Riley Creek
Watershed Action Plan
(HUC #0410008-04)

Prepared and Written by
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In collaboration with:

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November 2012

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The Riley Creek Watershed Action Plan Endorsement

The Blanchard River Watershed Partnership would like to thank and recognize the involvement and contributions of the many organizations and individuals who have had a part in the development of this community-based watershed action plan.

We, the undersigned, support and agree to pursue implementation of this Watershed Action Plan and agree to seek the necessary resources to improve over all water quality in the Riley Creek watershed and the Blanchard River Watershed.

Allen County Commissioners	Allen County Engineer	Allen County SWCD
Allen County Health Deptartment	Village of Bluffton	OSU Extension
Lima Allen Regional Planning Commission	Hancock County SWCD	Hancock County Commissioners
Hancock County Engineer	Hancock County Board of Health	Hancock Regional Planning Commission
Hardin County SWCD	Hardin County Commissioners	Hardin County Board of Health
Putnam County Commissioners	Putnam County SWCD	Putnam County Board of Health
Putnam County Engineer	Putnam County Regional Planning	

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Preface

The development of the Riley Creek Watershed Action Plan (WAP) began in the spring of 2010. The Blanchard River Watershed Partnership (BRWP) started a stream observational walk of the area where landowners permission was given. Seven Water Quality Monitoring (WQM) sites were set up for the study of the macroinvertebrate population on the Little Riley Creek and Riley Creek. The release of the "Biological and Water Quality Study of the Blanchard River" by the OEPA provided technical support data from the Total Maximum Daily Load (TMDL) study started in 2005 for the plan. Input from several meetings with OEPA, OSU Extension - Hancock County, Allen, Hancock, and Putnam SWCD; Allen, Hancock, and Putnam County officials; and the Steering Committee of the Blanchard River Watershed helped to provide a framework for the development of the watershed plan.

Starting in July of 2011, the actual writing of the draft of Riley Creek started. The writing of the draft continued into 2012. The draft was submitted for review in May 2012. Additional funding from NOAA, through a Coastal Management Assistance Grant - Cycle 15 was used to fund the writing of the action plan from July 1, 2011 until June 30, 2012. The BRWP received a three-year Implementation grant from ODNR in 2012 to cover the watershed coordinator's position. The grant took affect on July 1, 2012.

"This watershed action plan was prepared by the Blanchard River Water Partnership under award NA10NOS4190182 from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce through the Ohio Department of Natural Resources, Office of Coastal Management. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the National Oceanic and Atmospheric Administration, Department of Commerce, Ohio Department of Natural Resources, or the Office of Coastal Management."

Table of Contents

LIST OF FIGURES

LIST OF TABLES

Appendix F:

Appendix H:

LIST OF SIDEBARS

LIST OF PICTURES

LIST OF MAPS

List of Acronyms Used

AWS	Agricultural Water Supply
ACBH	Allen County Board of Health
ACC	Allen County Commissioners
ASCWD	Allen Soil Water Conservation District
BMP	Best Management Practice
BOD	Board of Directors
BRWP	Blanchard River Watershed Partnership
CAP	Community-based Approach to Watershed Management
CDBG	Community Development Block Grant
CMAG	Coastal Management Assistance Grant
CNPCP	Coastal Non-point Pollution Control Program
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CSO	Combined Sewer Overflow
CSW	Construction Storm Water
CWA	Clean Water Act
CWH	Cold Water Habitat
CZARA	Coastal Zone Act Reauthorization Amendments
CZMA	Coastal Zone Management Act
DRP	Dissolved Reactive Phosphorus
ECBP	Eastern Corn Belt Region
EDF	Environmental Defense Fund
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ERIN	Earth Resources Information Network
EWH	Exceptional Warm-water Habitat
FSA	Farm Service Agency
GIS	Geographic Information System
HCBH	Hancock County Board of Health
HCC	Hancock County Commissioners
HCE	Hancock County Engineers
HELP	Huron/Erie Lake Plains
HRPC	Hancock Regional Planning Commission
HrCBH	Hardin County Board of Health
HrCC	Hardin County Commissioners
HrCE	Hardin County Engineers
HrSWCD	Hardin County Soil Water Conservation District
HSWCD	Hancock Soil Water Conservation District
HSG	Hydrological Soil Group
HSTS	Home Septic Treatment System
HUC	Hydrological Unit Code
IBI	Index of Biological Integrity
ICI	Invertebrate Community Index
ISW	Industrial Storm Water
IWS	Industrial Water Supply

LaMP	Lake-wide Management Plan
LACRPC	Lima-Allen County Regional Planning Commission
LEQI	Lake Erie Quality Index
LRW	Limited Resource Water
MIwb	Modified Index of Well Being
MWH	Modified Warm-water Habitat
NASS	National Agricultural Statistics Service
NCWQR	National Center for Water Quality Research
NOAA	National Oceanic and Atmospheric Administration
NPA	Nonpoint Assessment
NPS	Nonpoint Source
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NWOFMP	Northwest Ohio Flood Mitigation Partnership
OAC	Ohio Administrative Code
ODH	Ohio Department of Health
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
OEPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
OSU ext.	Ohio State University Extension
PCBH	Putnam County Board of Health
PCC	Putnam County Commissioners
PCE	Putnam County Engineers
PSWCD	Putnam Soil Water Conservation District
PCR	Primary Contact Recreation
PDWS (PWS)	Public Drinking Water Supply
PHC	Public Health Council
RM	River Mile
SDWA	Safe Drinking Water Act
SWAPP	Source Water Assessment and Protection Plan
TDF	Tile Discharge Filter
TMDL	Total Maximum Daily Load
TSD	Technical Support Document (from OEPA to support TMDL studies)
USACE	United States Army Corp of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WAP	Watershed Action Plan
WLEB	Western Lake Erie Basin
WQM	Water Quality Monitoring
WQL	Water Quality Laboratory
WRP	Wetlands Reserve Program
WWTP	Waste Water Treatment Plant
WWH	Warmwater Habitat
WY	Water Year

Acknowledgements

The development of this watershed action plan has not been an easy task. The entire process was new to the BRWP and to most of the stakeholders in the watershed. Money has been scarce and time commitment huge. However, the willingness of the many organizations and agencies to partner with the BRWP to share their expertise and resources to create this action plan has been the catalyst for its formation. Most of these agencies have been active in the conservation effort in the watershed over the past years. By refining these partnerships through mutual goals, the BRWP has developed resources and knowledge, and has continued the enthusiastic effort to enhance and protect the local streams, ditches, and the Blanchard River Watershed. The BRWP has provided a valuable resource to the local area, the Maumee River Basin, and the Lake Erie Basin.

The support from these groups is indicative of the effort needed in any community to protect one of the most valuable resources they have - clean water.

BRWP Partners and Supporters

Hancock Soil and Water Conservation District
Hancock County Engineers
Hancock County Commissioners
City of Findlay
Hancock Park District
Hancock Regional Planning Commission
Hancock Board of Health
Bluffton University
University of Findlay
Owens Community College
ODNR Office of Coastal Management
ODNR Division Of Soil & Water
ODNR Division of Wildlife
OSU Extension
Hancock County NRCS
Allen County Commissioners
Allen County SWCD
Allen County Health Department
Allen County NRCS
Lima-Allen County Regional Planning Commission
Village of Bluffton
Environmental Defense Fund
Ohio Environmental Protection Agency
Putnam County Health Department
Putnam Soil and Water Conservation District
Putnam County Commissioners
Putnam Regional Planning Commission
Blanchard River Watershed Partnership
Hardin County SWCD

Executive Summary

Watershed action plans guide land-use and other implementation strategies that are designed to produce water quality improvements that meet a water quality goal common throughout Ohio: a statewide average watershed assessment score of 80 by the year 2010. The Blanchard River Watershed Partnership has prepared the Riley Creek Watershed Action Plan (WAP) to mitigate identified causes and sources of water quality impairments through regulatory adoption and implementation of best management practices. (BMPs).

The first step in gathering data and information needed to write the Riley Creek Watershed Action Plan was to conduct a survey of the stakeholders in the Riley Creek watershed. In the fall of 2010, a postcard with instructions was mailed to 500 landowners. Forty nine stakeholders took the survey. The results of the survey can be read in Appendix A.

The Riley Creek WAP is based on the findings and recommendations of the Ohio EPA 2005 TMDL Study of the Blanchard River Watershed. The final TMDL Report was adopted in July 2009. The OEPA released on June 28, 2007 a related report called "Biological and Water Quality Study of the Blanchard River and Selected Tributaries 2005." This report on the Blanchard River Basin provided technical support data for the WAP.

The first four chapters of the Riley Creek WAP provide introductory and background information on a wide range of fundamental concepts that form the basis of the action plan. Chapter 1 provides information about what is a WAP and the involvement of the Blanchard River Watershed Partnership. Chapter 2 reviews what a watershed is and the ecology of a watershed. Chapter 3 addresses the federal, state, and regional policies that pertain to multiple water resource issues that are relevant to the stakeholders of the Riley Creek watershed and the need to implement watershed management. Chapter 4 provides a watershed inventory of the physical and social resources found throughout the Riley Creek watershed.

Chapter 5 and 6 discusses several important water resource concepts, such as "Designated Uses" and "Use Attainment." Designated uses that are relevant to the Riley Creek watershed include Aquatic Life Use and Public Drinking Water Supply. Parts of the Riley Creek watershed are in full aquatic life support use attainment (5.9%). Other parts of the watershed are either in partial or non-attainment (94.1%). The final Assessment Unit Score for the watershed was 6.3 out of a possible 100 points.

Chapter 7 provides an implementation plan for remediation and restoration of the identified problem areas within the Riley Creek watershed. Water Quality impairments in the Riley Creek watershed described by the Ohio EPA TMDL 2009 report include habitat/flow alteration, sedimentation, pathogens, total phosphorus and nitrate-nitrites. These impairments encompass several sources that contribute to the pollutant loads or degraded habitat: agricultural runoff, failing home septic systems, loss of riparian buffers and wetlands, streambank and in-stream erosion, and urban runoff.

Chapter 8 provides an overview of how the Ohio Coastal Nonpoint Source Pollution Management Plan applies to the Riley Creek watershed. Chapter 9 provides an overview of the budget that will be used by the BRWP during the next six years of the implementation phase of the WAP.

Chapter 10 discusses the evaluation plan the BRWP will use in evaluating the success of the implementation plan in addressing the impairments. The Riley Creek WAP is a living document and revisions are possible during the 6 year implementation phase. A complete revision will be addressed in 2018.

Through the use of the Riley Creek WAP, the BRWP expects to bring the watershed into full attainment while empowering the community to take ownership of their water resource. This will ensure a clean and high water quality for future generations.

Special Thanks

No project as big as the writing of a watershed action plan could be accomplished without the help of many people. Below is a summary of people who were very important to the completion of this WAP.

Karen Chapman, Denny Tressel, & Dave Reese - Environmental Defense Fund
Katie McKibben - Ohio EPA
Allen, Hancock, Hardin, & Putnam SWCDs
Dr. David Baker - Heidelberg University - NCWQR
Steve Lewis & Brian George - ODNR Coastal Management - GIS Mapping
Board of Directors - BRWP
Matt Atkins - ODNR Coastal Management
Carole Elchert - Proofreading
Lindsay Summit, Brad Price, Gary Shields, & Matt Elling - County Board of Health
Allen, Hancock, & Putnam County Engineers

Finally, thanks to the numerous residents, farmers, and other stakeholders for their input and support in writing this action plan. Only through their stewardship has and will this WAP be successful.

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Chapter 1: Introduction

Purpose
Chapter 1 introduces the reader to the purpose of the Riley Creek Watershed Action Plan. This chapter is designed to be a resource for learning what is involved in watershed planning and the "watershed approach" to solving water quality problems in the Riley Creek subwatershed. This chapter also introduces potential partners to the efforts of the the Blanchard River Watershed Partnership (BRWP) partners.

Chapter Acknowledgements
This chapter was prepared using material from The Outlet/Lye Creek Watershed Action Plan and by the watershed coordinator and BRWP partners.

Purpose of the Riley Creek Watershed Action Plan

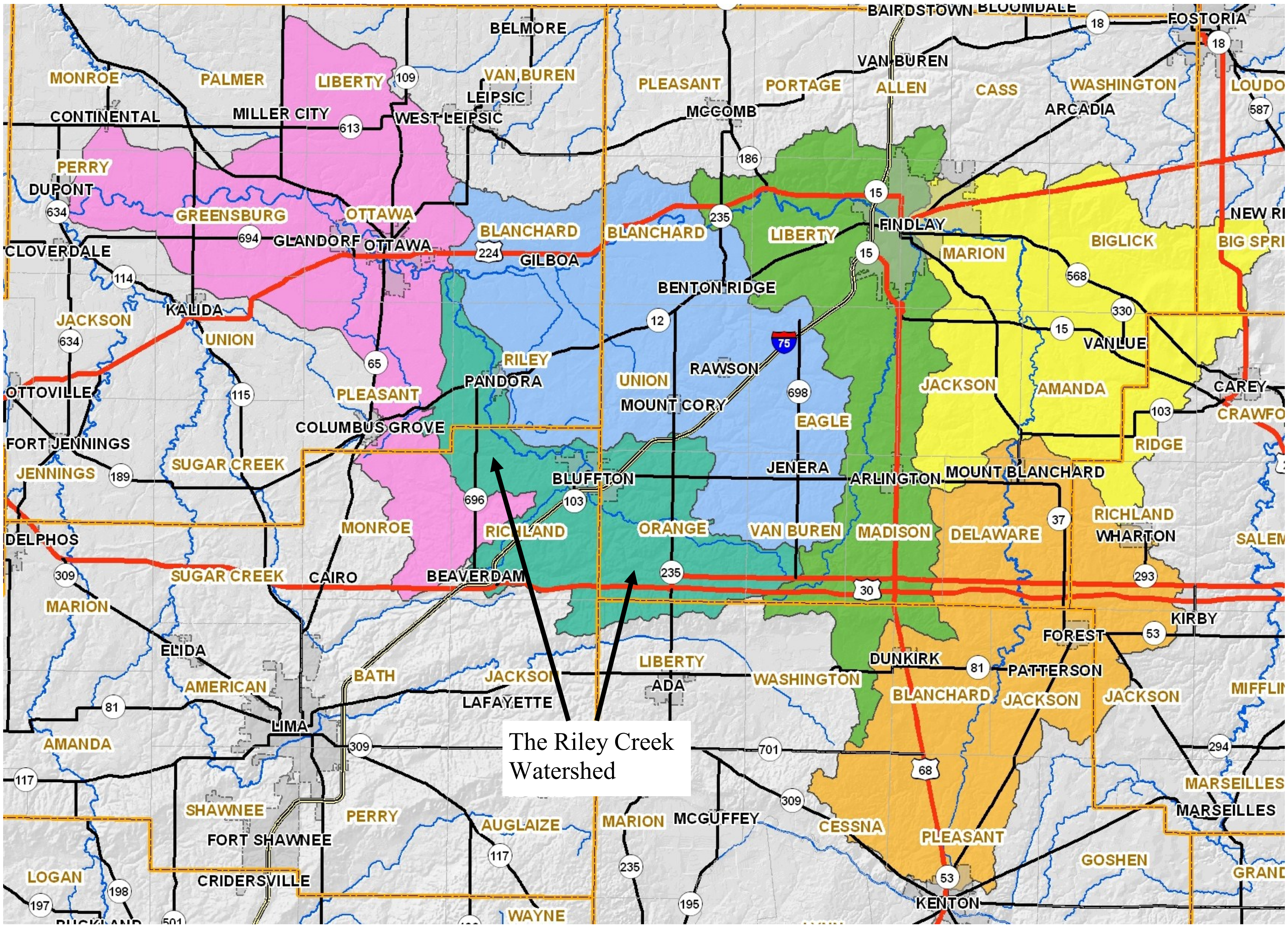
The basic purpose of developing and implementing a Watershed Action Plan (WAP) for the Riley Creek subwatershed is to achieve environmental objectives, including public health, regarding Ohio's surface and ground water resources. Watershed action plans guide implementation strategies that are designed to improve water quality in accordance with Ohio's water quality goal of a statewide average watershed assessment score of 80 out of 100 on the Ohio Water Quality Assessment Unit Standards by 2010. Since each subwatershed is unique, a WAP that is specific to an individual watershed is necessary for achieving local goals and objectives. Local participation and approval are necessary to fully account for the local nature of issues and for both the planning process and resulting WAP to establish legitimacy among the watershed residents.

The Riley Creek WAP is based on the findings and recommendations of the Ohio EPA's Total Maximum Daily Loads (TMDL) study conducted in the Blanchard River Watershed in 2005. The United States Environmental Protection Agency (USEPA), Division of Surface Water approved the Final TMDL Report in July 2009. This TMDL report addresses the results of the 2005 field study of chemical, physical, and biological conditions in order to determine if streams and diyches in the Riley Creek watershed area were attaining their designated uses. Map 1.1 on page 1-2 shows the Riley Creek subwatershed's location in the Blanchard River Watershed.

Stakeholders' Participation

The initial planning process for developing the Riley Creek WAP was conducted by the Blanchard River Watershed Partnership (BRWP). A two-phase process was developed. In Phase I, a stream observational walk was conducted. Landowners along the Riley Creek and Little Riley Creek were contacted for permission to walk along the waterway area. Data collected was used, along with the TMDL report and the OEPA, to develop problem statements for the subwatershed that are discussed in Chapter 7. Phase II involved a Water Quality Monitoring (WQM) study using macroinvertebrates. Nine sites were identified based on the TMDL sites. Monitoring has been conducted starting in the fall of

Map 1.1: Riley Creek's location in the Blanchard River Watershed



and continuing to the present. Monitoring occurs in June and late September/ October.

A survey of the Riley Creek watershed was conducted during the fall of 2010. Stakeholders were responded to various questions concerning the watershed. The results of the survey can be viewed in Appendix A

The problem statements list the identified the problems, cause(s), source(s), remedial action(s), goal(s) for attainment, and best management practices (BMPs) needed to receive the desire attainment goal. These BMPs were selected by professional individuals in the Blanchard River Watershed.

What is a Watershed Action Plan?

A Watershed Action Plan (WAP) is a comprehensive plan that addresses how to protect, restore, and improve a watershed. A WAP includes an inventory of the watershed resources, identifies and evaluates problems within the watershed, and develops problem statements which will lead to restoring and protecting the watershed using best management practices. Figure 1.1 illustrates how to develop a watershed plan.

