.cuyahogacounty.us/
City of North Olmstead Storm Sewer Department: http://www.north-olmsted.com/service/publicworks/stormsewer.cfm
City of Westlake Water and Sewer: http://www.cityofwestlake.org/services/water.aspx
Cuyahoga Soil and Water Conservation District: http://www.cuyahogaswcd.org/
Cuyahoga County Planning Commission: http://planning.co.cuyahoga.oh.us/index.html
Ashland County School Districts: http://www.puc.state.oh.us/pucogis/newcntymaps/sd005.pdf
Ashland County Board of Health: http://www.ashlandhealth.com/uploads/sewagerules2008.pdf
Ashland SWCD: http://www.ashlandswcd.com/
Ashland County Planning Department: http://www.ashlandcounty.org/planning/commission.cfm
Huron County School Districts: http://en.wikipedia.org/wiki/School_Districts_of_Huron_County,_Ohio
Northern Ohio Rural Water: http://www.norw.org/board-and-representatives

Huron Soil and Water Conservation District: http://huronswcd.com/
Findley State Park: http://www.dnr.state.oh.us/parks/parks/findley/tabid/734/Default.aspx
Ohio Environmental Protection Agency (Ohio EPA) Municipal Separate Storm Sewer website: http://epa.ohio.gov/dsw/storm/ms4_index.aspx
Ohio EPA Alternative General Permit for MS4s Located within Rapidly Developing Watersheds: http://epa.ohio.gov/dsw/permits/gpfact.aspx#currently%20available
City of Oberlin 2004 Comprehensive Plan: http://www.cityofoberlin.com/Files/Planning/TEXT Plan Update 2004.pdf
United States Environmental Protection Agency (US EPA) Ecoregions: http://www.epa.gov/wed/pages/ecoregions/ohin_eco.htm

Rare Plant Species in the Black river Watershed:

- *Phegopteris connectilis* (Long Beach Fern): http://www.ohiodnr.com/Portals/3/Abstracts/Abstract_pdf/P/Phegopteris_connectilis.pdf
- *Castanea dentata* (American Chestnut): http://www.ohiodnr.com/Portals/3/Abstracts/Abstract_pdf/C/Castanea_dentata.pdf
- *Carex louisianica* (Louisiana Sedge): http://www.ohiodnr.com/Portals/3/Abstracts/Abstract_pdf/C/Carex_louisianica.pdf
- *Shepherdia Canadensis* (Canada buffalo-berry): http://www.ohiodnr.com/Portals/3/Abstracts/Abstract_pdf/S/Shepherdia_canadensis.pdf
- *Thuja occidentalis* (Arbor Vitae): http://www.ohiodnr.com/Portals/3/Abstracts/Abstract_pdf/T/Thuja_occidentalis.pdf
- *Poa paludigena* (Marsh Spear Grass): http://www.ohiodnr.com/dnap/Abstracts/p/poapalu2/tabid/1464/Default.aspx
- *Carex bushii* (Bush's Sedge): http://www.ohiodnr.com/Portals/3/Abstracts/Abstract_pdf/C/Carex_bushii.pdf
- *Glyceria acutiflora* (Sharp-glumed Manna Grass): http://www.ohiodnr.com/Portals/3/Abstracts/Abstract_pdf/G/Glyceria_acutiflora.pdf
- *Cornus rugosa* (Round-leaved Dogwood): http://www.ohiodnr.com/Portals/3/Abstracts/Abstract_pdf/C/Cornus_rugosa.pdf
- *Carex cephaloidea* (Thin-leaved Sedge): http://www.ohiodnr.com/Portals/3/Abstracts/Abstract_pdf/C/Carex_cephaloidea.pdf
- *Woodwardia areolata* (Netted Chain Fern): http://www.ohiodnr.com/Portals/3/Abstracts/Abstract_pdf/W-Z/Woodwardia_areolata.pdf
- *Plagiothecium latebricola* (Lurking Leskea): http://www.ohiodnr.com/dnap/Abstracts/p/plaglate/tabid/1449/Default.aspx

Rare Animal Species in the Black River Watershed:

- *Myotis sodalis* (Indiana Bat): http://www.dnr.state.oh.us/Home/species_a_to_z/SpeciesGuideIndex/indianabat/tabid/6662/Default.aspx

- *Charadrius melodus* (Piping Plover): http://www.dnr.state.oh.us/Home/species_a_to_z/SpeciesGuideIndex/pipingplover/tabid/6902/Default.aspx
- *Sistrurus catenatus* (Eastern Massasauga): http://www.dnr.state.oh.us/Home/species_a_to_z/SpeciesGuideIndex/easternmassasauga/tabid/6610/Default.aspx
- *Oxyura jamaicensis* (Ruddy Duck): http://www.dnr.state.oh.us/Home/species_a_to_z/SpeciesGuideIndex/ruddyduck/tabid/6920/Default.aspx
- *Notropis heterolepis* (Blacknose Shiner): http://www.dnr.state.oh.us/tabid/22430/Default.aspx
- *Notropis dorsalis* (Bigmouth Shiner): http://www.dnr.state.oh.us/Home/species_a_to_z/SpeciesGuideIndex/bigmouthshiner/tabid/22426/Default.aspx
- *Cistothorus platensis* (Sedge Wren): http://www.dnr.state.oh.us/Home/species_a_to_z/SpeciesGuideIndex/sedgewren/tabid/6925/Default.aspx

The Nature Conservancy's Targeted Invasive Species List:
http://www.nature.org/wherewework/northamerica/states/ohio/science/art6279.html

Ohio EPA Ohio Water Resource Inventory: http://www.epa.ohio.gov/portals/35/documents/96vol3.pdf
FindLakes database: http://findlakes.com/main.php?lorain
United States Geological Survey (USGS) Black River Flow Gauge:
http://waterdata.usgs.gov/nwis/uv/?site_no=04200500&agency_cd=USGS
Ohio EPA Source Water Assesment Plans Program: http://www.epa.ohio.gov/ddagw/swap.aspx
The Lorain County Historical Society: http://sites.google.com/site/loraincountyhistoricalsociety/home
Black River Historical Society: http://www.loraincityhistory.org/
Leonard M. Moore House: http://www.loraincityhistory.org/history_of_moorehouse.html
Lorain Lighthouse: http://www.loraincityhistory.org/lighthouse_front.html
Oberlin College: http://new.oberlin.edu/

- Oberlin Conservatory of Music: http://new.oberlin.edu/conservatory/
- Oberlin Conservatory of Music Bertram and Judith Kohl Building: http://www.oberlin.edu/kohl/
- A.J. Lewis Center for Environmental Studies: http://www.oberlin.edu/ajlc/ajlcHome.html
- Allen Memorial Art Museum: http://www.oberlin.edu/amam/default.html

Apollo Theatre: http://new.oberlin.edu/apollo/
Lorain County Community College: http://www.loraincc.edu/
Lorain Palace Theatre: http://www.lorainpalace.com/
Black River Remedial Action Plan: http://www.blackriverrap.com/
Northeast Ohio Areawide Coordinating Agency (NOACA) Black River RAP website:
http://www.noaca.org/rapbg.html
Lower Black River Master Ecological Plan:
http://www.blackriverrap.com/files/announcements/attachments/204_December_final_report.pdf
City of Elyria Greenway and Trail Plan:

http://www.blackriverrap.com/files/announcements/attachments/141_BRR_-_Whole_Report.pdf
Ohio EPA Black River 1999 Total Sediment Discharge (TSD) Report:
http://www.epa.ohio.gov/portals/35/documents/black97.pdf

Appendix E

Summary of Riparian and/or Wetland Regulations in the Black River Watershed as of November 2010

City of Lorain: http://www.conwaygreene.com/Lorain/lpext.dll?f=FifLink&t=document-frame.htm&l=jump&iid=52d77ce8.3d1aeaff.0.0&nid=126f#JD_153308

1533.08 ESTABLISHMENT OF DESIGNATED WATERCOURSES AND RIPARIAN SETBACKS.

(a) Designated watercourses shall include those watercourses meeting any one of the following criteria:

(1) All watercourses draining an area greater than one square mile, or

(2) All watercourses draining an area less than % square mile and having a defined bed and bank.