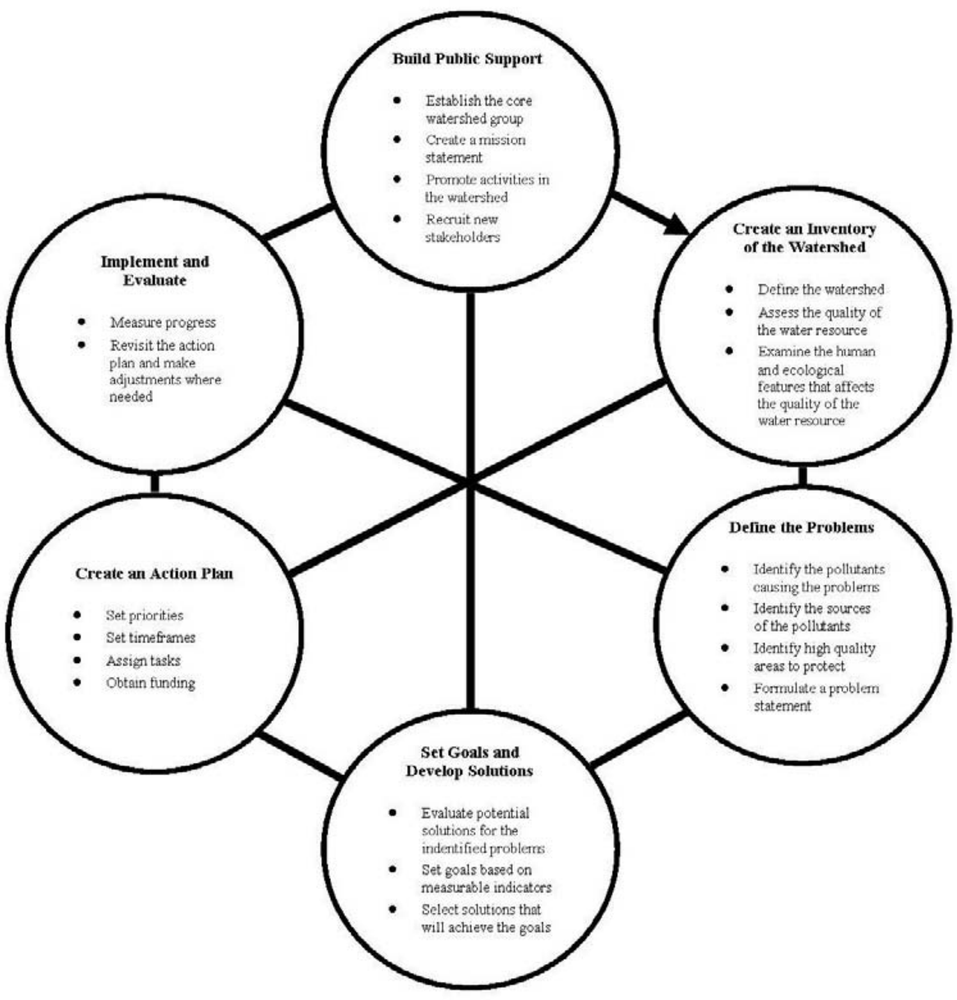


Figure 1.1: Implementing the Watershed Approach (OEPA, 1997)

What is watershed management?

According to The Ohio State University Fact Sheet WS 0001:

> *Watershed management consists of those human activities aimed at controlling, enhancing, and/or restoring watershed functions. In the past, watershed management in Ohio was viewed largely as the responsibility of government agencies and conservancy districts and was focused primarily on controlling the flow of water through the construction of dams and levees to protect human communities from flooding, store water for times of drought, and provide opportunities for water-related recreation.*
>
> *But this emphasis on structural solutions to water storage and flooding has given way to a new approach that recognizes the multitude of functions watershed provide and the need to meet multiple objectives such as flood prevention, erosion control, wildlife habitat, and provision of recreation.*

This new approach is a **Community-Based Approach to Watershed Management (CAP).** In this approach, instead of decisions and actions originating at the top level, (government), all decisions include input from everyone (stakeholders) in the watershed. These stakeholders include federal, state, and local officials, as well as educators, concerned citizens, and private interests. The overall goals of a CAP are to restore and maintain the biological, chemical, and physical integrity of the water resources in the watershed without causing adverse effects on the economy of local communities.
A CAP includes a comprehensive effort by the social and political communities to address issues associated with water quality, water quantity, and the impact on the health and well being of the watershed. Thus, the result of a CAP is to achieve the environmental objectives as they apply to Ohio's water using a strategic management approach.

Blanchard River Watershed Partnership

The Blanchard River Watershed Partnership is a community-based volunteer organization that seeks to address problems and concerns that affect the health of the Blanchard River Watershed and educate all citizens about the dynamics of the Blanchard River and its tributaries. The BRWP members include interested citizens, local government agencies, educators, representatives of industry, conservation groups and agencies, and other stakeholders. They have all come together with one goal in mind: to improve and maintain water quality within the watershed. One of the main ways to achieve improved water quality is through the development of watershed action plans for each of the six subwatersheds located within the Blanchard River Watershed. The BRWP received its 501c3 Public Charity status on July 26, 2006. The Partnership has received several grants that have allowed the group to begin a WQM program. The group is also involved with several outreach and education programs throughout the watershed. The Partnership hired a part-time coordinator in

January of 2009 to facilitate the writing of this WAP and to achieve other objectives of the BRWP.

Figure 1.2: BRWP Logo

The Partnership is organized around a membership that includes both individuals and organizations. From the membership, an elected Board of Directors (BOD) and the steering committee were formed to be the main working groups of the Partnership. The BOD is comprised of nine members that serve three-year terms: one member from each of the six subwatersheds and three at-large members. Figure 1.3 on page 1-6 shows the Organizational Chart for the group while Table 1.1 on page 1-7 shows the membership of the Steering Committee. The steering committee includes the elected BOD but as well as a representative from each committee. Ex-officio members of the steering committee consist of government and educational personnel as determined by the steering committee. Ex-officio members do not have a vote but provide valuable leadership to the group. Bi-monthly public meetings are held by the steering committee to guide the Partnership activities. The Partnership is governed by a set of by-laws that are also available for review on the Partnership's web site: http://www.blanchardriver.org. The watershed hired a full-time coordinator, Phil Martin, during 2010, who can be contacted at 419-422-6487.

The BRWP has continued to focus on an education/outreach aspect to their work. A more detail look at the education/outreach aspect is discussed in Chapter 10.

Between 2005 and 2008, the Partnership gathered information based on the Appendix 8 Update provided by the OEPA for developing local WAPs. In the summer of 2008, the Partnership decided to develop the WAPs for the Blanchard River Watershed on the HUC 11 digit level. This will allow a more localized WAP and a more focused plan for improving and restoring water quality in the entire watershed. The Outlet/Lye Creek watershed was the first subwatershed selected. Full endorsement of The Outlet/Lye Creek Watershed Action Plan was achieved during May 2011. During the summer of 2009, plans were started for doing a WAP in the Riley Creek subwatershed. The completion of each new WAP is dependent on both local acceptance and state endorsement.

Figure 1.3
Organizational Chart
for the Blanchard River
Watershed Partnership

Blanchard River Watershed Partnership
Organizational Chart

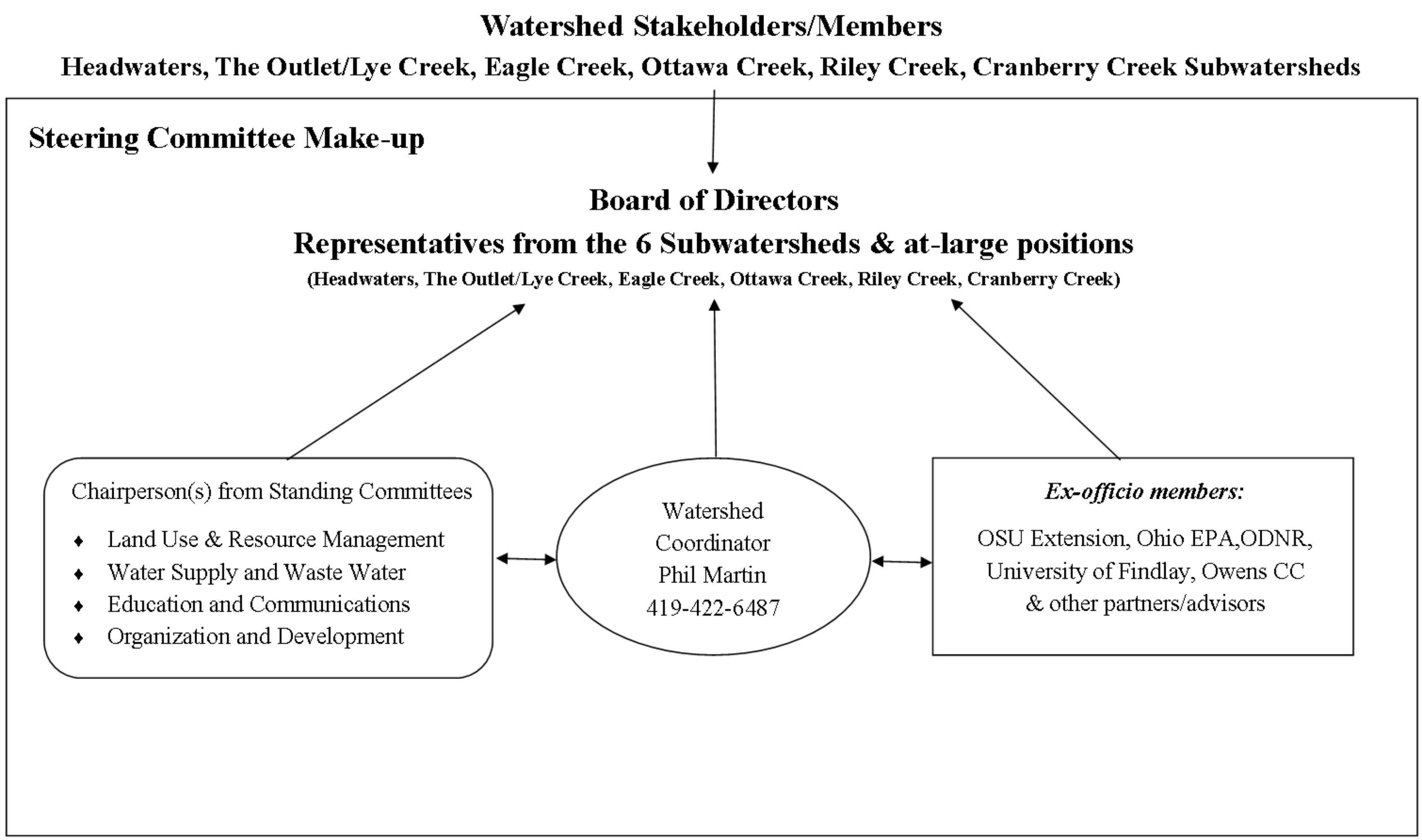


Table 1.1: Steering Committee of Blanchard River Watershed Partnership

Seat	Election Year	Most Recent of Current Representative
Subwatersheds		
Headwaters*	2010	Theresa Allen, Resident Hardin County
The Outlet/Lye Creek*	2012	Richard Kozlowski, Resident of Findlay
Eagle Creek*	2011	Bob Connour, Owens Community College
Ottawa Creek*	2010	Leo Schroeder, Businessman and Farmer
Riley Creek*	2011	Robert Antibus, Resident of Bluffton
Cranberry Creek*	2012	Ted Elliott, Resident of Putnam County
At-Large #1*	2011	Tim Brugeman, Resident of Findlay
At Large #2*	2010	Jeff Loerhke, Resident of Putnam County
At-Large #3*	2012	Jane McCleary, Resident of Hancock Co.
Standing Committees		
Land Use & Resource Management		
Water Supply & Waste Water	2012	Randy Greeno - Findlay WTTP
Education & Communication	2012	Jane McCleary - Findlay Resident
Organization & Development	2012	Tim Brugeman, President - Blanchard River Watershed Partnership
Ex-officio		Multiple Individuals
*Members of the Board of Directors		

Blanchard River Watershed Partnership

Mission Statement:

To create partnerships that will promote watershed awareness, responsible land use and management decisions, to restore and preserve water quality, and to protect and enhance watershed functions.

Motto:

Action Today, Cleaner Water Tomorrow

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Chapter 2: Watershed Science Overview

Purpose

This chapter overviews the science of watershed, including the geographic scale, water cycle, ecosystem dynamics, and water pollution from a nonpoint source. This chapter is designed to be an educational resource for understanding how watersheds work and how a watershed is affected by land use.

Chapter Acknowledgements

This chapter was prepared using material from The Outlet/Lye Creek Watershed Action Plan and by the watershed coordinator and BRWP partners.

What is a Watershed?

A watershed is any area of land where surface water drains into a common body of water, such as a river, lake, or wetland. If water from a certain area drains into a particular body of water, then that certain area shares a common watershed. A watershed can contain one or more of the following features: streams, ditches, ponds, lakes, and/or wetlands. A watershed is also known as a "drainage basin" and/or "hydrological unit."

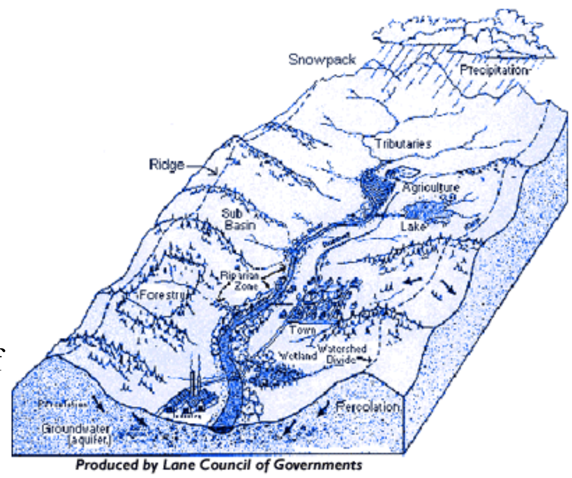


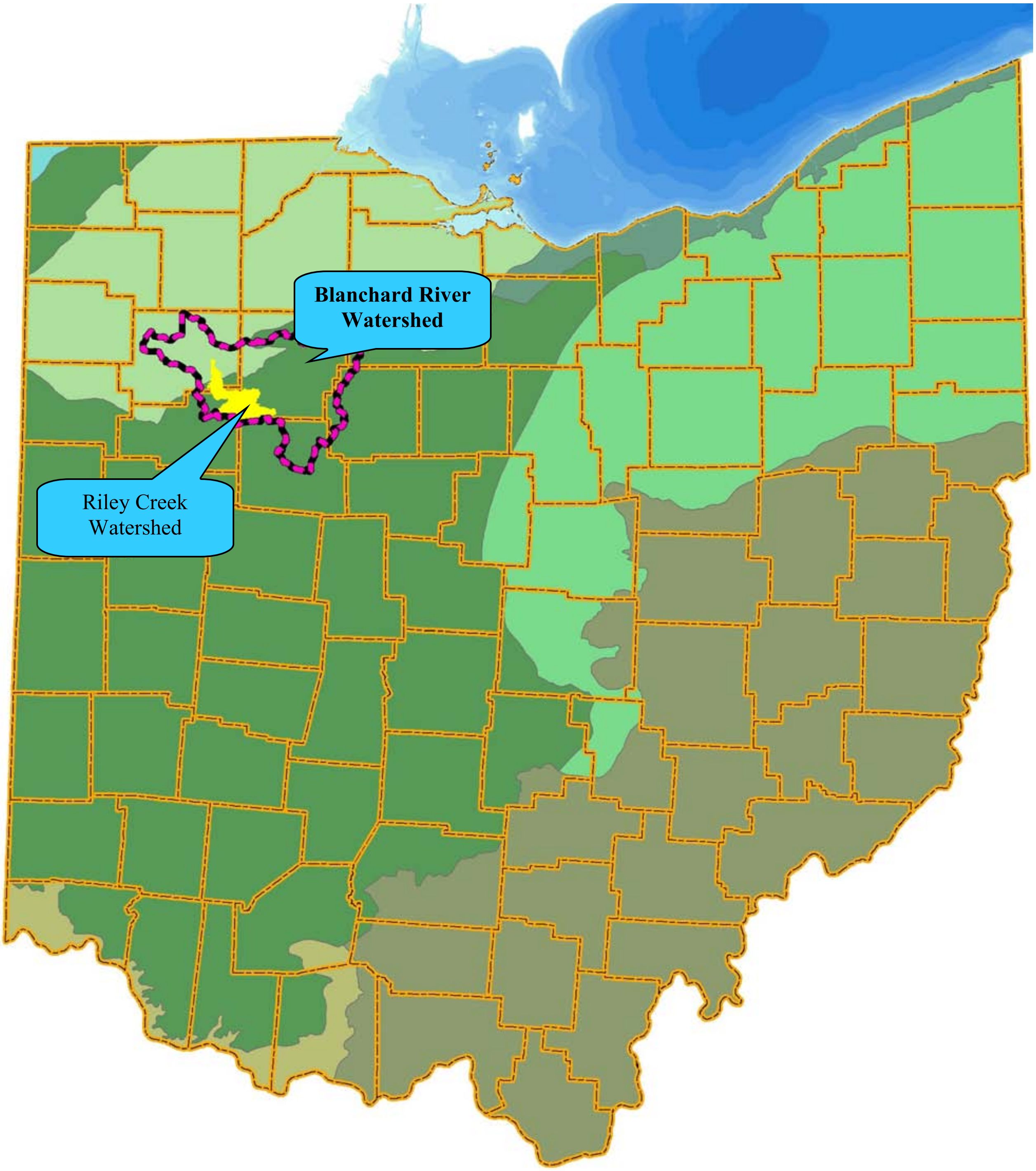
Figure 2.1: Watershed diagram

The Riley Creek map (See map 2.1, pg. 2-2) shows the location of the watershed within the larger Blanchard River Watershed. The Blanchard River Watershed covers area in six counties. The Blanchard River Watershed is located within the larger Maumee River Basin which is a part of the Western Lake Erie Basin.

The Blanchard River Watershed is identified using an 8-digit Hydrological Unit Code (HUC), 04100008. There are six subwatersheds located within the Blanchard River Watershed. Each of these subwatersheds is identified using an 10-digit HUC. The Riley Creek subwatershed's HUC is 0410000804. There are 5 smaller 12-digit HUC subwatersheds located in The Riley Creek subwatershed. Map 2.2 (See pg. 2-3) shows the 12-digit subwatersheds.

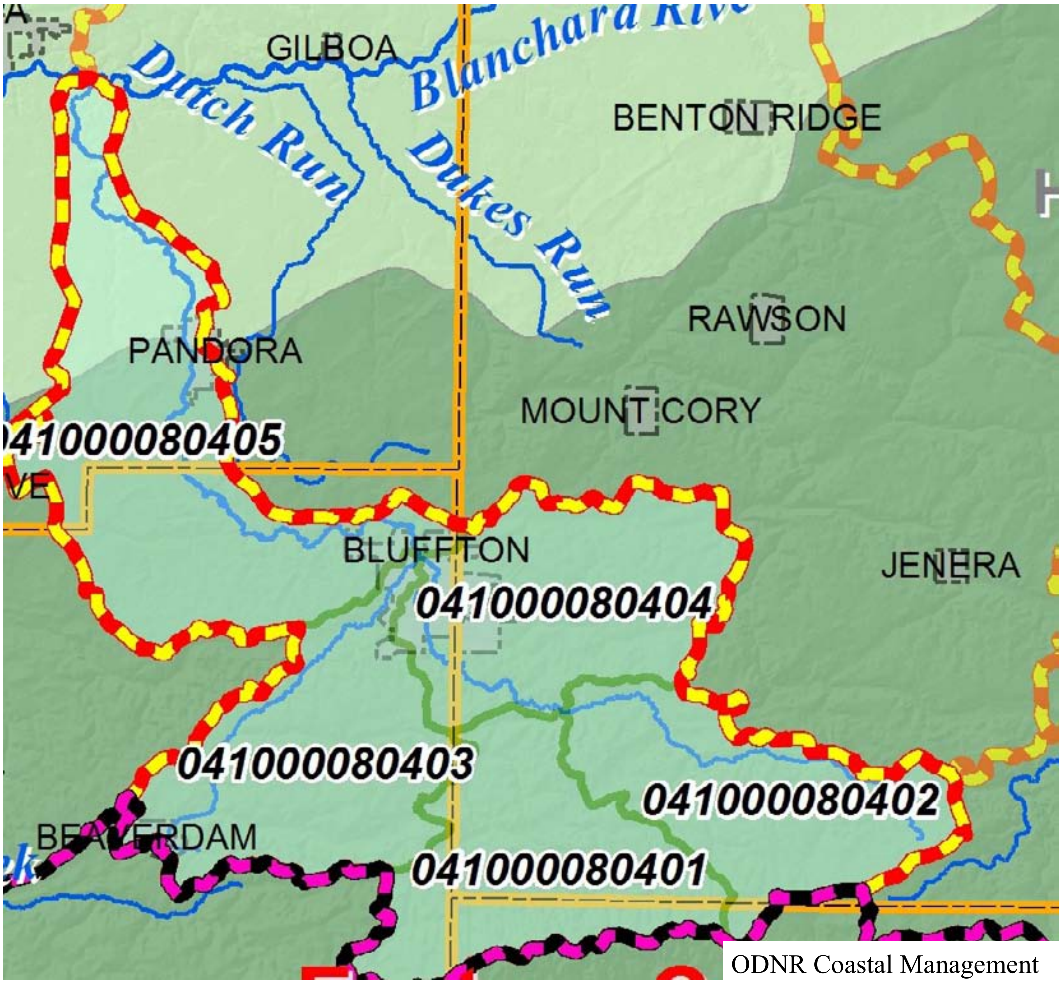
The Blanchard River Watershed is also a part of the Western Lake Erie Basin (WLEB). The Blanchard River flows into the Auglaize River, which flows into the Maumee River in Defiance. The Maumee River flows into Lake Erie in Toledo. Because the Blanchard River flows into Lake Erie it is subjected to the rules and regulation pertaining to Lake Erie. Chapter 3 will explain which rules and regulations apply to Lake Erie and the Blanchard River.
Map 2.3 (see pg. 2-4) shows the location of the Blanchard River Watershed in the WLEB.

Map 2.1: The Riley Creek Watershed location within the Blanchard River Basin and Ohio



ODNR Coastal Management

Map 2.2: 12-Digit Watersheds in Riley Creek Watershed



ODNR Coastal Management

12-digit subwatersheds located within the Riley Creek watershed (HUC 041000804)

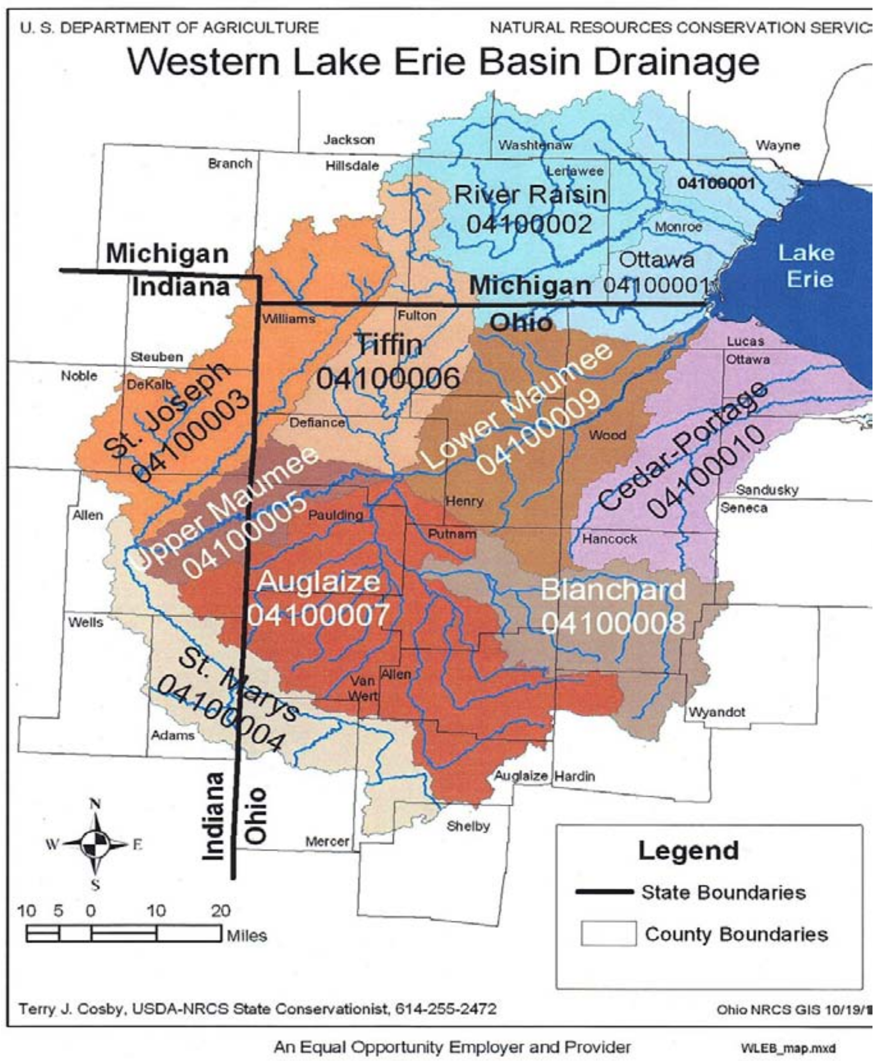
041000080401 - Binkley Ditch-Little Riley Creek
041000080402 - Upper Riley Creek
041000080403 - Marsh Run-Little Riley Creek
041000080404 - Middle Riley Creek
041000080405 - Lower Riley Creek

The US EPA and ODNR began to require the use of the USGS's new Hydrological Unit Code system in 2010 on all watershed action plans and grants. Under this new system, HUCs have changed from 11 and 14-digits to 10 and 12-digits for identifying watersheds below the 8-digit level. Table 2.1 shows the changes as they apply to the Riley Creek watershed.

Table 2.1: Conversion Table for 14-digit to 12-digit watersheds in the Riley Creek watershed

HU_ 14_ NAME	HUC_14	HU_12_NAME	HU_12	Change from 14
Riley Creek headwaters to above L. Riley Creek (1)	04100008 050 010	Upper Riley Creek	04100008 04 02	Same area
Little Riley Creek (1)	04100008 050 020	Binkley Ditch-Little Riley Cr.	04100008 04 01	Same area
Riley Creek below L. Riley Cr. (1) to above L. Riley Cr. (2)	04100008 050 030	Middle Riley Creek	04100008 04 04	Same area
Little Riley Creek (2)	04100008 050 040	Marsh Run-Little Riley Creek	04100008 04 03	Same area
Riley Creek below L. Riley Cr. (2) to Blanchard River	04100008 020 050* 04100008 050 060*	Lower Riley Creek	04100008 04 05	Aggregated*

*Aggregated refers to two 14-digit watersheds being combined into one 12-digit watershed under the new system developed by the USGS



Map 2.3: Location of Blanchard River Watershed in theWestern Lake Erie Basin

Hydrologic (Water) Cycle

All the water on Earth is stored in three reservoirs: surface water (streams, lakes, oceans, and glaciers), underground (groundwater), and atmosphere (clouds). Basically, water travels through these reservoirs by a process known as the water cycle. Water that falls from the sky may become run-off, infiltrate into the ground, or evaporate/transpire back into the atmosphere, depending on the conditions of the area. Once water has returned to the atmosphere, it has completed the process, and the cycle starts again. Water is essential to the weather patterns and climate system of the Earth. As water circulates through the process, weather conditions are distributed throughout the Earth, which in turn creates various landscapes and ecosystems. The Great Lakes naturally maintain their water quantity through the inflows (precipitation and run-off) and outflows (evaporation and discharge to the Atlantic Ocean) as part of the global water cycle. The Great Lakes become the "battle ground" for air masses bringing warm moist air up from the Gulf of Mexico and running into cold dry air masses from the Arctic area. As a result, the phrase "wait a day, the weather will change" applies to the Great Lakes region.

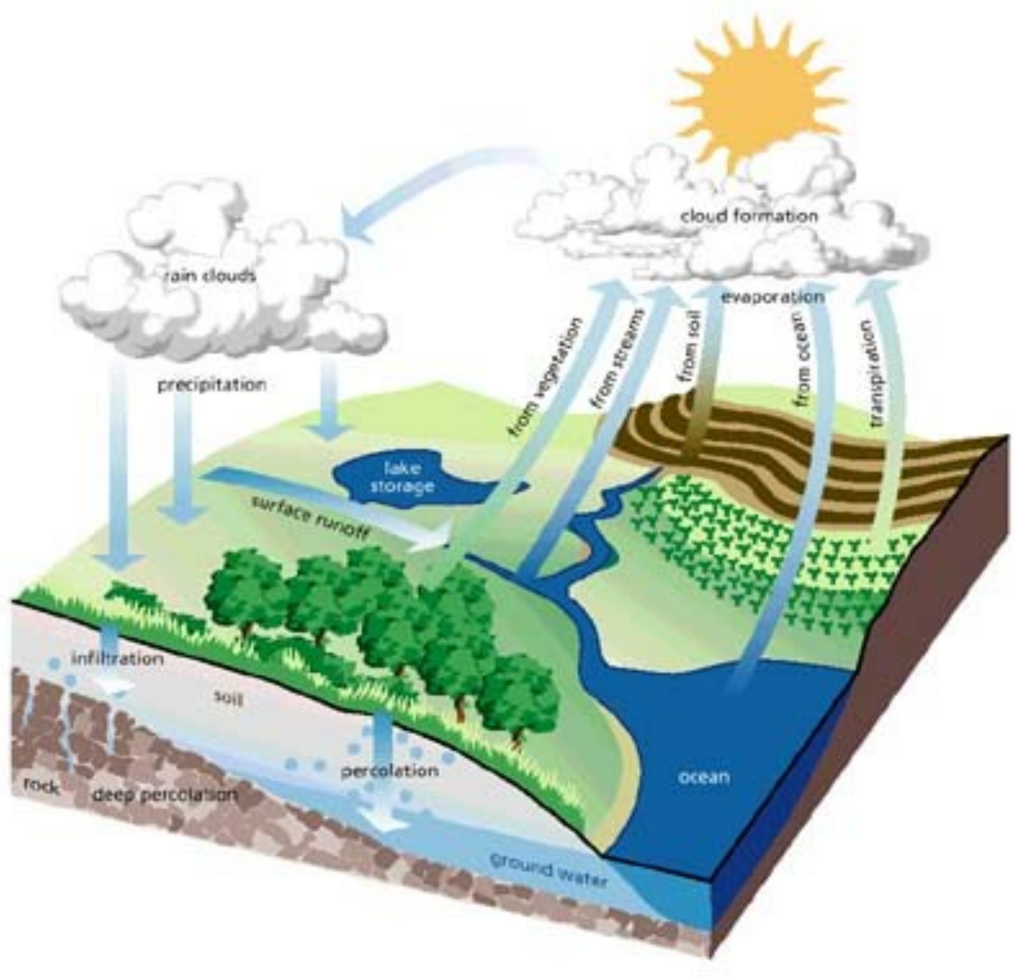


Figure 2.2: Water Cycle http://www.epa.gov/watertrain/ecology/s7.jpg

Watershed Ecology

Understanding the structure and processes of watersheds helps us better recognize the effects of human activities on water quality, habitat, plant and animal communities, and the quality of human life. Watershed dynamics can be separated into three categories: chemical budgets, water budgets, and biotic structure. In a healthy watershed, all three factors are in balance. Riparian zones have a variety of definitions; however, they generally refer to an area of vegetation, usually woody species, that acts as a transition from the water's edge to the adjacent land. A healthy, natural riparian zone, often referred as a "buffer," provides the essential functions to filter excess nutrients (chemical budget) from entering the stream and to store flood waters (water budget) that could have negative impacts on aquatic and terrestrial life native to the watershed. In our local watersheds, losses of riparian buffer and non-point source pollution are the greatest stressors impacting streams. Figure 2.4 on page 2-7 shows the benefits of various vegetation zones for pollution reduction and maintaining stream health.

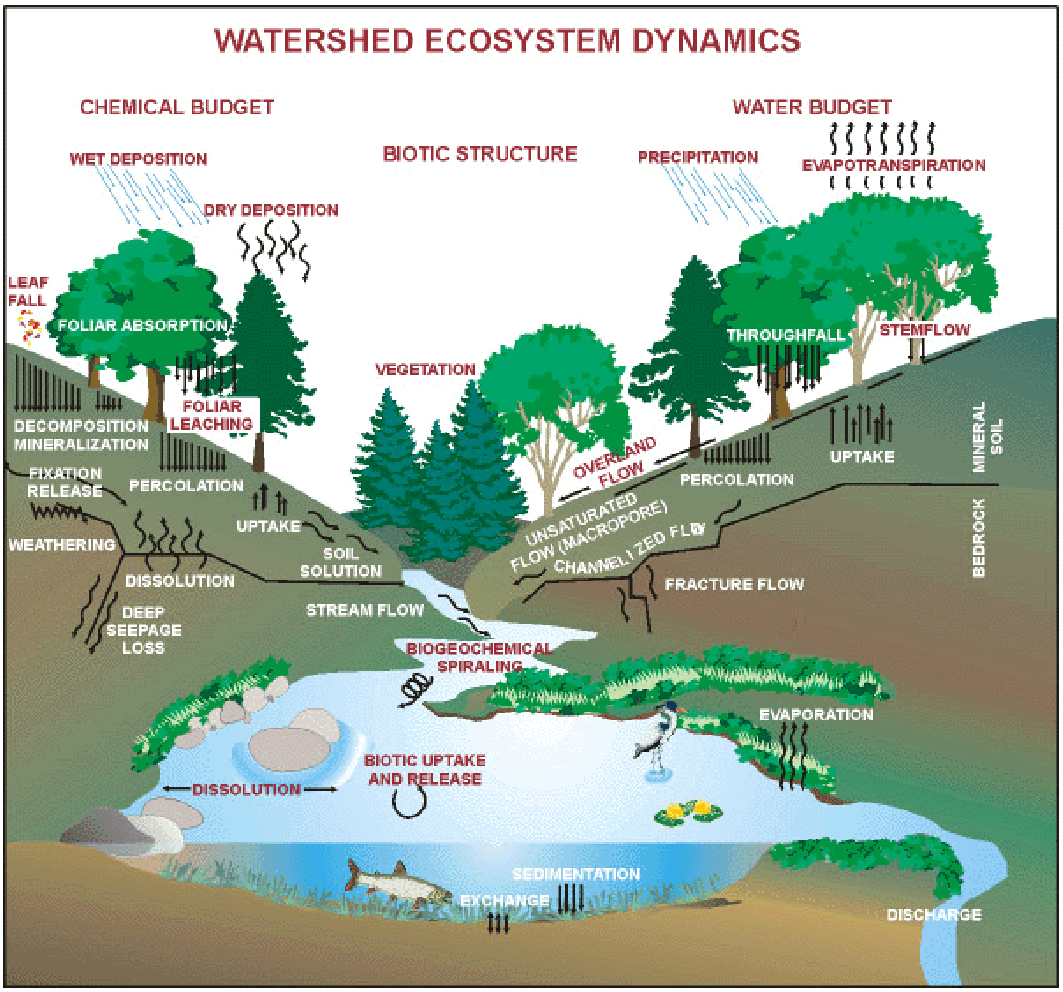


Figure 2.3: Watershed ecology diagram demonstrating modes of movement of water and chemical factors and their relation to the biotic structure.
redrafted from Johnson and Van Hook, 1989. Analysis of biogeochemical cycling processes in Walker Branch Watershed

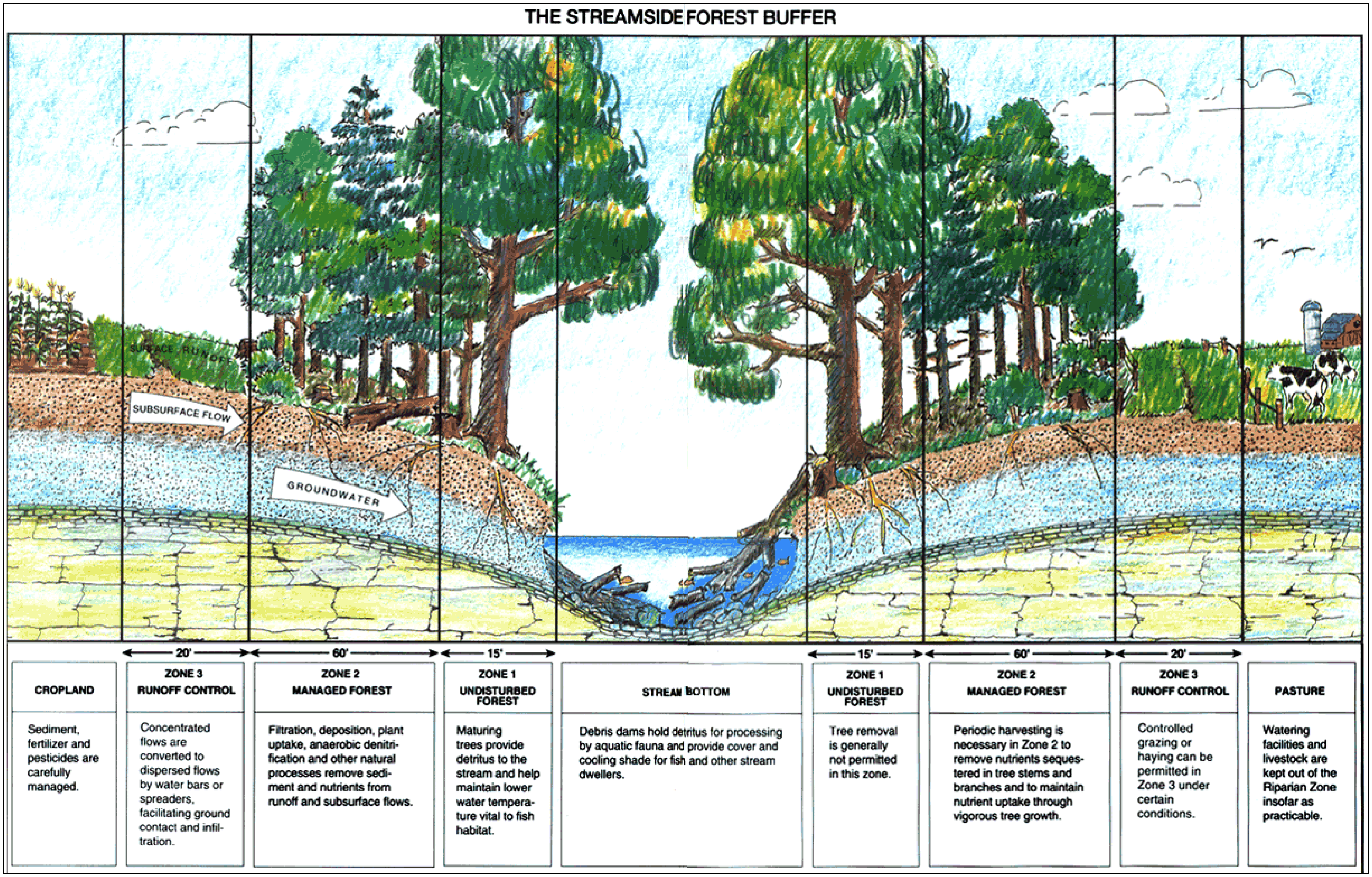


Figure 2.4: Example of a forested riparian buffer and benefit for various vegetation zones for pollution reduction and maintaining stream health.