(3) In determining if watercourses have a defined bed and bank, the City of Lorain may consult with a representative of the local county SWCD or other technical experts as necessary.

(b) Riparian setbacks on designated watercourses are established as follows:

(1) A minimum of 300 feet on both sides of all watercourses draining an area greater than 300 square miles.

(2) A minimum of 120 feet on both sides of all watercourses draining an area greater than 20 square miles and up to and including 300 square miles.

(3) A minimum of 75 feet on both sides of all watercourses draining an area greater than one half square mile and up to and including 20 square miles.

(4) A minimum of 25 feet on both sides of all watercourses draining an area less than one half square mile and having a defined bed and bank as determined above.

(c) Riparian Setback Map:

(1) The City of Lorain shall use the latest edition of the official soil survey that shows drainage features, on the paper maps in the back of the book, as the map identifying designated watercourses and their riparian setbacks. The drainage features identified on the paper maps in the official soil survey and the information contained therein shall be believed to be accurate.

(2) At the time of application of this regulation, if any discrepancy is found between the Riparian Setback Map and the criteria for designated watercourses or riparian setbacks as set forth in these regulations, the criteria shall prevail,

(3) In reviewing and interpreting the maps the City of Lorain may consult with a representative of the local county SWCD and other technical experts as necessary.

(d) The following conditions shall apply in riparian and wetland setbacks:

(1) Riparian and wetland setbacks shall be measured in a perpendicular and horizontal direction outward from the ordinary high water mark of each designated watercourse and defined wetland boundary.

(2) Except as otherwise provided in this regulation, riparian and wetland setbacks shall be preserved in their natural state and shall be established and marked in the field prior to any soil disturbing or land clearing activities.

(3) Where the 100-year floodplain is wider than a riparian setback on either or both sides of a designated watercourse, the riparian setback shall be extended to the outer edge of the 100-

year floodplain. The 100-year floodplain shall be determined by the project engineer conducting a hydrologic analysis of the project area in conformance with standard engineering practices and approved by the City Engineer.

(4) Where wetlands are identified within a riparian setback, the minimum riparian setback width shall be extended to the outer boundary of the wetland. In addition, wetlands shall be protected to the extent detailed in these regulations.

(5) Wetlands shall be delineated by a site survey approved by the City of Lorain using delineation protocols accepted by the U.S. Army Corps of Engineers and the Ohio EPA at the time of application of this regulation. If a conflict exists between the delineation protocols of these two agencies, the delineation protocol that results in the most inclusive area of wetland shall apply.

(e) The applicant or his or her designated representative shall be responsible for delineating riparian and wetland setbacks, including any expansions or modifications as required by these regulations, and identifying these setbacks on all property/parcel splits, commercial development or other land development plans, and/or building permit applications submitted to the City of Lorain. This delineation may be done by a metes and bounds, or higher level, survey and shall be subject to review and approval by the City of Lorain. As a result of this review, the City of Lorain may consult with a representative of the local county SWCD or other technical experts as necessary.

(f) Prior to any soil disturbing activity, riparian and wetland setbacks shall be clearly delineated on site by the applicant or his or her designated representative, and such delineation shall be maintained throughout soil disturbing activities.

(g) No approvals or permits shall be issued by the City of Lorain prior to on-site delineation of riparian and wetland setbacks in conformance with these regulations.

(h) Upon completion of an approved property/parcel split, land development, or other improvement, riparian and wetland setbacks shall be permanently recorded on the plat records of the City of Lorain.

(Ord. 109-04. Passed 7-19-04.)

City of Elyria:

http://www.amlegal.com/nxt/gateway.dll?f=id$id=Elyria,%20OH%20Code%20of%20Ordinances%3Ar%3Ae5b9$cid=ohio$t=document-frame.htm$an=JD_960.13$3.0#JD_960.13

960.13 WATERCOURSE PROTECTION.

(a) Every person owning property through which a watercourse passes, or such person's lessee, shall keep and maintain that part of the watercourse within the property free of trash, debris, excessive vegetation, and other obstacles that would pollute, contaminate, or significantly retard the flow of water through the watercourse in such a way as to cause or potentially cause flooding upstream. In addition, the owner or lessee shall maintain existing privately owned structures within or adjacent to a watercourse, so that such structures will not become a hazard to the use, function, or physical integrity of the watercourse.

(b) Any such trash, debris, excessive vegetation or other obstacle or structure that violates or would violate this chapter is hereby declared to be a nuisance.

(c) Vehicles should avoid water resources. A written approval is required by the City Engineer if vehicles must enter and/or cross these areas repeatedly.

(d) No soil, rock, debris, or any other material shall be dumped, disposed of or placed into a water resource or into such proximity that it may slough, slip, or erode into a water resource.

(1) Such dumping or placing is allowable only if authorized by the City Engineer and, when applicable, the US Army Corps of Engineers and Ohio EPA, for such purposes as, but not limited to, constructing bridges, culverts and erosion control structures.

(2) Rock may be used for stream bank stabilization when approved by the City Engineer.

(Ord. 2008-18. Passed 2-19-08.)

City of Sheffield Lake:
http://www.conwaygreene.com/SheffieldLake/lpext.dll/SheffieldLake/3569/3738/3946?f=hitlist&q=riparian&x=Simple&opt=&skc=80000002401AB26B34A120DF00003947&c=curr&gh=1&2.0#LPHit1

CHAPTER 944
Regulation of Pollutants into the Municipal Storm Sewer System

EDITOR'S NOTE: Pursuant to Ordinance 46-09, passed August 25, 2009, Council has adopted regulations controlling construction site soil erosion, sediment, storm water runoff, storm water quality, riparian setback, and wetlands protection (attached thereto and incorporated herein by reference).

Sheffield Village: http://www.sheffieldvillage.com/documents/ordinances.pdf

1375. 12 WATERCOURSE PROTECTION.

Every person owning property through which a watercourse passes, or such person's lessee, shall keep and maintain that part of the watercourse within the property free of trash, debris, excessive vegetation, and other obstacles that would pollute, contaminate, or significantly retard the flow of water through the watercourse in such a way as to cause or potentially cause flooding upstream. In addition, the owner or lessee shall maintain existing privately owned structures within or adjacent to a watercourse, so that such structures will not become a hazard to the use, function, or physical integrity of the watercourse.

City of Avon:
http://www.amlegal.com/nxt/gateway.dll/Ohio/avon_oh/codifiedordinancesofthecityofavonohio?fn=altmain-nf.htm$f=templates$3.0&vid=amlegal:avon_oh

1050.05
(a) Erosion and Sediment Kept on Site. Erosion and sedimentation caused by accelerated wind or storm water runoff over the site due to earth-disturbing activities shall be stabilized and confined to within the boundaries of the development site.

(b) Structural and Nonstructural Best Management Practices. Nonstructural storm water management practices shall be encouraged. Such practices may include, but not be limited to, preserving riparian areas, preserving existing vegetation and vegetative buffer strips, phasing of construction, and designation of tree preservation areas.
(c) Stream and Wetland Riparian Buffers. The site owner and/or applicant shall leave a riparian buffer on sides of and/or surrounding water resources, except for crossings and other riparian area impacts approved by the City Engineer. Buffer area shall equal all identified FEMA floodways and floodplains unless otherwise approved by the City Engineer. Buffer areas shall be maintained as identified in Section 1030.02(b) for minor and major ditch setbacks.
(d) Channel Protection. To protect stream channels from degradation, specific channel protection criteria shall be provided as prescribed in the latest edition of Rainwater and Land Development.
(Ord. 13-06. Passed 2-13-06.)

1030.02 AUTHORITY OF MAYOR; MAINTENANCE; PROPERTY DAMAGE; COSTS.
(a) All ditches, watercourses and drainage improvements of every kind, whether located within public or private property, shall be under the control of the Mayor or his or her designated agent.
(b) In cleaning, repairing and performing other maintenance work on ditches, watercourses and drainage improvements, the Mayor or his or her designated agent, whose duty it is to perform such maintenance work, may go upon the adjoining or abutting lands within the area necessary for the proper operation of the required machinery, tools, motor vehicles, conveyances or other equipment. The area necessary shall be seventy-five feet in the case of a major ditch and fifty feet in the case of a minor ditch, with the centerline thereof being the center of the ditch, watercourse or drainage improvement. If, in the course of the work, it is necessary to damage or temporarily remove fences, poles, wire lines or other objects which are not obstructing the waterway, then the cost of repairing or replacing such fences, poles, wire lines or other objects shall be the responsibility of the City.
(Ord. 70-96. Passed 5-13-96.)

City of Avon Lake:
http://www.amlegal.com/nxt/gateway.dll/Ohio/avonlake/codifiedordinancesofthecityofavonlakeohi?f=templates$fn=default.htm$3.0$vid=amlegal:avonlake_oh

1060.05 PERFORMANCE STANDARDS.
(c) Stream and Wetland Riparian Buffers. The site owner and/or applicant shall leave a riparian buffer on sides of and/or surrounding surface waters of the State, except for crossings and other riparian area impacts approved by the City Engineer. Buffer area shall equal all identified FEMA floodways and floodplains, or revised floodplain via FEMA, unless otherwise approved by the City Engineer. The buffer that operators shall leave undisturbed along a surface water of the state is 25 feet as measured from the centerline of the surface water.

City of North Ridgeville:
http://www.conwaygreene.com/Northridgeville/lpext.dll/NorthRidgeville/3c12/3ef1/441e/4481?f=templates&fn=document-frame.htm&2.0#JD_105605

1056.05 PERFORMANCE STANDARDS.
(a) Erosion and Sediment Kept on Site. Using BMPs, erosion and sedimentation caused by

accelerated wind or storm water runoff over the site shall be stabilized within the boundaries of the development site to the maximum extent practicable.

(b) Structural and Nonstructural Best Management Practices. Nonstructural storm water management practices shall be encouraged. Such practices may include, but not be limited to, preserving riparian areas, preserving existing vegetation and vegetative buffer strips, phasing of construction, and designation of tree preservation areas.

(c) Stream and Wetland Riparian Buffers. The site owner and/or applicant shall leave a riparian buffer on sides of and/or surrounding surface waters of the state, except for crossings and other riparian area impacts approved by the City Engineer. Buffer area shall equal all identified FEMA floodways and floodplains or revised floodplain via FEMA unless otherwise approved by the City Engineer. Buffer areas shall be maintained as identified in Section 1028.05(c) for minor and major ditch setbacks.

(d) Channel Protection. To protect stream channels from degradation, specific channel protection criteria shall be provided as prescribed in Rainwater and Land Development, or in a manner approved by the City Engineer.
(Ord. 4334-2006. Passed 10-16-06.)

1028.05 GENERAL PROHIBITIONS.

No person, firm or corporation shall:

(a) Prohibit or interfere with the City in the exercise of the duties and responsibilities set forth in this chapter.

(b) Erect any bridge, walkway or other structure in or across any ditch, watercourse or drainage improvement unless approved by the City Engineer, in writing.

(c) Install, construct or erect any structure or obstruction within thirty-seven and one-half feet of a major ditch or within twenty-five feet of a minor ditch, as measured from either side of the centerline of any ditch, watercourse or drainage improvement, unless approved by the City Engineer, in writing.

(Ord. 1150-76. Passed 3-15-76; Ord. 3465-99. Passed 6-21-99.)

City of Oberlin:
http://www.conwaygreene.com/Oberlin/lpext.dll/Oberlin/3a26/3d87/442e/4484?fn=document-frame.htm&f=templates&2.0

1344.05 DESIGN STANDARDS.

C. Conservation and Riparian Zones:

1. A riparian buffer of 50 feet on both sides shall be provided along the length of any perennial stream channel as designated by Lorain County Soil and Water Conservation District.

2. Walkways may be permitted to be located within riparian buffers when the Planning Commission determines that such will create minimum change to the riparian buffer.

(b) Other Design Criteria. In addition to the standards contained in Section 1344.05, all elements of a conservation development shall be designed in accordance with the following criteria to ensure that

the site's natural, historic and cultural features are appropriately addressed.

(8) Wetlands. Wetlands that are required to be retained by the Army Corps of Engineers or the Ohio EPA shall be protected by the following:

A. A buffer area having a width no less than 50 feet, measured from the edge of the delineated wetland. The area within this buffer shall not be disturbed and shall be retained in its natural state; and

B. A minimum building and pavement setback of 70 feet, measured from the edge of the designated wetland, shall be provided.

(Ord. 05-82AC. Passed 7-5-06.)

Pittsfield Twp: http://www.pittsfieldtwp.us/docs/zoningreslution012004.pdf

Chapter 4.3, Sec G, VI,

b. Wetlands Protection. Wetlands that are required to be retained by the Army Corp of Engineers or the Ohio EPA to be retained shall be protected by the following:

i) A buffer area having a width not less than 50 feet, measured from the edge of the designated wetland. The area within this buffer shall not be disturbed and shall be retained in its natural state; and

ii) A minimum building and pavement setback of 70 feet, measured from the edge of the designated wetland.

c. Conservation of Riparian Zones:

i) A riparian buffer of 100 feet shall be provided along the entire length and on both sides of the West Branch of the Black River. A riparian buffer of 50 feet on both sides shall be provided along the length of any other perennial stream channel as designated by Lorain County Soil and Water Conservation District.

ii) Walkways may be permitted to be located within riparian buffers when the Zoning Commission determines that such will create minimal change to the riparian buffer.