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Chapter 3: Environmental Policies and Programs

Purpose
This chapter provides an overview of environmental laws and conservation programs that serve as the policy support and development framework for the watershed action plan. This chapter is designed to be a quick resource to help readers understand the framework for watershed management locally and on a broader scale.

Chapter Acknowledgements
This chapter was prepared using material from The Outlet/Lye Creek Watershed Action Plan and by the watershed coordinator and BRWP partners.

Two significant federal acts of legislation are at the heart of multi-institutional efforts to implement a watershed approach for protecting or improving our nation's waters:

1) the Federal Water Pollution Control Act Amendments of 1972 (aka, the Clean Water Act: Public Law 92-500), and
2) the Safe Drinking Water Act of 1974 (Public Law 93-523).

Additionally, a third piece of legislation is significant for The Outlet/Lye Creek subwatershed, all other assessment units within the Blanchard River Basin, and other watersheds that lie within a coastal zone: the Coastal Zone Management Act, signed into law in 1972. All three federal laws have been amended at least once since their enactment in the 1970s. In communion with federal law, several state laws and programs are also relevant to watershed planning and will be addressed below, along with regional and local initiatives that relate on land-use activities within the Riley Creek subwatershed.

Clean Water Act (CWA)

Programs of importance that are products of the CWA include the Total Maximum Daily Load (TMDL) program, Section 319 nonpoint source management programs, and a permit system called the National Pollutant Discharge Elimination System (NPDES) which includes the Storm Water Program, to name a few, that have relevance to the Riley Creek subwatershed.

The TMDL program, section 303(d) of the CWA, is a regulatory mechanism for reducing both nonpoint source and point source pollution in watersheds throughout the country. A TMDL is essentially a pollutant budget for restoring impaired water bodies (e.g; streams, lakes) in order that they may fully attain their designated use(s). Regulations that the US Environmental Protection Agency (USEPA) set forth in 1985 and amended in 1992 remain in effect for the TMDL program.

The State of Ohio, much like all other states, is compelled by law to assess the quality of state waters relative to their designated use(s), identify waters that are for one or more of their designated uses, and develop a TMDL for remedial action where appropriate. The “Total Maximum Daily Loads for the Blanchard River Watershed - Final Report” is a product of this program, has been developed by the Ohio Environment Protection Agency (OEPA) and has relevance to residents of The Outlet/Lye Creek subwatershed. The Riley Creek subwatershed WAP presented here incorporates that data and presents a strategy for addressing identified impairments. Additional details of the TMDL for The Outlet/Lye Creek subwatershed are presented below.

When the CWA was reauthorized by the Water Quality Act of 1987, new emphasis was placed on the importance of controlling nonpoint sources of pollution. Section 319 of the CWA compels states to identify waters that are threatened by nonpoint sources of pollution and develop programs to reduce and eliminate this type of “poison runoff.” The State of Ohio is updating its nonpoint source pollution program.

Section 319, serving as a significant source of federal funding, is channeled through the states, for programs (e.g., BMP adoptions) that are designed to reduce nonpoint source pollution. In the near future a state-endorsed WAP may be a requirement for eligibility of this source of funding support. Pollution reduction strategies outlined in Chapter 7 are designed to facilitate the application for and approval of future Section 319 grants.

The NPDES Storm Water Program has been implemented in two phases. Phase II, whose Final Rule was published in the Federal Register on 8 December 1999 (64 FR 68722), expands the Phase I program by extending pollution control expectations to smaller municipal separate storm sewer systems (MS4s) and operators of small (i.e., 1-5 acres) construction sites. Findlay has been designated MS4s under Phase II. Ottawa already has separate sanitary and storm sewers.

Expectations for pollution control center on implementation of programs and practices to control polluted storm water runoff through the use of NPDES permits. The Phase II program approach attempts, among other matters, to facilitate and promote watershed planning and to implement the storm water program on a watershed basis (USEPA, 2000). Storm water management, therefore, will play an increasingly important role in both planning and implementing watershed action plans that aim to remediate impaired water bodies. More information can be found at http://www.epa.gov/lawsregs/laws/cwa.html.

Clean Water Restoration Act 2009

Senate Bill 787 was introduced in 2009 as the **Clean Water Restoration Act.** The purpose of the bill was to amend the Federal Water Pollution Control Act (commonly known as the Clean Water Act) to replace the term "navigable waters" that are subject to such Act with the term "waters of the United States," defined to mean all waters subject to the ebb and flow of the tide, including lakes, rivers, streams (including intermittent streams), mudflats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, natural ponds, and all impoundments of the foregoing, to the fullest extent that these waters, or activities affecting them, are subject to the legislative power of Congress under the Constitution. The law declares that nothing in such Act affects the authority of the Secretary of the Army or the Administrator of the Environmental Protection Agency (EPA) under the provisions of the Clean Water Act related to discharges composed:

(1) of return flows from irrigated agriculture;
(2) of stormwater runoff from certain oil, gas, and mining operations composed entirely of flows from precipitation runoff conveyances, which are not contaminated by or in contact with specified materials;
(3) of dredged or fill materials resulting from normal farming, silviculture, and ranching activities from upland soil and water conservation practices; or from activities with respect to which a state has an approved water quality regulatory program; or
(4) of dredged or fill materials for the maintenance of currently serviceable structures, the construction or maintenance of farm or stock ponds, irrigation ditches and maintenance of drainage ditches; or farm, forest, the territorial seas, and all interstate and intrastate waters and their tributaries, or temporary roads for moving mining equipment in accordance with best management practices; or the construction of temporary sedimentation basins on construction sites for which discharges do not include placement of fill material into the waters of the United States. See http://www.opencongress.org/bill/111-s787/show for additional information.

Safe Drinking Water Act (SDWA)

The SDWA created a federal program to monitor and improve the safety of the nation's drinking water supply. The SDWA authorizes the USEPA to set and implement drinking water standards to protect against both naturally occurring and man-made contaminants in public drinking water. The roots of Ohio's Source Water Protection Plan, a program to assist public water suppliers with protecting their sources of drinking water (streams and aquifers) from contamination, can be traced back to the SDWA. See http://water.epa.gov/lawsregs/rulesregs/sdwa/index.cfm for additional information.

Ohio's Source Water Protection Program addresses public water systems only, and features two phases. The first phase is an assessment phase that involves delineating the area in need of protection, identifying the potential contaminant sources in that area, and determining the susceptibility of the source(s) of drinking water. The Ohio EPA reports that this phase was better than 99% complete for Ohio's community public water systems by January 2004. The second phase involves developing and implementing a local drinking water source protection plan. This second phase is to be led by the public water system owner/operator with assistance from others, including local watershed groups. It makes sense for these source water protection plans be integrated into watershed action plans as both strive to protect the vital water resources necessary for human health and a healthy economy.

In Riley Creek subwatershed, the Village of Bluffton has their water pumped to the village from the village of Ottawa. Ottawa receives their water by pumping water from the Blanchard River into an upground reservoir. The village of Pandora receives their water from two wells in the village. All other water sources in the watershed are individual wells. Water quality criteria established in Ohio Administrative Code for public water supply apply within 500 feet of an intake. Both the Village of Ottawa and the Village of Pandora have completed a drinking water source assessment and are now developing local protection plans. Partnership efforts at developing The Riley Creek WAP will be a great benefit to the protection of drinking water sources and will work with both municipalities as appropriate to protect this critical water resource. See http://www.epa.state.oh.us/ddagw/swap_protplan.aspx for additional information on the Ohio Source Water Plan.

Coastal Zone Management Act (CZMA)

The Coastal Zone Management Act of 1972 (Public Law 92-583) established a voluntary national program within the Department of Commerce to encourage coastal states, including Ohio, to both develop and implement coastal zone management plans. This policy represents a unique federal/state partnership and was devised for purposes of conserving the high-value coastal zone resources for present and future generations.

As part of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA), Congress created a stand-alone provision to recognize the impacts of nonpoint source pollution on coastal water quality. Named after its placement within these amendments, Section 6217 requires that states and territories with approved coastal management programs develop a Coastal Nonpoint Pollution Control Program (CNPCP). The Ohio CNPCP is administered by the Ohio Department of Natural Resources (ODNR) Division of Soil and Water Resources. The CNPCP must be submitted to USEPA and the National Oceanic and Atmospheric Administration (NOAA) for approval and be implemented through changes to both the existing state coastal management program and the new nonpoint source management program that stems from Section 319 of the CWA. Within these state programs, management measures must be specified for restoring and protecting coastal waters from specific categories of nonpoint source pollution.

Management measures are defined in Section 6217 of the CZARA as "economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of best available nonpoint pollution control practices. technologies, processes noting criteria, operating methods, or other alternatives." Watershed action plans developed for the Ohio Lake Erie Basin, such as presented in the Riley Creek subwatershed, must describe how the relevant management measures of the Ohio CNPCP will be implemented within the specific watershed if a watershed inventory or identified water quality impairments indicate applicability. Management measures must also be addressed in order for the State of Ohio to gain approval for its Coastal Nonpoint Source Pollution Control Program (CNSPC). Details regarding the relevant management measures are offered in Chapter 8 Coastal Management Measures See the following website for "Guidance for Watershed Projects to Address Ohio's Coastal NPS Pollution Control Program. http://www.dnr.state.oh.us/Portals/12/programs/coastalnonpoint/Watershed%20Action%20Plan%20Guidance%20to%20Ohio%20Coastal%20Nonpoint%20Pollution%20Control%20Program%20Plan.pdf The complete CNSPC can also be found in Appendix G.

Ohio Nonpoint Source Management Plan

The State of Ohio has completed the Nonpoint Source (NPS) Management Plan 2005 - 2010 for submission to the USEPA. The last comprehensive Ohio NPS Management Plan approved by the USEPA was produced in 1988 and guided by the CWA Amendments of 1987. Updates to this earlier plan were developed and appended in 1993 and 1998.

Over the course of the last several years, many new initiatives have come about to influence state NPS program direction. Thus, this new NPS Management Plan aims to take these initiatives into consideration and serve as the most comprehensive and definitive expression of NPS management goals within the State of Ohio. Several important changes reflected in the revised plan include:

The plan must be:

- Outcome(s) based using existing targets and new targets
- Integrated items with regional, national, and international water quality goals
- Targets that are not program specific
- The importance of local NPS implementation is emphasized
- Environmental outcomes that place an emphasis on stream integrity
- Comprehensive approaches to addressing Ohio's nonpoint source pollution management are encouraged
- The accessibility to the plan is enhanced

Further information can be found at http://wwwapp.epa.ohio.gov/dsw/nps/NPSMP/index.html. Implementation of watershed action plans will be a key ingredient of state NPS management and in that context should feature three core attributes. Watershed action plans must be science-based, community-led, and sustainable.

Lake Erie Protection & Restoration Plan

While neither a law nor regulatory mechanism, the Lake Erie Protection & Restoration Plan is still the State of Ohio's blueprint for Lake Erie's future and serves as a guidance document for achieving the goals and objectives set forth in a companion piece, the Lake Erie Quality Index (LEQI).
See http://lakeerie.ohio.gov/Portals/0/Reports/2008LEPRplan.pdf . As noted earlier, The Riley Creek watershed is situated within the Lake Erie Watershed. Land use activities within the Riley Creek subwatershed, therefore, have a direct impact on Lake Erie.

Having released the Second Progress Report in September 2004, the Lake Erie Protection & Restoration Plan proposes the implementation of 84 strategic actions for improving the environment, recreational opportunities, and the economy of the Lake Erie Watershed. These strategies are grouped under ten areas that address water quality, pollution sources, habitat, biology, coastal recreation, boating, fishing, beaches, tourism, and shipping. While many of these areas are not directly relevant to life in the Riley Creek subwatershed, some are. Several of the strategies having to do with water quality, pollution sources, habitat, and biology will have an impact on state views and expectations of land-use activities within the Riley Creek subwatershed and the other subwatersheds of the Blanchard River Basin.

For example, one of the strategies found under the Pollution Sources category states, "Increase from 52% to 80% the percentage of agricultural acreage in the Lake Erie Watershed under conservation tillage practices by 2010." This is one of four strategic actions that are designed to meet the strategic objective of reducing agricultural sediment loading from the Lake Erie Watershed by 67%. Thus, conservation tillage, establishing buffers along 80% of Lake Erie ditches, streams, and tributaries, and other Protection and Restoration Plan actions will be achieved by local and related efforts that seek to reduce sediment and nutrient loadings to the Riley Creek subwatershed.

Another strategic action of the Lake Erie Protection and Restoration Plan calls for reforesting riparian corridors and marginal agricultural acreage, floodplains, and wetlands using a variety of existing programs. This action is compatible with the need to reestablish and reconnect riparian corridors in the Riley Creek subwatershed. There are other examples where goals of the Riley Creek WAP and the Protection and Restoration Plan are complementary.

Recommendations in this WAP that address the requirements of improving water quality in the Riley Creek subwatershed will, therefore, satisfy other State initiatives, such as the Lake Erie Protection & Restoration Plan. To learn more about the Lake Erie Protection & Restoration Plan, please visit their website: http://www.epa.state.oh.us/oleo/reports/lepr2/secondreport.html.

Lake Erie Lakewide Management Plan (LaMP)

The Lake Erie Lakewide Management Plan (LaMP) provides a structure for the people of the United States and Canada to address environmental and natural resource concerns, coordinate research activities, pool resources, and make joint commitments to improving the environmental quality of our shared resource: Lake Erie (Lake Erie LaMP Work Group, 2004). An excerpt from this binational effort clarifies why the Lake Erie LaMP, updated yearly, is important to the residents of the Riley Creek subwatershed:

> *The environmental integrity of Lake Erie is dependent not only on various characteristics and stressors within the lake itself, but also on actions implemented throughout the Lake Erie watershed and beyond. Urban sprawl, shoreline development, climate change, the introduction of exotic species, the exploitation and destruction of natural lands and resources, the dominant agricultural and industrial practices within the lake basin, and long-range transport of contaminants from outside the basin all impact the health of Lake Erie.*

The Lake Erie LaMP identified land-use practices as the dominant management category affecting the Lake Erie ecosystem. For agricultural land-use, the Lake Erie LaMP calls for continuing reductions in the use of conventional tillage, agricultural chemicals and fertilizers. Specific watershed targets are to be established for securing, protecting, and restoring natural lands. Phosphorus exports from non point sources, including agricultural land use, is to be strongly reduced for purposes of favoring recovery and maintenance of healthy aquatic communities in the immediate receiving waters such as Maumee Bay. Sewage treatment plants may be expected to improve upon their previously achieved phosphorus load reductions. Thus, pollutant reductions from both point and nonpoint sources will simultaneously achieve local and regional initiatives that are complementary to one and another.

To learn more about the Lake Erie LaMP, readers are encouraged to visit this website: http://www.epa.gov/ginpo/lakeerie/2004update/index.html.

Balanced Growth Task Force

The Balanced Growth Task Force of the Ohio Lake Erie Commission has produced a strategy to protect and restore Lake Erie and its watersheds for the purpose of achieving long-term competitiveness, ecological health, and quality of life. The planning framework produced by the Task Force recommends a voluntary, incentive-based program for balanced growth in the Ohio Lake Erie basin. This framework reflects ten guiding principles outlined in the Lake Erie Protection and Restoration Plan discussed earlier.

Throughout the Balanced Growth plan, a watershed approach is promoted for planning and decision making. Furthermore, this framework includes active roles for both local and state governments in supporting local watershed planning partnerships. The essence of the Balanced Growth framework is fully compatible with watershed action plans developed at the scale of the Riley Creek subwatershed. The Balanced Growth framework offers reason to believe that new incentives for implementing locally-produced watershed action plans could be enjoyed by those groups with such plans.

This new strategy gives residents of the Riley Creek subwatershed more reason to "go with the flow" and produce a meaningful action plan that will lead to greater conservation and an improved quality of life. To learn more about Balanced Growth Plan in the Ohio Lake Erie Watershed, please visit the following website: http://www.lakeerie.ohio.gov/BalancedGrowth.aspx.

Great Lakes Ecosystem Protection Act 2010

HB 4755 was introduced in the House of Representatives in March 2010. A summary of this bill follows:

- *Authorizes the Great Lakes Restoration Initiative at $475 million per year. This is the level of funding initially proposed by the President for FY2010.*
- *Authorizes a new advisory group to the EPA. The two-tiered group is loosely modeled on the Great Lakes Regional Collaboration (GLRC).*
- *Authorizes the Federal Interagency Task Force which was established in 2004 by Executive Order which means that it could be dissolved by Executive Order.*
- *Reauthorizes the Great Lakes Legacy Act which expires in 2010. The authority is for $150 million per year, the level recommended by the GLRC Strategy Report.*
- *Reauthorizes EPA's Great Lakes National Program Office (GLNPO) at level funding ($25 million).*

Further information can be found at http://www.opencongress.org/bill/111-h4755/show.

Ohio Household Sewage Treatment Regulations

Effective May 6, 2005, Substitute House Bill 231 (125th General Assembly) Chapter 3718 of the Ohio Revised Code required the Public Health Council to adopt new rules governing household sewage treatment systems and small flow on-site sewage treatment systems (not more than 1,000 gallons of sewage per day).

Amended Substitute House Bill 119 (Am. sub. HB 119), passed by the 127th Ohio General Assembly, contains substantial amendments to the Ohio Revised Code (ORC) and the Ohio Administrative Code (OAC) regarding the regulation of household and small flow on-site sewage systems in Ohio. The sewage treatment system rules adopted by the Public Health Council (PHC) that became effective on Jan. 1, 2007, has been rescinded as required by the bill. The bill also enacts several uncodified provisions into state law that took effect July 1, 2007. These uncodified provisions are effective until July 1, 2009, and have substantial impact on the sewage programs implemented by the Ohio Department of Health (ODH) and local health districts.

In compliance with Am. Sub. HB 119, the director of Health adopted statewide interim sewage rules (OAC 3701-29) effective July 2, 2007. The PHC, at its July 25, 2007, meeting adopted these rules as minimum standards through July 1, 2009. In mid July 2009 HB 1 issued a six month extension continuing the previous ruling established on July 25, 2007. Local health districts are responsible for code enforcement and are permitted to adopt more stringent rules during the same time period.

The Am. Sub. HB 119 requires compliance with National Pollutant Discharge Elimination System (NPDES) permit requirements for new and replacement discharging Home Septic Treatment Systems (HSTS). An installation permit for a new or replacement discharging HSTS cannot be issued by a local health district until a homeowner obtains NPDES permit coverage. (information from Mills ODH) Further information can be found at http://www.odh.ohio.gov/odhPrograms/eh/sewage/sewrules.aspx.