Adopted 12/16/02

City of North Olmsted:
http://www.conwaygreene.com/NorthOlmsted/lpext.dll/NorthOlmsted/3721/39d5/3e1a/3ea2?f=templates&fn=document-frame.htm&2.0#JD_92606

926.06 DESIGNATED WATERCOURSES AND RIPARIAN SETBACKS.

(a) Designated watercourses shall include those watercourses meeting any one of the following criteria:

(1) All watercourses draining an area greater than ½ square mile, or

(2) All watercourses draining an area less than ½ square mile and having a defined bed and bank.

(3) In determining if watercourses have a defined bed and bank, the City may consult with a representative of the Cuyahoga SWCD or other technical experts as necessary.

(b) Riparian setbacks on designated watercourses are established as follows:

(1) A minimum of 300 feet on both sides of all watercourses draining an area greater than

300 square miles.

(2) A minimum of 120 feet on both sides of all watercourses draining an area greater than 20 square miles and up to and including 300 square miles.

(3) A minimum of 75 feet on both sides of all watercourses draining an area greater than one half square mile and up to and including 20 square miles.

(4) A minimum of 25 feet on both sides of all watercourses draining an area less than one half square mile and having a defined bed and bank as determined above.

(c) Riparian Setback Map.

(1) The City shall use the latest edition of the official soil survey that shows drainage features, on the paper maps in the back of the book, as the map identifying designated watercourses and their riparian setbacks. The drainage features identified on the paper maps in the official soil survey and the information contained therein shall be believed to be accurate.

(2) At the time of application of this regulation, if any discrepancy is found between the Riparian Setback Map and the criteria for designated watercourses or riparian setbacks as set forth in these regulations, the criteria shall prevail.

(3) In reviewing and interpreting the maps the City may consult with a representative of the Cuyahoga SWCD and other technical experts as necessary. (Ord. 2006-67. Passed 3-7-06.)

926.07 ESTABLISHMENT OF WETLAND SETBACKS.

Wetland setbacks are established as follows:

(a) A minimum of 120 feet surrounding and including all Ohio EPA Category 3 Wetlands, or current equivalent Ohio EPA classification.

(b) A minimum of 75 feet surrounding and including all Ohio EPA Category 2 Wetlands, or current equivalent Ohio EPA classification.

(Ord. 2006-67. Passed 3-7-06.)

City of Westlake: http://www.cityofwestlake.org/pdfs/CodifiedOrdinances/HPlanningPlatting.pdf

1127.06 PUBLIC USES.

(a) Utility Easements. Where utilities are not located in the street, easement for overhead power lines at least fifteen feet wide shall be centered on rear lot lines. Easements for other utilities shall be determined by the Director of Engineering.
(b) Drainageways. Where a subdivision is traversed by a drainageway and easement of an appropriate type conforming substantially with the lines of such drainageway shall be provided. Easements for drainageways shall be a minimum width of twenty feet or of such further width as required by the Director.

Appendix F

Goals, Objectives, and Actions

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
Watershed-Wide											
All	Create Map Showing Potential Riparian Setback/Buffer Widths	Variable	Multiple		Multiple	EA	1	$5,000-$10,000	N/A	Hard Copy & Interactive Online Map	
All	Inventory of Potential Stream, Wetland, and Floodplain Restoration Projects	Variable	Multiple		Multiple	EA	1	$23,000	N/A	Subwatershed Basis to Meet 12-Digit HUC Goals	
All	Dam Removal Inventory and Evaluation	Variable	Multiple		Multiple	EA	1	$10,000	N/A		
All	Implement County HSTS programs to meet CMM and new rules.	Variable	Excessive nutrients/bacteria/low DO		Point Sources	EA	5	Unknown	N/A	Each County	
All	Develop a regular inspection program (every 3-5 years) for HSTS.	Variable	Excessive nutrients/bacteria/low DO		Point Sources	EA	5	Unknown	N/A	Each County	
All	Develop a GIS-driven database and inventory of existing HSTS and Semi-Public Systems.	Variable	Excessive nutrients/bacteria/low DO		Point Sources	EA	5	Unknown	N/A	Each County	
All	Action Items Identified in Non-Point Coastal Strategic Plan (Table 49; Page 210)	Variable	Multiple		Multiple	See Table 49 (Page 210)	See Table 49 (Page 210)	See Table 49 (Page 210)	N/A	See Table 49 (Page 210)	
All	Assistance to local non-residential property owners to apply for stormwater credits in local stormwater utilities		Flow alteration		Land Development/ Suburbanization				N/A	Install stormwater BMPs to restore natural stream flow and infiltration capacities and allow businesses to obtain credits from local stormwater utilities	Lorain County Stormwater Utility, any community-specific stormwater utility (Sheffield Lake, etc)
041100010503: Wellington Creek											
	Restore eroding stream banks	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	6 6 1.1	$3,168,000 $3,168,000 $580,000	2,154 lb N/yr 1,077 lb P/yr 195.3 tons TSS/yr	Includes ditch retrofits. 319, SWIF, other grants.	

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	Design & construct demonstration ditch retrofit project	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	EA	1	$50,000	N/A	Include signage and/or brochures. Coordinate with Lorain County PIPE.	
	Restore riparian buffers (including floodplains & wetlands) along eroding streams & agriculture	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	8 8 4	$291,000 $291,000 $145,500	2,136 lb N/yr 2,154 lb P/yr 336 tons TSS/yr	Focus on non-attaining streams. 319, SWIF, other grants, Conduct meetings with County Commissioners, Farm Bureau Offices, extension offices, SWCD to strategize.	
	Preserve 25% of Existing Natural Areas	Non	Habitat Loss		Riparian Removal & Hydromodification	%	25	Unknown	N/A		Continue to work with local park districts, Western Reserve Land Conservancy, SWCDs
	Manure Storage Facility	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	3	$30,000-$150,000	1,803 lb N/yr 333 lb P/yr	NRCS Cost Share Programs	
	Grassed Waterways	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	12	$100,000	138 lb N/yr 74 lb P/yr 2.5 tons TSS/yr	NRCS Cost Share Programs	
	Wetland Creation / Restoration	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	2	$20,000-$30,000	10 lb N/yr 2 lb P/yr 1.2 tons TSS/yr	NRCS Cost Share Programs	
	Streambank Livestock Fencing	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	2	$4,500	150 lb N/yr 37 lb P/yr 37 tons TSS/yr	NRCS Cost Share Programs	
	Restore In-stream & Riparian Habitat	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	10	$7,900,000	Achieve WWH Biocriteria Values		Some costs/work associated with this item covered by items above.
	Remove/Repair/Replace HSTS	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	52	$780,000	2,205 lb N/yr 835 lb P/yr	Development of County HSTS Programs to meet CMM and new rules key to funding (Table 49; Page 210)	
	Update and implement local codes for riparian setbacks and stormwater control.	Non	Excessive nutrients/bacteria/low DO	Siltation	Hydromodification	EA	8	$65,560	N/A	Meet with communities & determine level of enforcement. Review existing codes, hold education meetings, develop reporting/tracking strategy for existing/new codes.	
	Remove invasive species	Non	Habitat Loss			AC	10	$30,000	N/A	Coordinate with Lorain County Metro Parks and Ohio DNR.	
041100010601: French Creek											

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	Restore eroding stream banks	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	5 5 1.4	$2,640,000 $2,640.000 $580,000	1,795 lb N/yr 898 lb P/yr 195.3 tons TSS/yr	Includes ditch retrofits. 319, SWIF, other grants.	
	Restore French Creek Tributary #4 Near Lorain County Public Library	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	3,400	$680,000	231 lb N/yr 116 lb P/yr 116 tons TSS/yr	319, SWIF, other grants.	
	Restore riparian buffers (including floodplains & wetlands) along eroding streams & agriculture	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	7 7 4	$255,000 $255,000 $145,500	1,893 lb N/yr 2,154 lb P/yr 336 tons TSS/yr	Focus on non-attaining streams. 319, SWIF, other grants, Conduct meetings with County Commissioners, Farm Bureau Offices, extension offices, SWCD to strategize.	
	Design & construct demonstration ditch retrofit project	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	EA	1	$50,000	N/A	Include signage and/or brochures. Coordinate with Lorain County PIPE.	
	Preserve 25% of Existing Natural Areas	Non	Habitat Loss		Riparian Removal & Hydromodification	%	25	Unknown	N/A		Continue to work with local park districts, Western Reserve Land Conservancy, SWCDs
	Remove/Repair/Replace HSTS	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	181	$2,715,000	7,638 lb N/yr 2,984 lb P/yr	Development of County HSTS Programs to meet CMM and new rules key to funding (Table 49; Page 210)	
	Restore In-stream & Riparian Habitat	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	13	$10,300,000	Achieve WWH Biocriteria Values		Some costs/work associated with this item covered by items above.
	Update and implement local codes for riparian setbacks and stormwater control.	Non	Excessive nutrients/bacteria/low DO	Siltation	Hydromodification	EA	6	$49,170	N/A	Meet with communities & determine level of enforcement. Review existing codes, hold education meetings, develop reporting/tracking strategy for existing/new codes.	
	Construct stormwater BMPs/Stormwater retrofits to treat urban runoff	Non	Excessive nutrients/bacteria/low DO	Siltation	Siltation, Habitat Loss, Urban Runoff & Storm Sewers	AC	20	Unknown	168 lb N/yr 12 lb P/yr 9 tons TSS/yr	Create inventory of potential projects, pursue grant funds, meet with Phase II communities to review codes, hold education meetings, evaluate reporting/tracking	
	West Point Retention Basin Expansion and Wetland Restoration	Non	Siltation	Runoff	Siltation, Habitat Loss, Urban Runoff & Storm Sewers	AC-FT	11	$600,000	98 lb N/yr 16 lb P/yr 12 tons TSS/yr	Expand existing retention basin & restore wetlands	None
	Remove invasive species	Non	Habitat Loss			AC	10	$30,000	N/A	Coordinate with Lorain County Metro Parks and other natural resource management entities	

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	Inventory and Assessment of Potential Stormwater Retrofit Projects	Non	Multiple		Multiple	EA	1	$20,000			
	Develop Stormwater Management Codes (Phase II Communities)	Non	Excessive Siltation	Excessive nutrients/bacteria/low DO	Riparian Removal & Non-Point Sources	EA	3	$9,000 Each		Chagrin River Watershed Partners & NOACA have developed model codes (See Page 161)	
	Develop Illicit Discharge Detection and Elimination Codes (Phase II Communities)	Non	Excessive Siltation	Excessive nutrients/bacteria/low DO	Riparian Removal & Non-Point Sources	EA	3	$9,000 Each			
	Establish Good Housekeeping Practices (Phase II Communities)	Non	Excessive Siltation	Excessive nutrients/bacteria/low DO	Riparian Removal & Non-Point Sources	EA	3	$9,000 Each			
	Establish PIPE Programs for Public Information and Education (Phase II Communities)	Non	Excessive Siltation	Excessive nutrients/bacteria/low DO	Riparian Removal & Non-Point Sources	EA	3	Unknown			
041100010506: Lower West Branch											
	Restore eroding stream banks	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	6 6 2	$3,168,000 $3,168,000 $580,000	2,154 lb N/yr 1,077 lb P/yr 580 tons TSS/yr	Includes ditch retrofits. 319, SWIF, other grants.	
	Restore riparian buffers (including floodplains & wetlands) along eroding streams & agriculture	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	10 10 5.4	$364,000 $364,000 $196,000	2,605 lb N/yr 1,398 lb P/yr 442 tons TSS/yr	Focus on non-attaining streams. 319, SWIF, other grants, Conduct meetings with County Commissioners, Farm Bureau Offices, extension offices, SWCD to strategize.	
	Design & construct demonstration ditch retrofit project	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	EA	1	$50,000	N/A	Include signage and/or brochures. Coordinate with Lorain County PIPE.	
	Preserve 25% of Existing Natural Areas	Non	Habitat Loss		Riparian Removal & Hydromodification	%	25	Unknown	N/A		Continue to work with local park districts, Western Reserve Land Conservancy, SWCDs
	Remove/Repair/Replace HSTS	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	87	$1,305,000	3,668 lb N/yr 1,389 lb P/yr	Development of County HSTS Programs to meet CMM and new rules key to funding (Table 49; Page 210)	
	Restore In-stream & Riparian Habitat	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	17	$13,464,000	Achieve WWH Biocriteria Values		Some costs/work associated with this item covered by items above.

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	Update and implement local codes for riparian setbacks and stormwater control.	Non	Excessive nutrients/bacteria/low DO	Siltation	Hydromodification	EA	14	$114,730	N/A	Meet with communities & determine level of enforcement. Review existing codes, hold education meetings, develop reporting/tracking strategy for existing/new codes.	
	Remove invasive species	Non	Habitat Loss			AC	10	$30,000	N/A	Coordinate with Lorain County Metro Parks and other natural resource management entities	
	Manure Storage Facility	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	3	$30,000-$150,000	1,803 lb N/yr 333 lb P/yr	NRCS Cost Share Programs	
	Grassed Waterways	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	12	$100,000	138 lb N/yr 74 lb P/yr 2.5 tons TSS/yr	NRCS Cost Share Programs	
	Wetland Creation / Restoration	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	2	$20,000-$30,000	10 lb N/yr 2 lb P/yr 1.2 tons TSS/yr	NRCS Cost Share Programs	
	Streambank Livestock Fencing	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	2	$4,500	150 lb N/yr 37 lb P/yr 37 tons TSS/yr	NRCS Cost Share Programs	
	Eliminate CSOs in Elyria	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	10	Unknown	40 lb N/yr 7 lb P/yr	City of Elryia is currently negotiating a CSO reduction program with USEPA	
041100010602: Black River											
	Restore eroding stream banks	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	1	$528,000	359 lb N/yr 180 lb P/yr 180 tons TSS/yr	Includes ditch retrofits. 319, SWIF, other grants.	
	Cascade Park, Elyria Stream Bank and Riparian Restoration	Non	Riparian Removal	Habitat Loss	Riparian Removal and Stream Bank Erosion	Linear Ft	3,000	$700,000	204 lb N/yr 102 lb P/yr 102 tons TSS/yr		
	Restore riparian buffers (including floodplains & wetlands) along eroding streams & agriculture	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	10 10 5.4	$364,000 $364,000 $196,400	2,610 lb N/yr 1,400 lb P/yr 436 tons TSS/yr	Focus on non-attaining streams. 319, SWIF, other grants, Conduct meetings with County Commissioners, Farm Bureau Offices, extension offices, SWCD to strategize.	
	Design & construct demonstration ditch retrofit project	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	EA	1	$50,000	N/A	Include signage and/or brochures. Coordinate with Lorain County PIPE.	