Western Lake Erie Basin Partnership (WLEB)

The Western Lake Erie Basin Partnership includes 14 Federal, State, and regional partners. These 14 groups include US Army Corps of Engineers; US Department of Agriculture - Natural Resources Conservation Service; US Fish & Wildlife Service; US Geological Survey; Ohio Water Science Center; US EPA; Governor of Ohio; Governor of Indiana; Governor of Michigan; Ohio State Technical Committee; Indiana State Technical Committee; Michigan State Technical Committee; Ohio Department of Natural Resources, Division of Soil & Water Conservation; National Association of Conservation Districts; and Maumee River Basin Partnership of Local Governments. The WLEB completed a Blanchard River Assessment in August 2009. The report can be found at: http://www.wleb.org/documents/assessments/Blanchard%20Watershed%20Final%20Assessment%20091509.pdf. For more information about the WLEB visit their web site at: http://www.wleb.org.

Northwest Ohio Flood Mitigation Partnership (NWOFMP)

The Northwest Ohio Flood Mitigation Partnership, Inc. was formed after the major flood in 2007. The NWOFMP was a private/nonprofit organization whose purpose was to expedite the design and development of a flood mitigation plan in coordination with responsible public authorities in the Blanchard River Watershed.

The NWOFMP succeeded in developing a working relationship between the City of Findlay, the Village of Ottawa, the Hancock and Putnam County Commissioners, and all other political subdivisions within the watershed. The NWOFMP's intent was once they had accomplished stated goals and construction was turned over to a public entity, the NWOFMP organization will cease to exist in its present form. The Northwest Ohio Flood Mitigation Partnership officially went out of business on December 31, 2010, as planned.

There was a need for an organization to continue through construction and take over maintenance and operations of the projects. A task force of watershed elected officials started meeting in January 2010 to decide how to proceed with the flood mitigation plan. The USACE required a local watershed entity to enter into the cost-sharing portion of the flood plan on short-term basis by June 1, 2010. The group decided that the Hancock County Commissioners would act as the public entity for the short term. On September 13, 2010, a petition was filed with the Hancock County Clerks of Court to create a separate Conservancy District. The six judges held a public meeting on November 22, 2010, in Findlay concerning the Conservancy. In early December, the six judges voted 4 - 2 against a separate Conservancy District. The Hancock County Commissioners filed a letter with the Maumee Conservancy District in January 2011 asking the Maumee Conservancy District to take over responsibility for the flood efforts in the Blanchard River Watershed.

Lima-Allen County Regional Planning Commission

The Lima-Allen County Regional Planning Commission (LACRPC) provides a wide array of technical planning and engineering services to member governments and their residents across portions of 4 counties. The LACRPC has various responsibilities and undertakes special studies under contractual arrangements with member communities. The LACRPC serves as the metropolitan planning organization responsible for transit and highway planning, project development and project allocations for member governments pursuant to federal funding (FHWA/FTA) requirements. The LACRPC administers the Allen County Floodplain Management Regulations and the Allen County Subdivision Regulations. The LACRPC also manages the Community Development Block Grant Program, the Safe Community Program and the Farmland Preservation

Program Office. The LACRPC serves as a census affiliate and repository, which possesses a wide array of historical data and archival maps, including aerial photos, as well as traffic flow, zoning, and land use maps. The LACRPC maintains strong relationships with ODOT, ODOD, ODNR, ODPS and OEPA in addition to FHWA and FTA. For further information go their web site at: http://www.lacrpc.com

Hancock Regional Planning Commission

The Hancock Regional Planning Commission (HRPC) provides professional planning services for the City of Findlay and Hancock County. HRPC is responsible for enforcement of the Hancock County Subdivision Regulations, Lot Splits, Assistance to the Villages and Townships Zoning Codes, Zoning Advisory, and City Planning Reviews.

Also provided are professional grant writing services for the cities of Findlay, Fostoria, and for Hancock County. This includes administration of the Community Development Block Grant (CDBG) program, Economic Development Grants, Revolving Loan Fund dollars, review and reporting of the Enterprise Zones and TIF. For further information go their web site at: http://www.hancockrpc.org/.

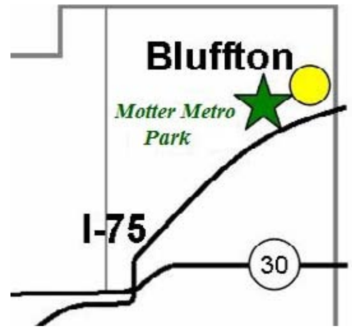
Putnam County Regional Planning Commission

The Putnam County Regional Planning Commission is composed of eleven members, which include the Board of County Commissioners and eight appointed citizens. The focus of the planning commission is to promote orderly development while preserving the elements that define Putnam County's quality of life. The main duties of the planning commission include enforcing the subdivision and floodplain regulations and assisting zoning officials. We wish you much success with your new land use endeavors and look forward to working with you in developing Putnam County into a safe and prosperous community. For further information go their web site at: http://www.putnamcountyohio.gov/Commissioners/Planning%20Commission/commissioner%20planning_commission.htm

Johnny Appleseed Metropolitan Park District

The Park District, created in June, 1972 according to Chapter 1545 of the Ohio Revised Code is a separate political subdivision of the State of Ohio. The Park District is a comprehensive park system of natural areas and preserves designed to enhance the quality of life for citizens of Allen County by providing passive outdoor recreational and educational opportunities while conserving and protecting the natural resources of the area for future generations.

The Park District currently has 12 park areas with over 1,200 acres. The Motter Metro Park is the only park of the Park District that is located in the Riley Creek Watershed. Picture 1.3 shows the location of the Motter Metro Park just west of Bluffton. The Motter Metro Park was acquired in two parcels in 2006 and 2009. The open meadow park land has been planted in prairie grasses and will restore grassland habitat that is in short supply in Allen and surrounding counties. The Little Riley Creek runs through the park, providing critical habitat for wetland and water species of plants and animals. A wildlife observation deck, wetland mitigation project, and environmental education panels are planned for the future. The park is located at 10740 Columbus Grove-Bluffton Road in Richland township just west of Bluffton. The Park covers 105 acres and has mowed grass trails.



Picture 3.1 Motter Metro Park location
Martin from web site

Chapter 4: Riley Creek Watershed Inventory

Purpose

The focus of this chapter is to provide an extensive inventory of the resources within the Riley Creek Watershed. This inventory will provide very useful information in making decisions on how to improve and maintain water quality and habitat within the watershed.

Chapter Acknowledgements:
This chapter was prepared, using material from The Outlet/Lye Creek Watershed Action Plan and by the watershed coordinator and BRWP partners.

Land Use

The Land Use is illustrated in Map 4-1 on the next page. Table 4.1 summarizes land use for the entire 12-digit watershed. The watershed covers 54,873 acres. Table 4.2 on page 4-3 shows the Land Use for the 12-digit subwatersheds located in the Riley Creek Watershed. Like most of the Blanchard River Watershed, agriculture is the predominant land use (75.6%) for the watershed. The main crops grown are corn, soybeans, and wheat. There have been an estimated loss of 8057.8 acres of agricultural land since 2011. The agriculture area is heavily tiled with many ditches being channelized to aid in drainage. Urban areas are the second largest land use (15.5%) with 8480 acres. Urban development has increased by an estimated 7284.7 acres since 2001. Most of the development has occurred around Bluffton and Pandora. Wooded areas, composed mainly of deciduous species, account for (8.4%) of the land use. These areas are scattered in a fragmented pattern in small woodlots that are separated from other woodlots by the agricultural fields. Continuous woody vegetation is found along most of the riparian corridor on Little Riley Creek. Most of the riparian corridor of Riley Creek is covered with mature trees.

Table 4.1: Land Use Riley Creek Watershed

Land Use	2009 (acres)	Change from 2001 (acres)
Agriculture	41470.5	-8057.8
Water	292.9	-83.5
Urban	8480	+7284.7
Forest	4583.6	+879.7
Barren	37.1	+37.1
Shrub/Scrub	0.8	-59.9
Total Acres	54,873	

ERIN Watershed Reports from ODNR

Map 4.1: Land Use the Riley Creek Subwatershed

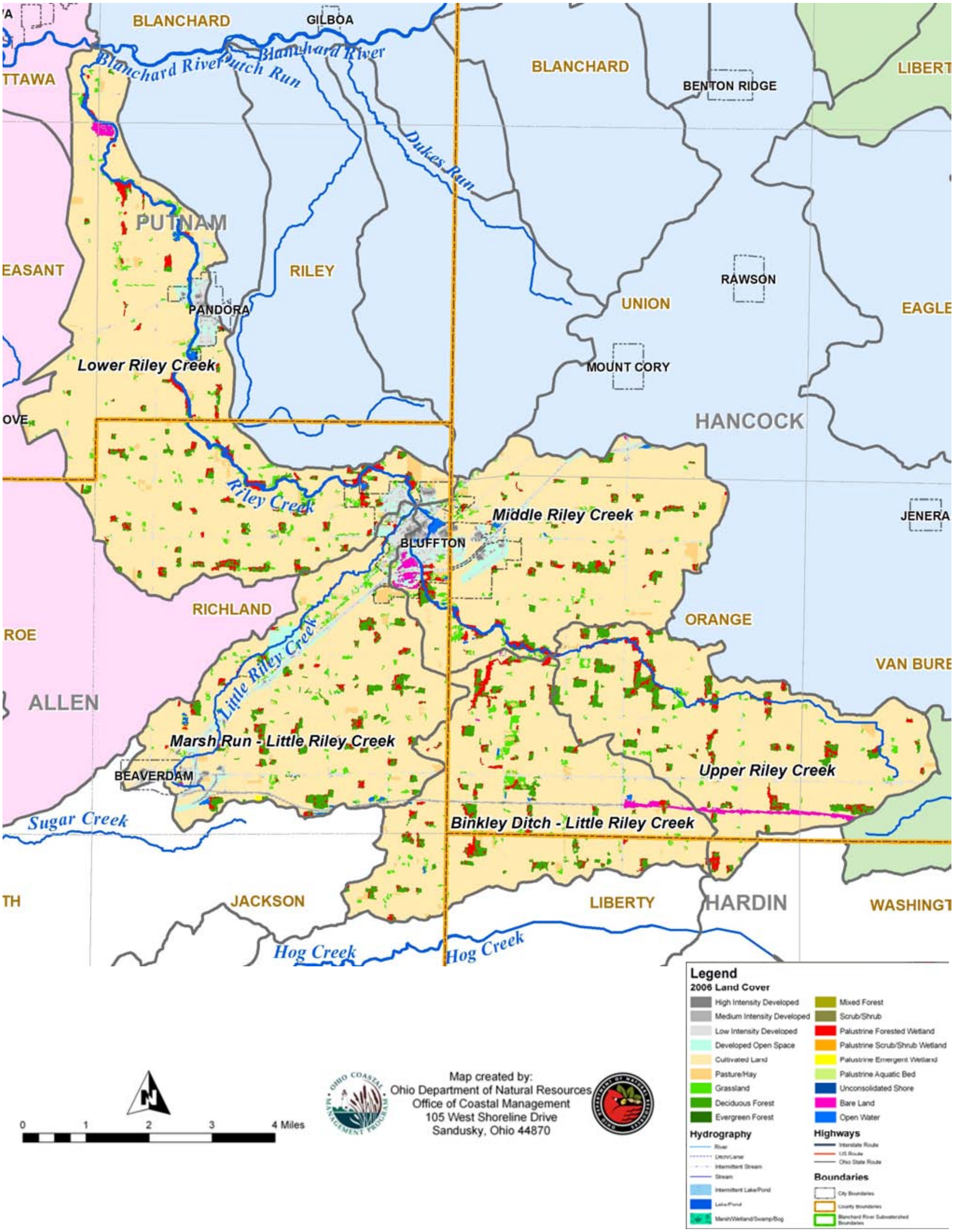


Table 4.2: Land Use for the 12-digit Watersheds in the Riley Creek Watersheds

12-digit watersheds→ Land Use (acres)↓	Binkley Ditch-Little Riley Creek (4100008 04 01)	Upper Riley Creek (04100008 04 02)	Marsh Run-Little Riley Creek (04100008 04 03)	Middle Riley Creek (04100008 04 04)	Lower Riley Creek (04100008 04 05)
Agriculture	7098.3 (8445.8)*	7109.1 (8201.4)*	7256.3 (9210.9)*	7175.8 (8816.1)*	12,831.1 (14,854.1)*
Water	18.6 (53.2)*	30.2 (67.2)*	56.6 (63.2)*	76.7 (98.5)*	110.8 (94.3)*
Urban	1239.1 (2.7)*	937.7 (0.0)*	2250.4 (471.3)*	2035.7 (471.1)*	2017.1 (250.2)*
Forest	832.3 (690.6)*	1105.0 (911.9)*	837.7 (657.5)*	685.0 (551.6)*	1123.6 (892.3)*
Barren	7.0 (0.0)*	1.5 (0.0)*	1.5 (0.0)*	15.5 (0.0)*	11.6 (0.0)*
Shrub/Scrub	0.0 (0.0)*	0.0 (0.0)*	0.0 (0.0)*	0.0 (60.7)*	0.8 (0.0)*
Total Acres	9193.3	9185.0	10,404.6	9995.5	16094.6

*2001 data

source: ERIN Watershed Reports from ODNR

Watershed Hydrology

Stream Drainage Network. Fig. 4.1 on the next pag, is a schematic drawing from the Technical Support Data (TDS) Report based on the 2005 TMDL study conducted by the OEPA on the Blanchard River. Some of the names of the tributaries have been added, using information from the Allen County, Hancock County, and Putnam County Engineer's office. Map 4.2 (see pg. 4-6) shows the tributaries for Riley Creek Watershed.

Fig. 4.1 also shows the stream order for the Riley Creek Watershed. The figure is based on the Strahler-Horton stream classification system used by the NRCS. In this system, first order streams have no tributaries. Where two first order tributaries join, a second order stream is formed. Where two second order tributaries join, a third order stream is formed, and so on and so forth.

In this watershed, the highest stream order is Riley Creek from the mouth to the mouth of Little Riley Creek with a stream order of 4. The stream order system can provide information about the watershed in five ways: 1) stream length; 2) stream gradient; 3) area of watershed; 4) stream continuum; and 5) number of streams of the order. In most watersheds, there are many more miles of low order streams than of high order streams. For the Riley Creek watershed there 126.65 miles of streams. See Table 4.3. below.

Table 4.3: Stream length by stream order in the Riley Creek watershed

Stream Order	Length (miles)	Percent of Miles
1st Order	60.80	48.01
2nd Order	36.93	29.16
3rd Order	8.61	6.79
4th Order	20.31	16.04
Total	126.65	100.00

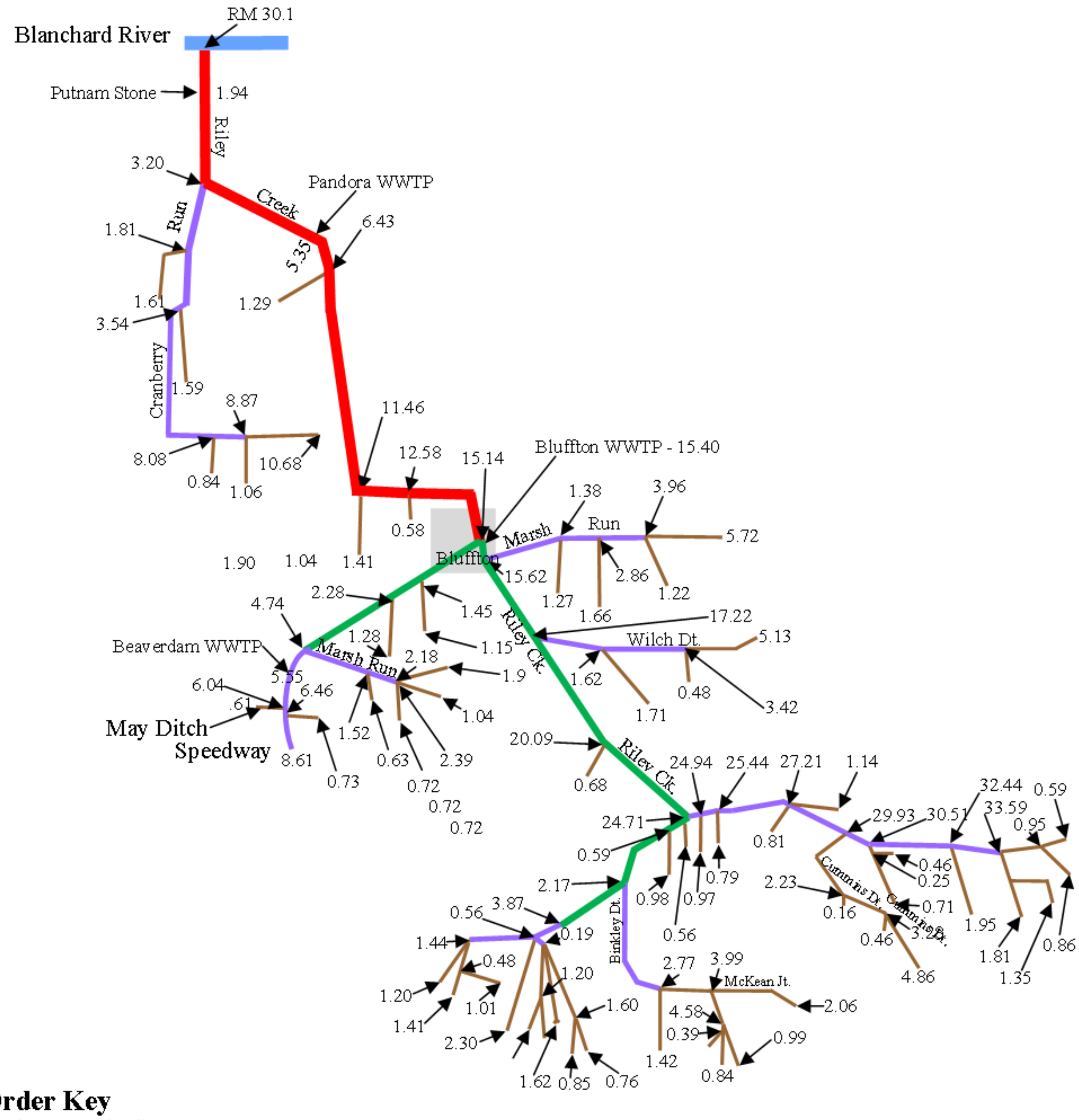
ODNR Coastal Management GIS and County Maintenance

Information on the main streams, ditches, and tributaries located in the Riley Creek Watershed are shown in Table 4.4 on page 4-7. Table 4.5 on pages 4-9 and Table 4.5.1 on page 4-10 breaks the waterways down into the 12-digit subwatersheds and shows stream order for each. This data was obtained from ODNR Coastal Management GIS Department in Sandusky, Ohio, and the Allen, Putnam, and Hancock County Engineer Departments.

Map 4.3 and Map 4.4 on page 4-7 shows the ditches and streams that are under county maintenance contract in Putnam and Hancock County's portion of the Riley Creek Watershed. Map 4.5 on page 4-8 shows the ditches and streams that are under county maintenance contract in Allen County's portion of the Riley Creek Watershed.