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	Preserve 25% of Existing Natural Areas	Non	Habitat Loss		Riparian Removal & Hydromodification	%	25	Unknown	N/A		Continue to work with local park districts, Western Reserve Land Conservancy, SWCDs
	Henderson Bridge Wetland Preservation	Non	Habitat Loss		Hydromodification	AC	7	$800,000			None
	Update and implement local codes for riparian setbacks and stormwater control.	Non	Excessive nutrients/bacteria/low DO	Siltation	Hydromodification	EA	6	$49,170	N/A	Meet with communities & determine level of enforcement. Review existing codes, hold education meetings, develop reporting/tracking strategy for existing/new codes.	
	Construct stormwater BMPs/Stormwater retrofits to treat urban runoff	Non	Excessive nutrients/bacteria/low DO	Siltation	Siltation, Habitat Loss, Urban Runoff & Storm Sewers	AC	20	Unknown	168 lb N/yr 12 lb P/yr 9 tons TSS/yr	Create inventory of potential projects, pursue grant funds, meet with Phase II communities to review codes, hold education meetings, evaluate reporting/tracking	
	Lorain County Job & Family Services Stormwater Retrofit	Non	Excessive nutrients/bacteria/low DO	Excessive Siltation	Urban Runoff & Storm Sewers	Each	1	$250,000	67 lb N/yr 5 lb P/yr	Potential 319 Grant Application	
	Establish Green Marina Program and Certification	Non	Runoff		Urban Runoff & Industrial Point Source	Each	1	$100,000	42 lb N/yr 16 lb P/yr	1 Marina	None
	Bulkhead Removal	Non	Habitat Loss		Hydromodification	Linear Ft	1000	$1.5 M	Achieve WWH Biocriteria Values		None
	Remove Slag & Restore Riparian Habitat RM 1.8-5	Non	Habitat Loss		Non-Point Sources	AC	100	$50 M	Achieve WWH Biocriteria Values		
	Remove Slag and Restore Wetland in Cooling Pond Near Heron Rookery	None	Habitat Loss		Riparian Removal and Non-Point Sources	AC	8	$1.5 M	Achieve WWH Biocriteria Values		None
	Phragmites removal RM 0-6	Non	Habitat Loss		Habitat Loss	Miles (Each Bank)	12	$1 M	Achieve WWH Biocriteria Values	USEPA Challenge Grant	Funding Acquired
	Evaluate potential for plant materials from Phragmites removal projects to be used otherwise in a beneficial re-use manner.	Non	Habitat Loss		Habitat Loss	Evaluation	1	Component of $1 M project above	Achieve WWH Biocriteria Values	USEPA Challenge Grant	Funding Acquired

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	Kobe Bioremediation System Removal & Restoration	Non	Habitat Loss		Industrial Non-Point Source	AC	2.7	340,000	Achieve WWH Biocriteria Values	bioremediation system removal - in disrepair and in riparian restoration	USFWS GLRI Grant Acquired - Project Underway
	Plant Aquatic Vegetation RM 0-6	Non	Habitat Loss		Hydromodification, Bank Erosion, Runoff	AC	2	$112,000	Achieve WWH Biocriteria Values	Plant Emergent and Submergent Aquatic Vegetation in shallow and near-shore areas	Two Projects Underway (1 AC)
	Aquatic Habitat Restoration RM 0-3	Non	Habitat Loss		Hydromodification	Linear Ft	1000	$350,000.00	Achieve WWH Biocriteria Values	Fish Shelves, Coarse Substrate, Coarse Woody Debris, Etc.	None
	Aquatic Habitat Restoration RM 3-6	Non	Habitat Loss		Hydromodification	Linear Ft	10,000	$3.5 M	Achieve WWH Biocriteria Values	Fish Shelves, Coarse Substrate, Coarse Woody Debris, Etc.	Two Projects Underway (5,240 Ft.)
	Remove/Repair/Replace HSTS	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	93	$1,395,000	3,921 lb N/yr 1,485 lb P/yr	Development of County HSTS Programs to meet CMM and new rules key to funding (Table 49; Page 210)	
	Packard Ditch Stormwater Improvements Assessment	Non	Excessive nutrients/bacteria/low DO		Urban Runoff & Storm Sewers	Linear Ft	4,000	$10,000	N/A	Stakeholder Interviews, Assessment, and Concept Development for Dumping in Ditch flowing to Black R.	None
	Packard Ditch Stormwater Improvements	Non	Excessive nutrients/bacteria/low DO		Urban Runoff & Storm Sewers	Linear Ft	4,000	Unknown	3,392 lb N/yr 1,285 lb P/yr	Implement Concept Developed Above	None
	Eliminate CSOs in Elyria	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	3	Unknown	12 lb N/yr 2.1 lb N/yr	City of Elryia is currently negotiating a CSO reduction program with USEPA	
	Inventory and Assessment of Potential Stormwater Retrofit Projects	Non	Multiple		Multiple	EA	1	$20,000	N/A		
	Develop Illicit Discharge Detection and Elimination Codes (Phase II Communities)	Non	Excessive Siltation	Excessive nutrients/bacteria/low DO	Riparian Removal & Non-Point Sources	EA	4	$9,000 Each	N/A		
	Establish Good Housekeeping Practices (Phase II Communities)	Non	Excessive Siltation	Excessive nutrients/bacteria/low DO	Riparian Removal & Non-Point Sources	EA	4	$9,000 Each	N/A		
	Establish PIPE Programs for Public Information and Education (Phase II Communities)	Non	Excessive Siltation	Excessive nutrients/bacteria/low DO	Riparian Removal & Non-Point Sources	EA	4	Unknown	N/A		

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
041100010501: Charlemont Creek											
	Restore eroding stream banks	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	10 10 1	$5,280,000 $5,280,000 $528,000	3,590 lb N/yr 1,097 lb P/yr 180 tons TSS/yr	Includes ditch retrofits. 319, SWIF, other grants.	
	Restore riparian buffers (including floodplains & wetlands) along eroding streams & agriculture	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	10 10 2.8	$364,000 $364,000 $102,000	2,610 lb N/yr 1,400 lb P/yr 246 tons TSS/yr	Focus on non-attaining streams. 319, SWIF, other grants, Conduct meetings with County Commissioners, Farm Bureau Offices, extension offices, SWCD to strategize.	
	Design & construct demonstration ditch retrofit project	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	EA	1	$50,000	N/A	Include signage and/or brochures. Coordinate with Lorain County PIPE.	
	Preserve 25% of Existing Natural Areas	Non	Habitat Loss		Riparian Removal & Hydromodification	%	25	Unknown	N/A		Continue to work with local park districts, Western Reserve Land Conservancy, SWCDs
	Remove/Repair/Replace HSTS	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	33	$495,000	1,391 lb N/yr 527 lb P/yr	Development of County HSTS Programs to meet CMM and new rules key to funding (Table 49; Page 210)	
	Restore In-stream & Riparian Habitat	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	17	$13,464,000	Achieve WWH Biocriteria Values		Some costs/work associated with this item covered by items above.
	Update and implement local codes for riparian setbacks and stormwater control.	Non	Excessive nutrients/bacteria/low DO	Siltation	Hydromodification	EA	14	$114,730	N/A	Meet with communities & determine level of enforcement. Review existing codes, hold education meetings, develop reporting/tracking strategy for existing/new codes.	
	Remove invasive species	Non	Habitat Loss			AC	10	$30,000	N/A	Coordinate with Lorain County Metro Parks and other natural resource management entities	
	Manure Storage Facility	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	3	$30,000- $150,000	1,803 lb N/yr 333 lb P/yr	NRCS Cost Share Programs	
	Grassed Waterways	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	12	$100,000	138 lb N/yr 74 lb P/yr 2.5 tons TSS/yr	NRCS Cost Share Programs	
	Wetland Creation / Restoration	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	2	$20,000-$30,000	10 lb N/yr 2 lb P/yr 1.2 tons TSS/yr	NRCS Cost Share Programs	