.25" = 1 mile

Figure 4.1: Schematic Drawing of the Riley Creek Watershed streams showing stream order HUC #04100008 04



Stream Order Key
(Based on entire watershed)

- first order
- second order
- third order
- fourth order
- fifth order

Map 4.2: Tributaries

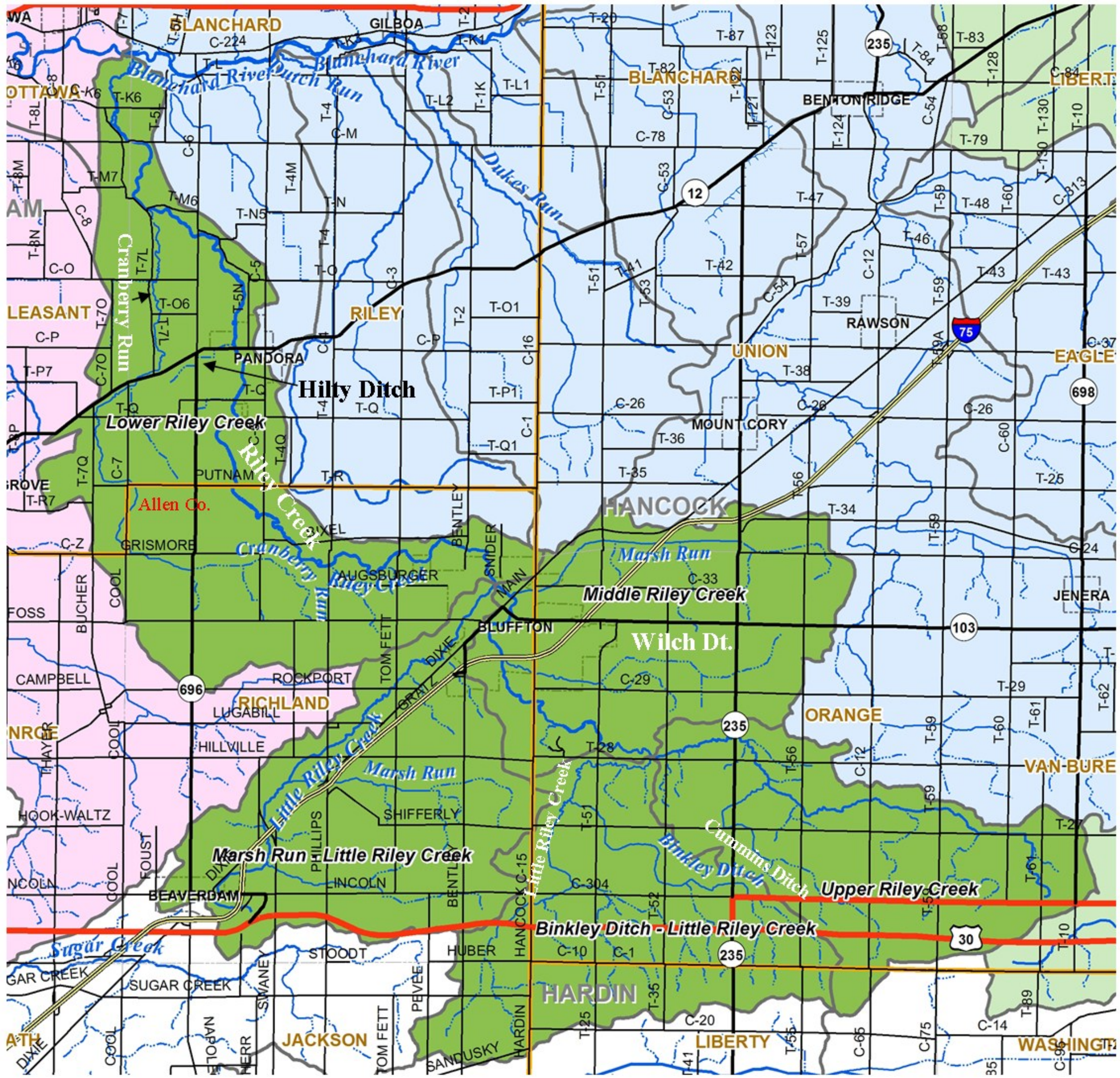
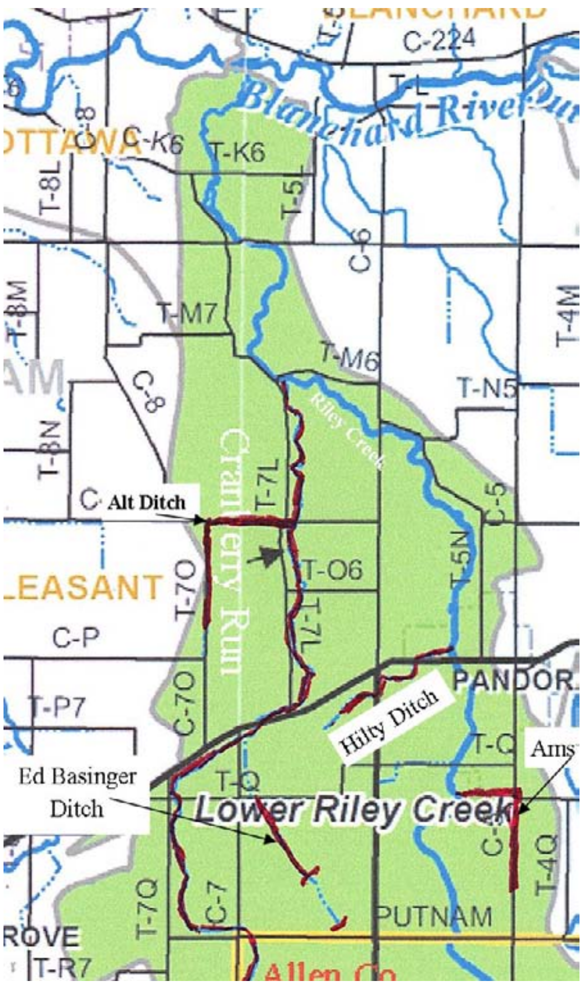
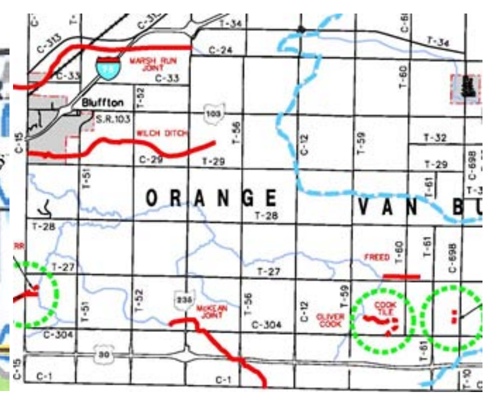


Table 4.4: Main tributaries in the Riley Creek Watershed

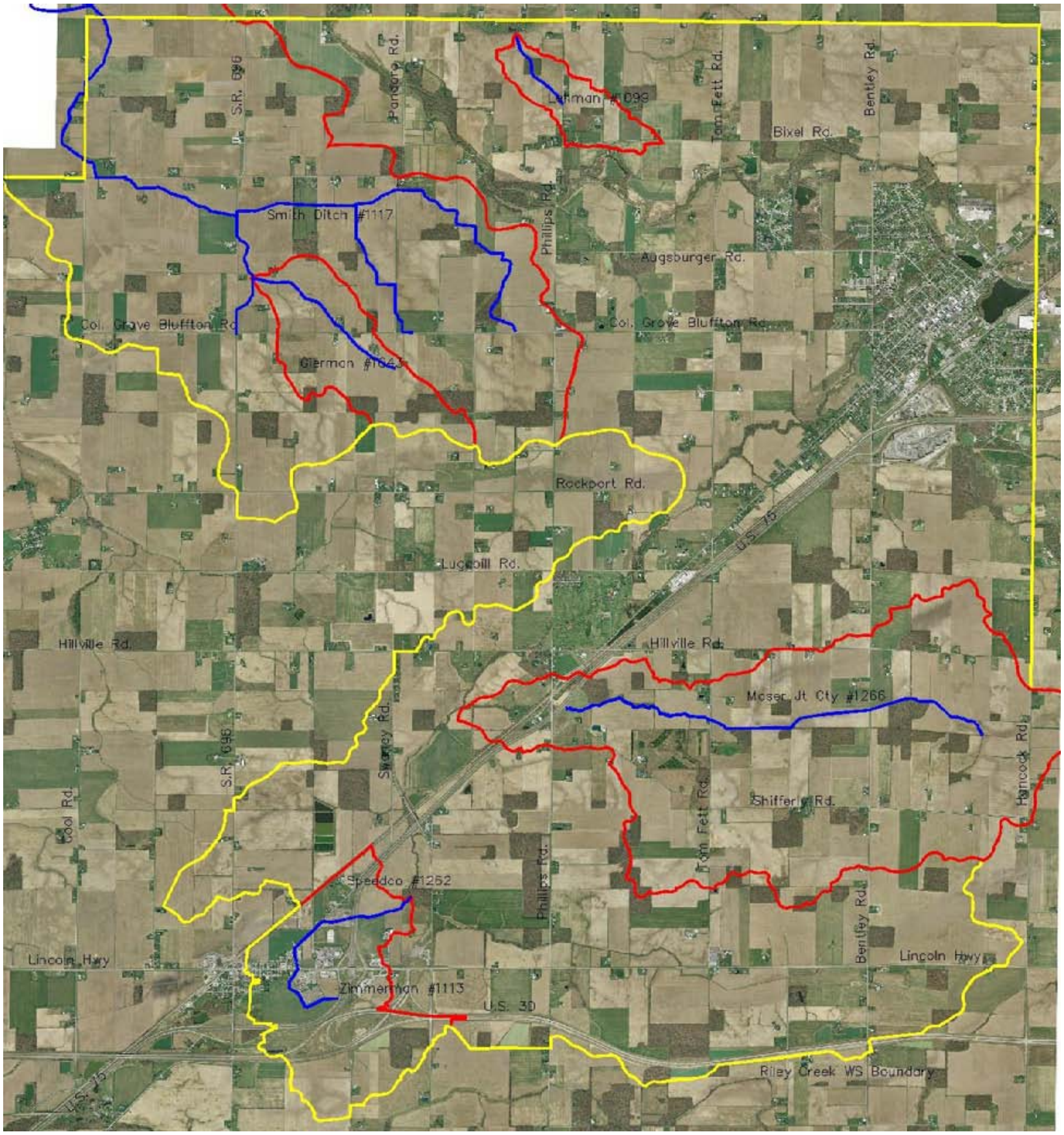
Stream Name	Flows Into	Length (mi.)	Elevation at source (ft.)	Elevation at mouth (ft.)	Average Fall (ft/mile)	Area Drainage (sq. miles)
Riley Creek	Blanchard River	22.2	893	712	8.2	85.7
Cranberry Run	Riley Creek	8.7	790	783	3.2	28.4
Little Riley Ck.	Riley Creek	8.3	867	806	7.4	16
Marsh Run	Little Riley Creek	2.3	855	836	8.3	4.23
May Ditch	Little Riley Creek	1.2	865	847	15	1.62
Marsh Run	Riley Creek	5	836	808	5.6	7.62
Little Riley Ck.	Riley Creek	5.5	895	849	8.4	14.8
Cummins Ditch	Little Riley Creek	3.6	910	864	12.8	3.5
Binkley Ditch	Riley Creek	3.6	905	863	11.7	4.67
				ODNR Gazetteer of Ohio Streams 2001		



Map 4.3: Putnam County waterways under county maintenance contract shown in red.



Map 4.4: Hancock County waterways under county maintenance contract shown in red.



Map 4.5: Allen County waterways under county maintenance contract shown in red. Smith Ditch is known as Cranberry Run on most maps. Cranberry Run enters Riley Creek in Putnam County, but Allen County is responsible for maintenance of the entire length of Cranberry Run.

Table 4.5: Streams and Ditches with Stream Order
Riley Creek Watershed - 12-digit subwatersheds
(Stream/Ditch in red under county maintenance contract)

Binkley Ditch - Little Riley Creek (HUC 0410000 04 01) (measurements in feet)

Stream/Ditch	first order	second order	third order	fourth order
Upper Little Riley Creek		8455	20,434	
-first unnamed	2959			
-second unnamed	5183			
-Binkley Ditch	13,122	24,182		
-first unnamed	7509			
-McKean Joint	14,342			
-third unnamed	19,757	2938		
-fourth unnamed	9609	6327		
-fifth unnamed	8561			
Total	81,042	41,902	20,434	

Upper Riley Creek (HUC 0410000 04 02) (measurements in feet)

Stream/Ditch	first order	second order	third order	fourth order
Riley Creek	8765	22,440		
-first unnamed	5124			
-second unnamed	4177			
-third unnamed	4294			
-Freed (3930')	6043			
-fourth unnamed				
-Cummins Ditch	28,102			
-Oliver Cook	6115			
-fifth unnamed	3745			
Total	66,365	22,440		

Marsh Run - Little Riley Creek (HUC 04100008 04 03) (measurements in feet)

Stream/Ditch	first order	second order	third order	fourth order
Little Riley Creek		11,299	25,027	
-first unnamed	6072			
-second unnamed	6758			
-Marsh Run (Moser Jt. County)		15,302		
-first unnamed	3336			
-second unnamed	5449			
-third unnamed	3776			
-third unnamed	3208			
-fourth unnamed	3837			
-Speedco/Zimmerman (8069')	9129			
-fifth unnamed	19,572			
Total	61,137	26,601	25,027	

Table 4.5 cont.: Streams and Ditches with Stream Order Riley Creek Watershed - 12-digit subwatersheds

(Stream/Ditch in red under county maintenance contract)

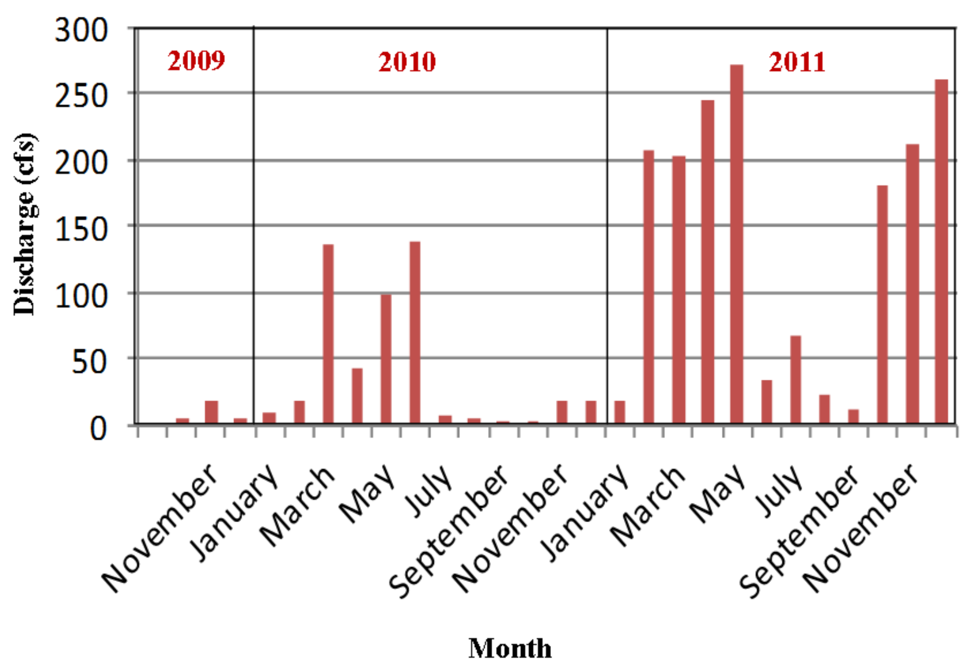
Middle Riley Creek (HUC 04100008 04 04)				(measurements in feet)
Stream/Ditch	**first order**	**second order**	**third order**	**fourth order**
Riley Creek				27298
-first unnamed	3599			
-Marsh Run (18900')		20931		
-first unamed	6706			
-second unnamed	6709			
-third unnamed	8755			
-fourth unnamed	6417			
-fifth unnamed	9281			
-Wilch Ditch		18,058		
-first unnamed	9038			
-second unnamed	2530			
-third unnamed	7921			
Total	60,956	38,989		27,298
Lower Riley Creek (HUC 04100008 04 05)				(measurements in feet)
Stream/Ditch	**first order**	**second order**	**third order**	**fourth order**
Riley Creek				79939
-Hilty Ditch	6890			
-Amstutz Ditch (5811')	7286			
-first unnamed	7445			
-second unnamed	3062			
-Cranberry Run		65,060		
-Alt's Ditch (5950')	8501			
-Ed Basinger Ditch (1410')	8395			
-first unnamed	4435			
-second unnamed	5491			
Total	51,505	65,060		79,939

Streamflow Characteristics

The stream flow within the Riley Creek watershed is documented by one USGS stream gage (#04189174) located on Riley Creek below Pandora, Ohio.

The gage on the Riley Creek is located at CR 6 with a drainage area of 70 mi^2. The gage has collected data continuously since October 2009. The discharge rates for Riley Creek below Pandora from October 2009 - December 2011 are shown in Figure 4.2 below. The summary of the statistics for this period are shown in Table 4.6 on the next page. The Average Monthly Discharge data for the Riley Creek below Pandora station are shown in Figure 4.3 on page 4-13.