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	Streambank Livestock Fencing	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	2	$4,500	150 lb N/yr 37 lb P/yr 37 tons TSS/yr	NRCS Cost Share Programs	
041100010504: Middle West Branch											
	Restore eroding stream banks	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	5 5 1	$2,640,000 $2,640,000 $528,000	1,795 lb N/yr 898 lb P/yr 180 tons TSS/yr	Includes ditch retrofits. 319, SWIF, other grants.	
	Restore riparian buffers (including floodplains & wetlands) along eroding streams & agriculture	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	10 10 1.6	$364,000 $364,000 $58,000	2,610 lb N/yr 1,400 lb P/yr 137 tons TSS/yr	Focus on non-attaining streams. 319, SWIF, other grants, Conduct meetings with County Commissioners, Farm Bureau Offices, extension offices, SWCD to strategize.	
	Ritter Property Stream and Riparian Restoration and Preservation	Non	Siltation	Habitat Loss	Riparian Removal, Hydromodification, Stream Bank Erosion	Miles AC	1.1 27	$2 M	790 lb N/yr 395 lb P/yr	Adjacent. to Carlisle Reserve	None
	Design & construct demonstration ditch retrofit project	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	EA	1	$50,000	N/A	Include signage and/or brochures. Coordinate with Lorain County PIPE.	
	Preserve 25% of Existing Natural Areas	Non	Habitat Loss		Riparian Removal & Hydromodification	%	25	Unknown	N/A		Continue to work with local park districts, Western Reserve Land Conservancy, SWCDs
	Remove/Repair/Replace HSTS	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	57	$855,000	2,390 lb N/yr 905 lb P/yr	Development of County HSTS Programs to meet CMM and new rules key to funding (Table 49; Page 210)	
	Restore In-stream & Riparian Habitat	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	16	$12,672,000	Achieve WWH Biocriteria Values		Some costs/work associated with this item covered by items above.
	Update and implement local codes for riparian setbacks and stormwater control.	Non	Excessive nutrients/bacteria/low DO	Siltation	Hydromodification	EA	8	$65,560	N/A	Meet with communities & determine level of enforcement. Review existing codes, hold education meetings, develop reporting/tracking strategy for existing/new codes.	
	Remove invasive species	Non	Habitat Loss			AC	10	$30,000	N/A	Coordinate with Lorain County Metro Parks and other natural resource management entities	
	Manure Storage Facility	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	3	$30,000- $150,000	1,803 lb N/yr 333 lb P/yr	NRCS Cost Share Programs	

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	Grassed Waterways	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	12	$100,000	138 lb N/yr 74 lb P/yr 2.5 tons TSS/yr	NRCS Cost Share Programs	
	Wetland Creation / Restoration	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	2	$20,000-$30,000	10 lb N/yr 2 lb P/yr 1.2 tons TSS/yr	NRCS Cost Share Programs	
	Streambank Livestock Fencing	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	2	$4,500	150 lb N/yr 37 lb P/yr 37 tons TSS/yr	NRCS Cost Share Programs	
041100010505: Plum Creek											
	Restore eroding stream banks	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	4 4 1	$2,112,000 $2,112,000 $528,000	1,436 lb N/yr 718 lb P/yr 135 tons TSS/yr	Includes ditch retrofits. 319, SWIF, other grants.	
	Restore riparian buffers (including floodplains & wetlands) along eroding streams & agriculture	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	10 10 1.2	$364,000 $364,000 $42,000	2,605 lb N/yr 1,398 lb P/yr 112 tons TSS/yr	Focus on non-attaining streams. 319, SWIF, other grants, Conduct meetings with County Commissioners, Farm Bureau Offices, extension offices, SWCD to strategize.	
	Design & construct demonstration ditch retrofit project	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	EA	1	$50,000	N/A	Include signage and/or brochures. Coordinate with Lorain County PIPE.	
	Preserve 25% of Existing Natural Areas	Non	Habitat Loss		Riparian Removal & Hydromodification	%	25	Unknown	N/A		Continue to work with local park districts, Western Reserve Land Conservancy, SWCDs
	Remove/Repair/Replace HSTS	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	31	$465,000	1,324 lb N/yr 501 lb P/yr	Development of County HSTS Programs to meet CMM and new rules key to funding (Table 49; Page 210)	
	Restore In-stream & Riparian Habitat	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	10	$7,920,000	Achieve WWH Biocriteria Values		Some costs/work associated with this item covered by items above.
	Construct stormwater BMPs/Stormwater retrofits to treat urban runoff	Non	Excessive nutrients/bacteria/low DO	Siltation	Siltation, Habitat Loss, Urban Runoff & Storm Sewers	AC	20	Unknown	168 lb N/yr 12 lb P/yr 9 tons TSS/yr	Create inventory of potential projects, pursue grant funds, meet with Phase II communities to review codes, hold education meetings, evaluate reporting/tracking	

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	Update and implement local codes for riparian setbacks and stormwater control.	Non	Excessive nutrients/bacteria/low DO	Siltation	Hydromodification	EA	10	$81,950	N/A	Meet with communities & determine level of enforcement. Review existing codes, hold education meetings, develop reporting/tracking strategy for existing/new codes.	
	Remove invasive species	Non	Habitat Loss			AC	10	$30,000	N/A	Coordinate with Lorain County Metro Parks and other natural resource management entities	
	Manure Storage Facility	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	3	$30,000-$150,000	1,803 lb N/yr 333 lb P/yr	NRCS Cost Share Programs	
	Grassed Waterways	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	12	$100,000	138 lb N/yr 74 lb P/yr 2.5 tons TSS/yr	NRCS Cost Share Programs	
	Wetland Creation / Restoration	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	2	$20,000-$30,000	10 lb N/yr 2 lb P/yr 1.2 tons TSS/yr	NRCS Cost Share Programs	
	Streambank Livestock Fencing	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	2	$4,500	150 lb N/yr 37 lb P/yr 37 tons TSS/yr	NRCS Cost Share Programs	
041100010403: Willow Creek											
	Restore eroding stream banks	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	3 3 1	$1,584,000 $1,584,000 $528,000	1,077 lb N/yr 539 lb P/yr 180 tons TSS/yr	Includes ditch retrofits. 319, SWIF, other grants.	
	Restore riparian buffers (including floodplains & wetlands) along eroding streams & agriculture	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	10 10 3	$364,000 $364,000 $109,000	2,591 lb N/yr 1,390 lb P/yr 258 tons TSS/yr	Focus on non-attaining streams. 319, SWIF, other grants, Conduct meetings with County Commissioners, Farm Bureau Offices, extension offices, SWCD to strategize.	
	Design & construct demonstration ditch retrofit project	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	EA	1	$50,000	N/A	Include signage and/or brochures. Coordinate with Lorain County PIPE.	
	Preserve 25% of Existing Natural Areas	Non	Habitat Loss		Riparian Removal & Hydromodification	%	25	Unknown	N/A		Continue to work with local park districts, Western Reserve Land Conservancy, SWCDs
	Remove/Repair/Replace HSTS	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	60	$900,000	2,530 lb N/yr 958 lb P/yr	Development of County HSTS Programs to meet CMM and new rules key to funding (Table 49; Page 210)	

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	LORCO Phase I HSTS Disconnection	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	70	$1,050,000	2,951 lb N/yr 1,118 lb P/yr	Eaton and Carlisle Townships	In Progress
	Restore In-stream & Riparian Habitat	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	13	$10,296,000	Achieve WWH Biocriteria Values		Some costs/work associated with this item covered by items above.
	Construct stormwater BMPs/Stormwater retrofits to treat urban runoff	Non	Excessive nutrients/bacteria/low DO	Siltation	Siltation, Habitat Loss, Urban Runoff & Storm Sewers	AC	20	Unknown	168 lb N/yr 12 lb P/yr 9 tons TSS/yr	Create inventory of potential projects, pursue grant funds, meet with Phase II communities to review codes, hold education meetings, evaluate reporting/tracking	
	Hawke Road Flooding	Non	Siltation		Urban Runoff	Homes	7	Unknown	0.2 tons TSS/yr	Columbia Township & Eaton Township along Headwaters of Willow Creek	NA
	Update and implement local codes for riparian setbacks and stormwater control.	Non	Excessive nutrients/bacteria/low DO	Siltation	Hydromodification	EA	6	$49,170	N/A	Meet with communities & determine level of enforcement. Review existing codes, hold education meetings, develop reporting/tracking strategy for existing/new codes.	
	Remove invasive species	Non	Habitat Loss			AC	10	$30,000	N/A	Coordinate with Lorain County Metro Parks and other natural resource management entities	
	Manure Storage Facility	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	3	$30,000-$150,000	1,803 lb N/yr 333 lb P/yr	NRCS Cost Share Programs	
	Grassed Waterways	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	12	$100,000	138 lb N/yr 74 lb P/yr 2.5 tons TSS/yr	NRCS Cost Share Programs	
	Wetland Creation / Restoration	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	2	$20,000-$30,000	10 lb N/yr 2 lb P/yr 1.2 tons TSS/yr	NRCS Cost Share Programs	
	Streambank Livestock Fencing	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	2	$4,500	150 lb N/yr 37 lb P/yr 37 tons TSS/yr	NRCS Cost Share Programs	
041100010502: Upper West Branch											
	Restore eroding stream banks	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	9 9 1.7	$4,752,000 $4,752,000 $898,000	3,231 lb N/yr 1,616 lb P/yr 311 tons TSS/yr	Includes ditch retrofits. 319, SWIF, other grants.	

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	Restore riparian buffers (including floodplains & wetlands) along eroding streams & agriculture	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	5 5 5	$182,000 $182,000 $182,000	1,396 lb N/yr 749 lb P/yr 409 tons TSS/yr	Focus on non-attaining streams. 319, SWIF, other grants, Conduct meetings with County Commissioners, Farm Bureau Offices, extension offices, SWCD to strategize.	
	Design & construct demonstration ditch retrofit project	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	EA	1	$50,000	N/A	Include signage and/or brochures. Coordinate with Lorain County PIPE.	
	Preserve 25% of Existing Natural Areas	Non	Habitat Loss		Riparian Removal & Hydromodification	%	25	Unknown	N/A		Continue to work with local park districts, Western Reserve Land Conservancy, SWCDs
	Remove/Repair/Replace HSTS	Non	Excessive nutrients/bacteria/low DO		Point Sources	EA	48	$720,000	2,015 lb N/yr 763 lb P/yr	Development of County HSTS Programs to meet CMM and new rules key to funding (Table 49; Page 210)	
	Restore In-stream & Riparian Habitat	Non	Excessive nutrients/bacteria/low DO	Habitat Loss	Hydromodification	Miles	14	$11,088,000	Achieve WWH Biocriteria Values		Some costs/work associated with this item covered by items above.
	Construct stormwater BMPs/Stormwater retrofits to treat urban runoff	Non	Excessive nutrients/bacteria/low DO	Siltation	Siltation, Habitat Loss, Urban Runoff & Storm Sewers	AC	20	Unknown	168 lb N/yr 12 lb P/yr 9 tons TSS/yr	Create inventory of potential projects, pursue grant funds, meet with Phase II communities to review codes, hold education meetings, evaluate reporting/tracking	
	Update and implement local codes for riparian setbacks and stormwater control.	Non	Excessive nutrients/bacteria/low DO	Siltation	Hydromodification	EA	16	$131,120	N/A	Meet with communities & determine level of enforcement. Review existing codes, hold education meetings, develop reporting/tracking strategy for existing/new codes.	
	Remove invasive species	Non	Habitat Loss			AC	10	$30,000	N/A	Coordinate with Lorain County Metro Parks and other natural resource management entities	
	Manure Storage Facility	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	3	$30,000- $150,000	1,803 lb N/yr 333 lb P/yr	NRCS Cost Share Programs	
	Grassed Waterways	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	12	$100,000	138 lb N/yr 74 lb P/yr 2.5 tons TSS/yr	NRCS Cost Share Programs	
	Wetland Creation / Restoration	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	AC	2	$20,000-$30,000	10 lb N/yr 2 lb P/yr 1.2 tons TSS/yr	NRCS Cost Share Programs	

12 Digit HUC	Action Item	Attainment Status	Causes	Causes	Sources	Unit	Target	Cost	Loading Reduction	Comments	Status
	Streambank Livestock Fencing	Non	Excessive nutrients/bacteria/low DO		Agricultural Runoff	EA	2	$4,500	150 lb N/yr 37 lb P/yr 37 tons TSS/yr	NRCS Cost Share Programs	
Other 12-Digit HUCs											
Heider Ditch - Frontal Lake Erie 04110001063	Day Ditch Stormwater Improvements		Excessive nutrients/bacteria/low DO		Urban Runoff & Storm Sewers	Linear Ft.	10000			Stream restoration and sewer separation	None
Heider Ditch - Frontal Lake Erie 04110001063	Schumaker Ditch Stormwater Improvements		Excessive nutrients/bacteria/low DO		Urban Runoff & Storm Sewers	Linear Ft.	9500			Stream restoration and sewer separation	None
Heider Ditch - Frontal Lake Erie 04110001063	Sheffield Lake Shopping Center Stormwater Improvements		Excessive nutrients/bacteria/low DO		Urban Runoff & Storm Sewers	AC	10			Stormwater BMPs to treat parking lot runoff	None
Jackson Ditch - East Branch Black River 41100010404	Ditch Stormwater Improvements	Full	Excessive nutrients/bacteria/low DO		Urban Runoff & Storm Sewers	Linear Ft.	3000			HSTS Disconnection, Remediation of Channel, and Stormwater BMPs	None