Figure 4.2: Stream Flow Riley Creek below Pandora 2009-2011



Picture 4.1:

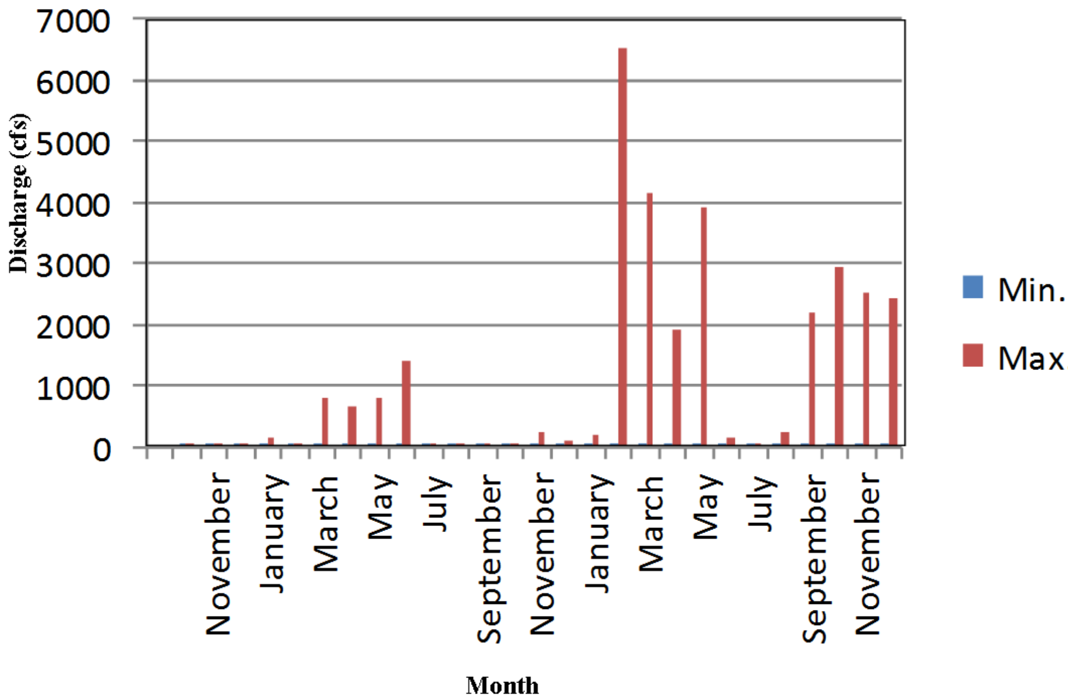
Riley Creek facing downstream from the bridge deck. USGS Gage station # 0418917 is located on this bridge.
(Martin)

Table 4.6: Summary of Statistics for USGS Stream Gage 04189174 on Riley Creek below Pandora from October 2009 - December 2011. Gage is located in the 12-digit watershed Lower Riley Creek HUC 04100008 04 05

Summary Statistics (cfs)	2009			2010											
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Total Flow	130.19	537.2	154.4	309.53	172.3	135.8	1264.5	3006.0	4166.0	207.39	168.32	27.95	67.10	537.2	548.2
Mean	4.2	17.90	5.0	10.0	17.90	135.8	42.2	97.0	138.9	6.7	5.43	0.93	2.16	17.9	17.68
Maximum	14.0	7.90	36.0	154.0	23.0	801.0	635.0	801.0	1380.0	25.0	32.0	4.2	8.8	236.0	114.0
Minimum	0.55	2.20	1.10	0.68	2.70	13.0	7.9	13.0	7.56	0.81	0.55	0.08	0.97	0.97	6.8

Summary Statistics (cfs)	2011											
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Total Flow	309.53	172.3	135.8	1264.5	3006.0	4166.0	207.39	168.32	27.95	67.10	537.2	548.2
Mean	10.0	17.90	135.8	42.2	97.0	138.9	6.7	5.43	0.93	2.16	17.9	17.68
Maximum	154.0	23.0	801.0	635.0	801.0	1380.0	25.0	32.0	4.2	8.8	236.0	114.0
Minimum	0.68	2.70	13.0	7.9	13.0	7.56	0.81	0.55	0.08	0.97	0.97	6.8

Figure 4.3: Average monthly discharge from Riley Creek below Pandora, Ohio USGS Gage 04189174 from October 2009 - December 2011



Stream Flashiness

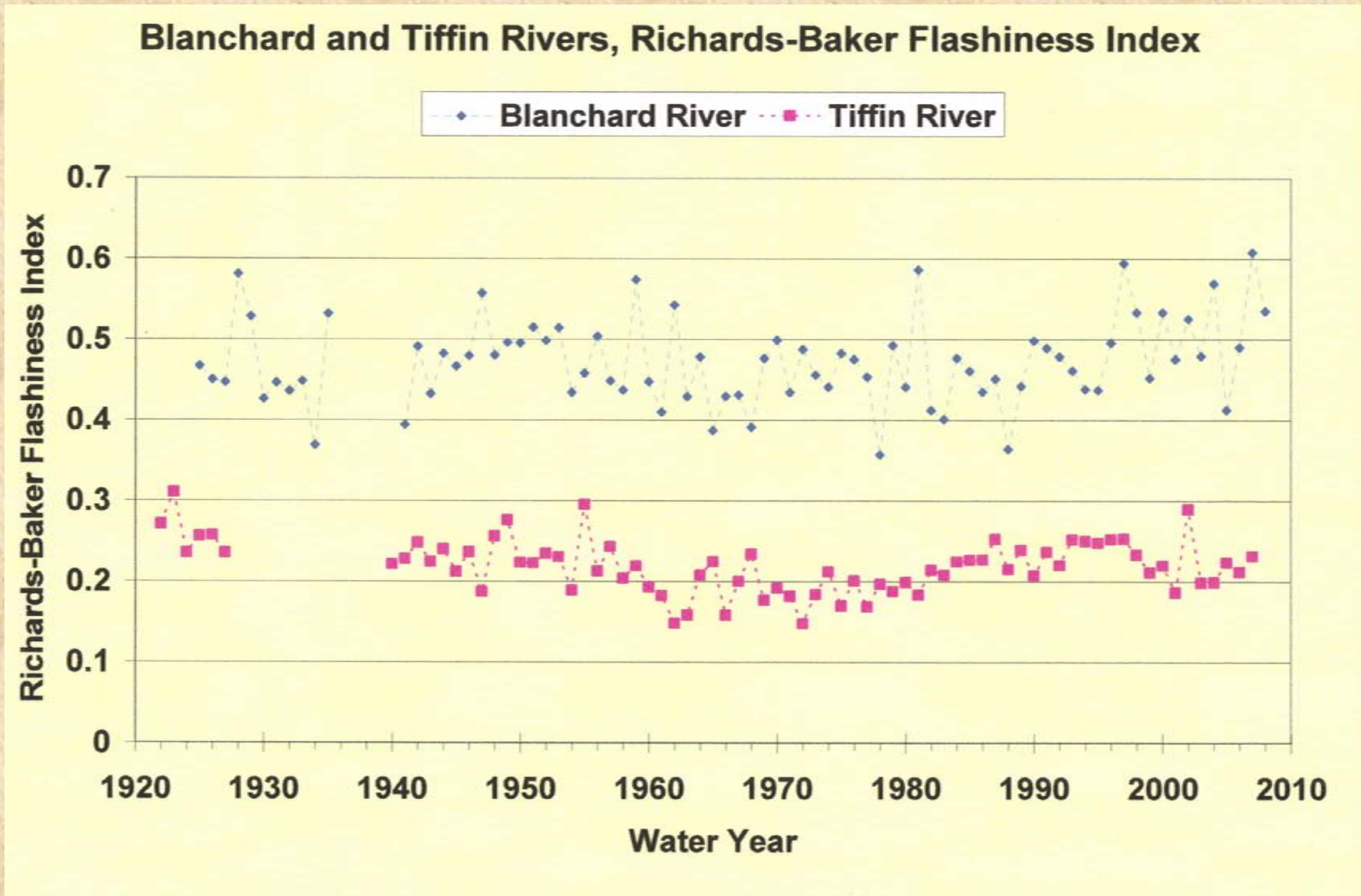
Stream flashiness is a measure of how quickly stream flows change during runoff events, relative to the total discharge of the stream. Flashy streams are those that, relative to other streams in their size range, have high peak flows during runoff events and low base flows. Low base flows for the Riley subwatershed, as well as the entire Blanchard River watershed were identified by the Ohio EPA as a problem in the 2009 TMDL Report. Dr. David Baker, from the National Center for Water Quality Research (NCWQR) located at Heidelberg University, has calculated the Richards-Baker Flashiness Index for the Blanchard River from 1920-2008. The data is shown in figure 4.3 on page 4-15. From the data, one can see that the Blanchard River has a higher degree of flashiness than the Tiffin River. The high stream flashiness is a problem that was probably created by the channelization of most of the waterways in the watershed for agricultural drainage and use. Best Management Practices (BMPs) will need to address this stream flashiness. Chapter 7 discusses the problem areas and offers BMPs to solve many of the problems identified in the Ohio EPA TMDL report.

Even though there are no direct measurement of flashiness in the Riley Creek watershed, it is logical to think that the flashiness in Riley Creek is similar or higher to flashiness throughout the Blanchard River Watershed. The Ohio 2010 Integrated Water Quality and Assessment Report state that sedimentation and nutrient loadings from agricultural runoff is a problem in all 5 of the 12-digit watersheds located in the Riley Creek watershed. Pictures 4.2 and 4.3 below were taken shortly after rain event in the watershed. Note the muddy appearance of the water and the high water level in Picture 4.3. Riley Creek rose 3 feet in a four-hour period from this rain event. This provides evidence that the stream flashiness if high.

Picture 4.2: Surface runoff following a 2-inch rain in November 2011. This picture was taken shortly after the rain ended. (Martin)

Picture 4.3: Riley Creek from the deck of the CR 6 bridge facing downstream. The picture was taken 3.5 hours after a 2-inch rain. The water in the Creek rose 3 feet in 4 hours, showing high flashiness. (Martin)

Figure 4.4



Information from Dr. David Baker from NCWQR at Heidelberg University 2009

Other Stream and Floodplain Attributes

Currently, the US Army Corps of Engineers, Hancock County Engineer, City of Findlay Engineer, URS Corporation, the Village of Ottawa, and other agencies are conducting several studies within the Blanchard River Watershed related to flooding and water quality. When the results of this study are released, this WAP will need to be updated to include information on the following attributes:

*Channel and floodplain condition, streambank condition, extent and location of levees and diversion channels, detention/retention basins, riparian habitat, and oxbow cutoffs;
*Extent and location of streams bordering conservation easements;
*Inventory of wetlands and opportunities for wetland restoration.

Ecoregional Location

The Riley Creek watershed is situated almost exclusively within the Eastern Corn Belt Plains (Level III), Clavey High Lime Till Plains (Level IV) Ecoregion of the United States. Only the northern half of the 12-digit Lower Riley Creek watershed starting at RM 15.0 is located in the Huron/Erie Lake Plains (HELP)(Level III), Maumee Lake Plains, and ClaveyHigh Lime Till Plains (Level IV) Ecoregion. The Ohio EPA uses water quality criteria for each ecoregion to evaluate biological conditions for the entire Riley Creek watershed. See Table 4.7 below for the Eastern Corn Belt Region (ECBP) standards and Table 4.8 on the next page for the Huron/Erie Lake Plains Region (HELP) standards.

Table 4.7: Ecoregion Biocriteria: Eastern Corn Belt Region (ECBP) (2009 Blanchard River Watershed TMDL report).

INDEX - Site Type	WWH	EWH	MWH
IBI Headwaters-Wading/Boat	40/42	50/48	24
Mlwb Wading/ Boat	8.3/8.5	9.4/9.6	4.0
ICI Headwaters-Wading/Boat	36	46	22

Table 4.8: Ecoregion Biocriteria: Huron/ Erie Lake Plains (HELP), 2009 Blanchard River Watershed TMDL report.			
INDEX - Site Type	**WWH**	**EWH**	**MWH**
IBI Headwaters-Wading/Boat	32/34	50/48	24
Mlwb Wading/ Boat	7.3/8.6	9.4/9.6	5.6/5.7
ICI Headwaters-Wading/Boat	34	46	22

Non-Agricultural Conservation or Conservation Easements

There are no non-agricultural conservation or conservation easements in the Riley Creek watershed.

Soils

Soils in the Riley Creek Watershed are derived from glacial drift of Wisconsin age. Map 4.6 on page 4-20 shows the Parent Material Soils found in the watershed.

A discussion of the main soil types in each of the 12-digit watershed in the Riley Creek Watershed will provided a better understanding of what erosion and loading problems could exist in that 12-digit watershed.

Binkley Ditch-Little Riley Creek (HUC 04100008 04 01)

Nearly 50% of the watershed is covered by Blount silt loam soil with a slope between 2-6%. Approximately 12% of the area is covered by Blount loam soil with a slope of 0-2%. The other large soil type is Pewamo silty clay loam, covering nearly 20% of the watershed. The remaining 18% of the watershed is composed of 28 different types of soil.

Upper Riley Creek (HUC 04100008 04 02)

Over 56.7% of the watershed is covered by Blount silt loam soil with a slope between 2-6%. The other large soil type is Pewamo silty clay loam, covering nearly 27.3% of the watershed. The only other soil covering a large area (6.3%) is Glynwood silty loam. The remaining 9.7% of the watershed is composed of 18 different types soil. A strip of Linwood-Adrian association lines the riparian corridor of the streams.

Marsh Run-Little Riley Creek (HUC 04100008 04 03)

Nearly 54% of the watershed is covered by Blount silt loam soil with a slope between 2-6%. The other large soil type is Pewamo silty clay loam, covering over 21% of the watershed. The only other soil covering a large area (8.3%) is Glynwood silty loam. Sloan silty clay loam, till substratum does cover 3.5% of the area mainly along the waterways. There are 27 other soil types in the remaining 13.2% of the watershed.

Middle Riley Creek (HUC 04100008 04 04)

Like the other 12-digit watershed, the Middle Riley Creek watershed is covered by Blount silt loam (51%) soil with a slope between 2-6%. The other large soil type is Pewamo silty clay loam, covering over 22% of the watershed. The only other soil covering a large area (7.2%) is Glynwood silty loam. Westland-Rensselaer complex is found in 4.6% of the watershed. There are 46 other soil types in the remaining 6.6% of the watershed.

Lower Riley Creek (HUC 04100008 04 05)

The Lower Riley Creek watershed includes the area where the Ecoregion changes from an Eastern Corn Belt Plains to the Huron/Erie Lake Plains Ecoregion. The change occurs just north of Pandora and results in many different soils appearing in the Lower Riley Creek watershed. Lenawee (Ls) soil covers nearly 1900 acres or 11.8% of the watershed. Lenawee soils are nearly level and very poorly drain soils. Lenawee soil continues to be found north of the watershed into Michigan. Blount silt loam soil with a slope between 2-6% cover over 18.7% of the area. Pewamo soil can be found covering nearly 16% of the watershed. There are over 90 additional soil types found in the remaining 50% of the watershed. No type is greater than 4% with most cover around 0.5% of the watershed.

A more detailed map of the soils at the phase level is shown in Appendix B, which contains a summary of the soils showing muname, museries, count, and area in acres.

Hydric Soils

According to the NRCS Hydric Soils Technical Note 1, a hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. The scope of this action plan does not require a complete understanding of hydric soils. Map 4.7, on page 4-21, shows the hydric soils for the Riley Creek watershed. As the map shows, there are wide areas of hydric soil in the Riley Creek watershed. GIS calculation show that 53,274 acres out of a total area of 142,535 acres, or 37.4%, are covered by hydric soils. Table 4.9 below summarizes the Hydric Soils for the entire the Riley Creek watershed.

Table 4.9: Hydric Soils - The Riley Creek watershed

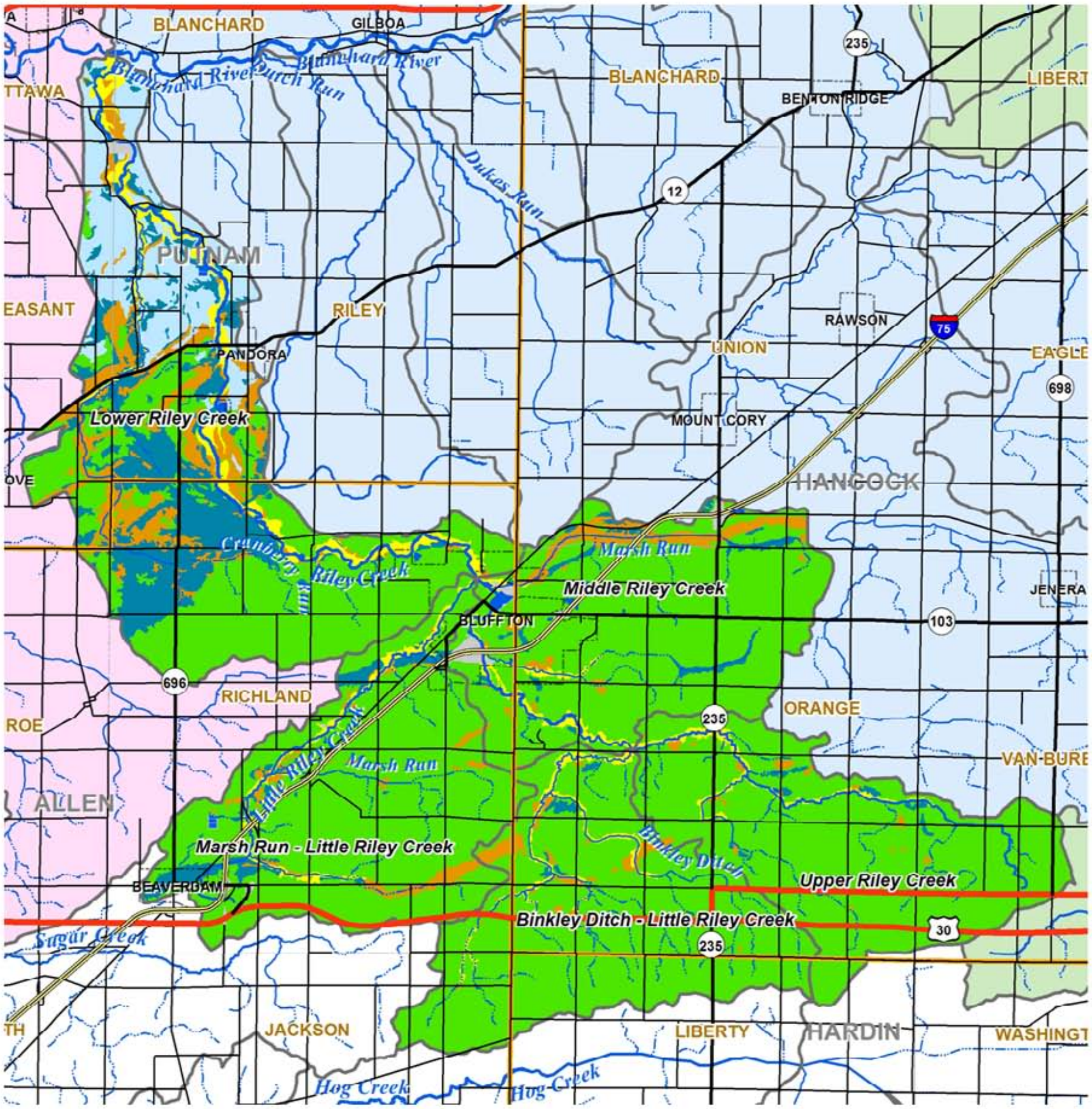
Hydric Soil	Area (acres)	Percent
Yes	53,274	37.4
No	87,579	61.4
Unranked	1,682	1.2
Total	142,535	100.00

Hydric soils are normally located along wide, flat drain ways or depressional areas of the landscape. The darker areas on Map 4.7 show best potential sites for wetland or floodplain restoration. Table 4.10 on the next page summarizes the Hydric Soils for the Riley Creek 12-digit subwatersheds.

Table 4.10: Hydrologic Soil Groups by 12-digit watersheds in the Riley Creek watershed

	Hydrological Soil Group (measurement in acres)						
12-digit watershed	**A**	**B**	**C**	**D**	**A/D**	**B/D**	**C/D**
Binkley Ditch-Little Riley Creek (04100008 04 01)	0.0	82.9	1981.6	577.1	0.0	538.9	6013.3
Upper Riley Creek (04100008 04 02)	0.0	68.0	255.5	706.4	0.0	341.5	7810.4
Marsh Run-Little Riley Creek (04100008 04 03)	0.0	42.8	40.0	1211.2	0.0	1120.9	7890.3
Middle Riley Creek (04100008 04 04)	0.0	174.8	100.8	780.8	0.0	924.0	7707.9
Lower Riley Creek (04100008 04 05)	208.2	1598.0	2256.7	689.1	0.0	5202.7	5933.8

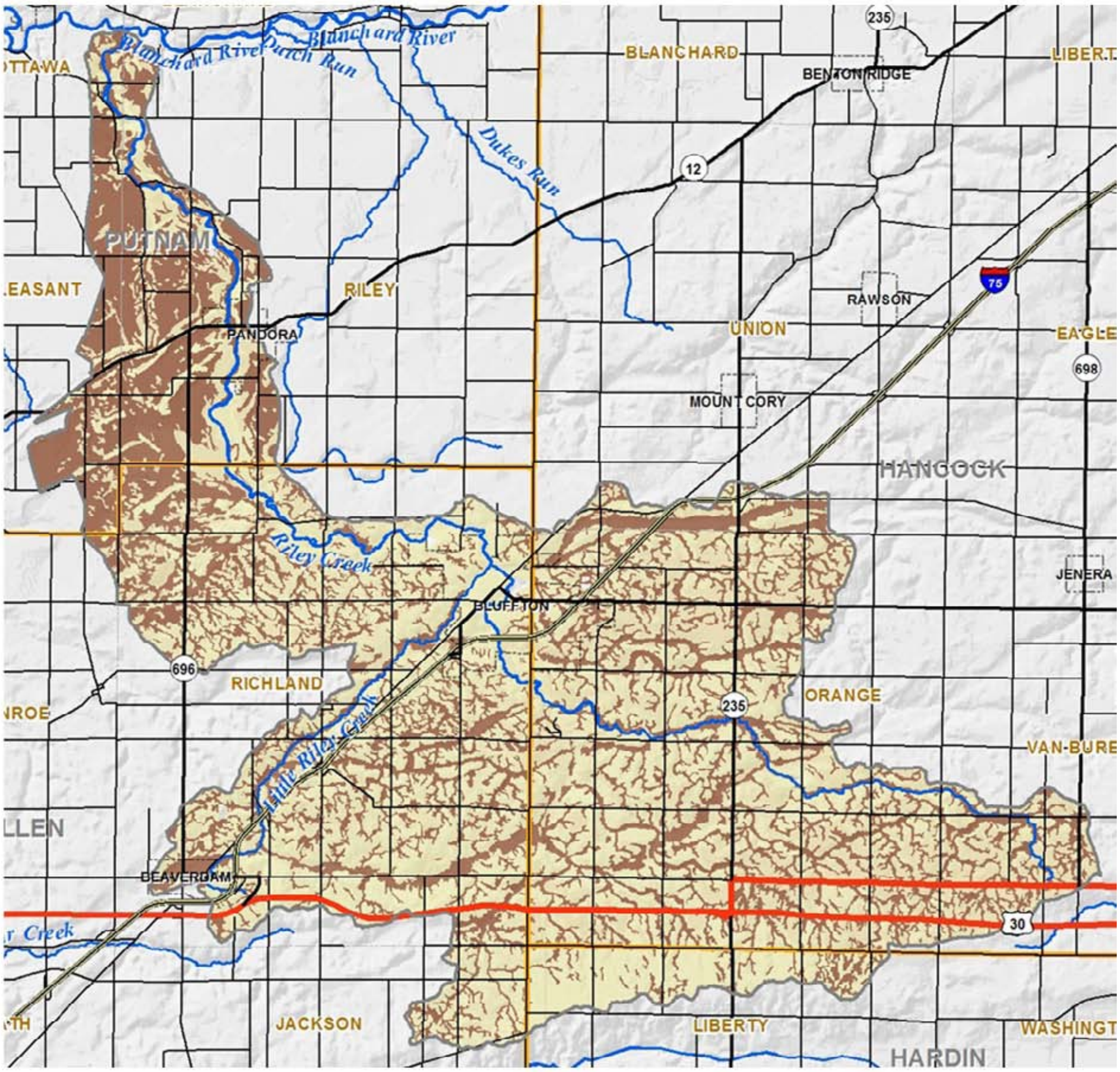
Map 4.6 Parent Materials Soils - The Riley Creek Subwatershed



Soil Legend:

- Glacial Till Soils
- Glacial Stream Sediment Soils
- Alluvial
- Offshore Lake Sediment
- Organic Soils
- Lakebed Sediment Soils

Map 4.7 Hydric Soils



The darker the area, the higher the percentage of hydric components. They range from 100% (very dark brown) down to 0% (very light tan).

Hydrologic Soil Groups

Table 4.11, below shows the percentages of the watershed area that fall within each hydrologic group along with a numeric measure of transmission rates by grouping. Map 4.9, on the next page, shows the Hydrologic soil groups in the watershed.

Hydrologic soil groups can be useful in estimating surface runoff from precipitation.

Table 4.11: Distribution of Hydrologic Soil Groups in the Riley Creek Watershed

Hydrological Soil Group	Transmission Rate	Acres	% of Classified Soils
A	>0.30 in/hr	46.28	0.08
B	0.15 to 0.30 in/hr	7828.77	13.70
C	0.05 to 0.15 in/hr	43367.52	75.89
D	0.00 to 0.05 in/hr	4598.70	0.49
A/D		0.00	0.00
B/D		3448.44	6.03
C/D		1559.97	2.73
Not Classified		613.29	1.07
Total		57143.60	100.00

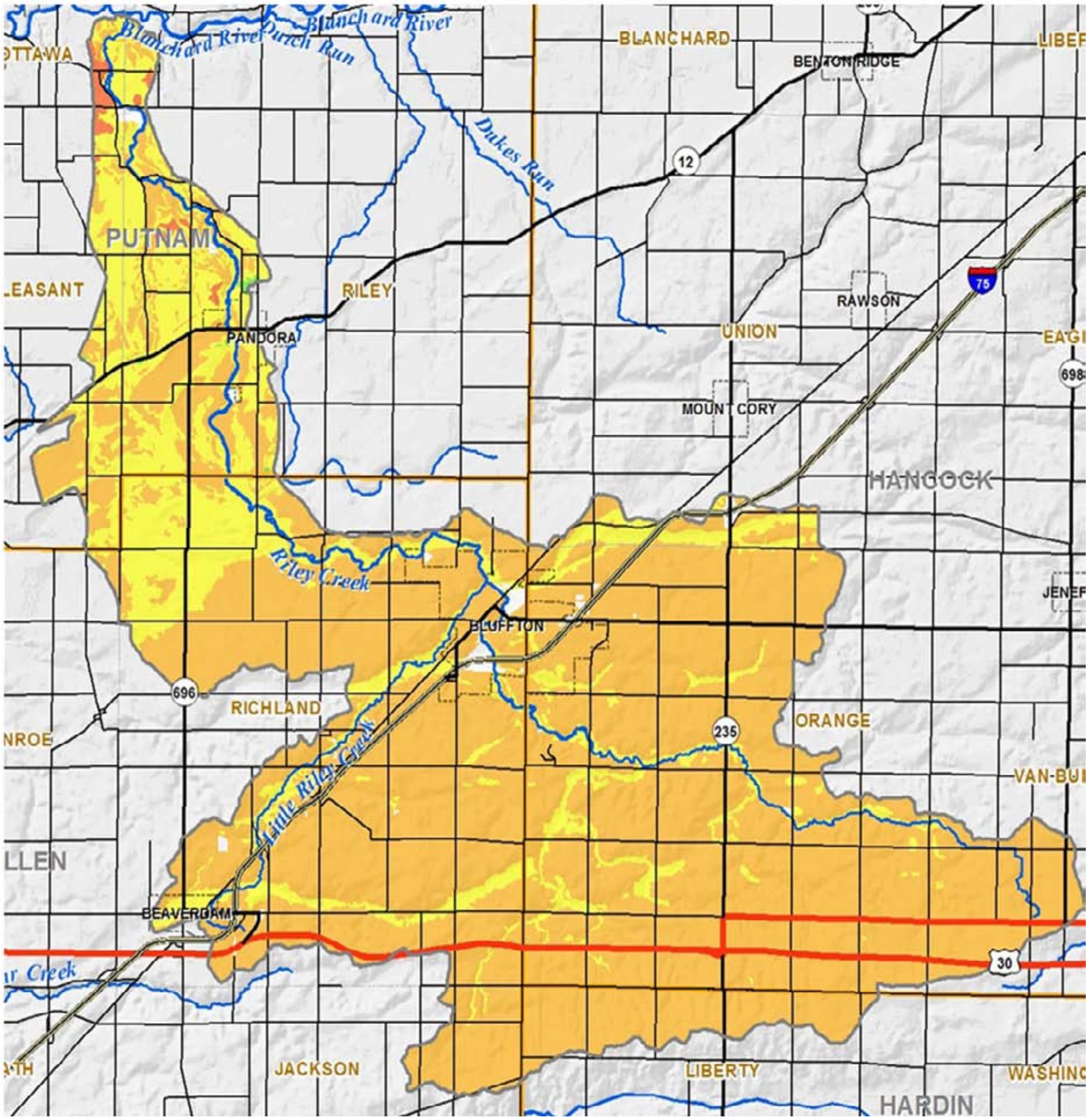
The Natural Resource Conservation Service (NRCS) has classified soils into four Hydrologic Soil Groups (HSGs) based on the soil's runoff potential. Soils that do not have year-round vegetative cover, such as tilled agricultural fields, are assigned to one of four groups. The four HSGs are A, B, C, and D. Soils in Group A generally have the smallest runoff potential and Group D soils the greatest runoff potential. HSGs are very useful in helping to estimate surface runoff amounts after storm events of varying frequency.

The NRCS and USDA discuss the classification of HSGs in "Urban Hydrology for Small Watersheds" in Technical Release-55. They have classified HSGs into four groups.

Group A is sand, loamy sand or sandy loam types of soils. Group A has low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission. Only 1.37% of the watershed soils are in Group A.

Group B is silt loam or loam. Group B has a moderate infiltration rate when thoroughly wetted and consists chiefly or moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. Group B makes up the second largest group of Hydrologic soil in the watershed at 14.09%.

Map 4.8 Hydrologic Soil Groups - Riley Creek Watershed



Group C soils are sandy clay loam. This group las low infiltration rates when thoroughly wetted and consists chiefly of soils with a layer that impedes the downward movement of water and soils with moderately fine to fine structure. This group makes up 75.87% of the watershed.

Group D soils are clay loam, silty clay loam, sand clay, silty clay or clay. This HSG has the highest runoff potential; have very low infiltration rates when thoroughly wetted; and consist chiefly of clay soils with a high swelling potential; soils with a permanent high water table; soils with a claypan or clay layer at or near the surface; and shallow soils over nearly impervious material. Only 2.89 % of the watershed is in this group.

Identifying the location of soils that are most prone to surface runoff will assist efforts to target adoption of BMPs. In Chapter 7, each identified problem statement contains a GIS soil map of that area. This knowledge, along with the local knowledge of the stakeholders in the area, will play a key role in identifying and implementing the BMPs to solve the problem(s) in that area.
However, additional funding will be required to fulfill the needed materials and analyses to complete each project.

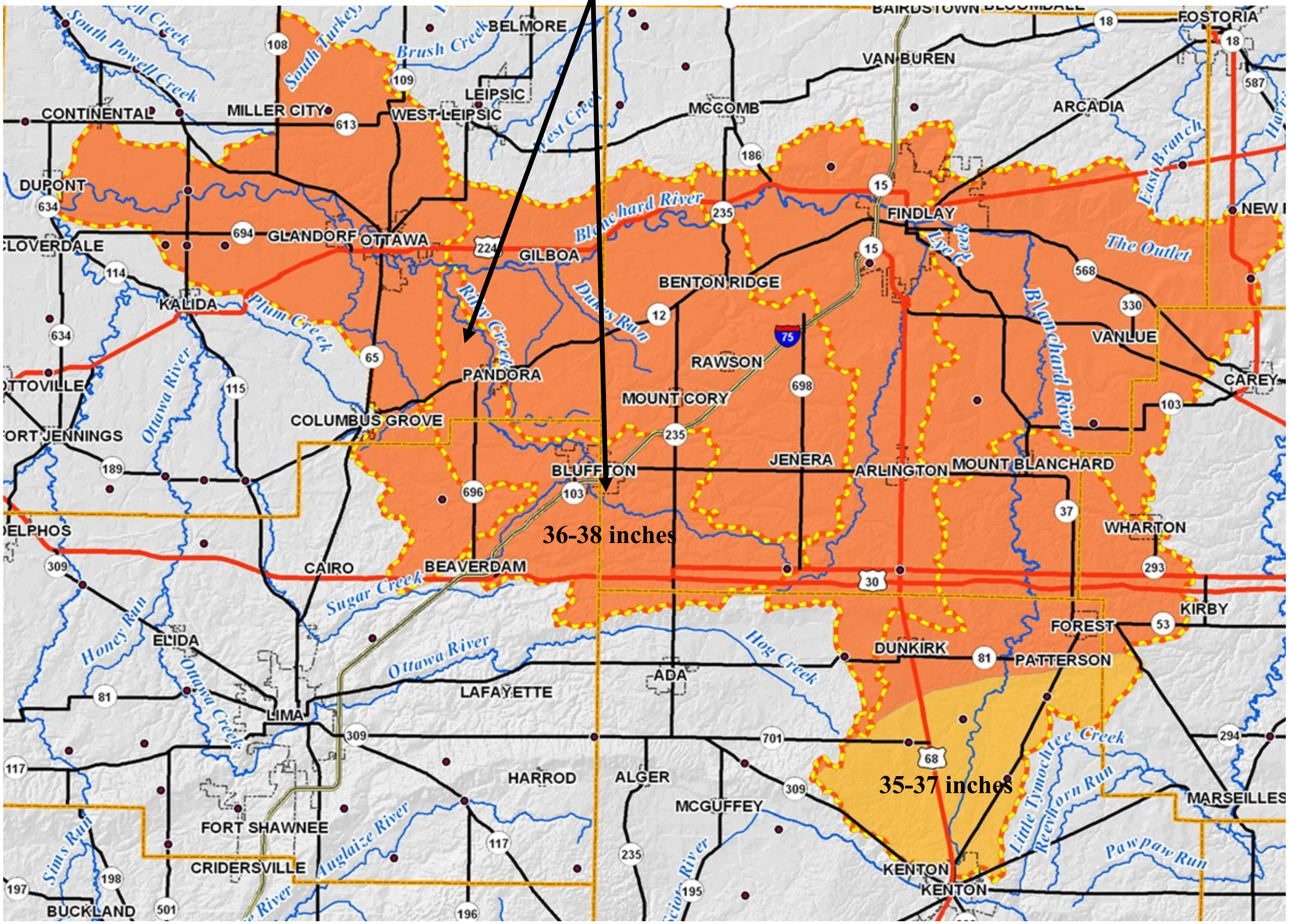
Climate

The Riley Creek watershed, like all the subwatersheds in the Blanchard River watershed, is cold in winter and hot in summer. Winter precipitation, frequently in the form of snow, results in a good accumulation of soil moisture by spring and minimizes drought during the summer. Normal annual precipitation patterns are adequate for all of the crops that are adapted to the temperature and the growing season in the survey area.

The average annual minimum temperature is 17.0 ^{o}F, and the average annual maximum temperature is 85 ^{o}F. The average annual precipitation is 37 inches in the Binkley Ditch-Little Riley Creek and Upper Riley Creek 12-digit watersheds. The average annual precipitation is 3 inches in the Marsh Run-Little Riley Creek, Middle Riley Creek, and Lower Riley Creek 12-digit watersheds (ERIN). Of this, 20.7 inches, or 57 percent, usually falls in May through October. Thunderstorms occur about 37 days each year, and most occur during the period of May through August. (See Map 4.9 on the next page).

The average seasonal snowfall is about 29 inches. The heaviest 1-day snowfall on record was 15.2 inches on January 31, 1982. The greatest snow depth at any one time during the period on record was 23 inches. On the average, 45 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year (Soil Survey of Hancock County, Ohio 2006).

Map 9.4: Precipitation



Geology

The Riley Creek Watershed in both Allen and Hancock Counties is located in the eastern part of the Central Lowland Province. The bedrock within the watershed is of sedimentary origin, primarily Silurian limestone and dolostone. These rocks compose the Salina Undifferentiated Group of bedrock (Ohio Department of Natural Resources 1947).

In Putnam County the underlying glacial till is limestone of the Monroe Formation (Putnam Soil Survey - 1974).

Political Geography and Demographics

A portion of the Riley Creek Watershed is situated in four counties: Allen (38.16%), Hancock (42.13%), Hardin (4.22%), and Putnam (15.49%).

The Riley Creek Watershed is located within a mainly rural landscape in northwest Ohio. There are eleven townships located in the watershed in the four county area. The area and estimated populations of each township can be found in Table 4.12 on the next page. To estimate the population of the watershed, each township's population was considered to be evenly distributed throughout the township. The percentage of the land within each township that is located within the watershed was used as a means of extrapolating the estimated population of the township within the watershed and the total population of the watershed. The basis for the data in determining the population was found at http://www.development.ohio.gov/research/documents/ALLSUBCOUNTY 2010.pdf

The Riley Creek watershed is located in a predominately rural area (94.4%) in northwest Ohio. The majority of the population is White (86.1%); African-Am. (6.8%); Native Am. (0.3%); Asian (0.9%); Hispanic (2.6%); and other (1.3%). The median age in the watershed is 36.9 years of age.

Based on the 2010 census, the largest concentration of population is located in Bluffton with 3,952 people. The village of Pandora has a population of 1,153 and the village of Beaverdam has a population of 382. (Note: only about 75% of Beaverdam is in the Riley Creek watershed. For additional information go to: http://www.development.ohio.gov/research/files/s0.htmf 382

Table 4.13 on page 4-29 shows the Political Units and other entities within the Riley Creek watershed.

Table 4.12: Township Data for the Riley Creek Watershed

Townships	Area of Twp. (ac.)	% of Twp. in Watershed	Area of Twp. in Watershed (ac.)	% of Watershed in Twp.	Population of Twp. in Watershed*		% Change 2000 to 2010
Allen Co.					2000**	2010**	
Jackson	23,077.2	5.46	1261.1	2.30	66	70	4.1
Monroe	23,089.4	0.47	108.4	0.20	4	4	0.0
Richland	26,813.2	72.8	19,531.5	35.7	3921	4195	6.5
Hancock Co.							
Orange	23,193.4	83.4	19,352.1	35.3	455	476	4.5
Union	22,804.2	5.47	1,248.5	2.3	37	41	3.3
Van Buren	15,547.6	15.9	2473.1	4.5	42	38	-3.0
Hardin Co.							
Liberty	23,080.0	10.1	1261.1	2.3	164	177	7.9
Putnam Co.							
Blanchard	23,200.2	1.3	308.9	0.6	7	8	3.1
Ottawa	23,228.3	1.7	382.8	0.7	56	55	-1.5
Pleasant	23,292.2	9.9	2307.2	4.2	166	160	-3.8
Riley	19,361.5	28.3	5485.2	10.0	219	212	-2.9
	Total Area in Watershed		54,773.6 acres	Total Population	5207	5436	4.2

*Township population extrapolated from Census data and percent of township in watershed.
**http://www.development.ohio.gov/research/documents/ALLSUBCOUNTY2010.pdf

Table 4.12: Political Units and Other Entities within the Riley Creek Watershed				
County	**Township**	**Locality**	**School District**	**Other Planning Organizations**
Allen				Lima-Allen Regional Planning Commission
	Jackson		Bluffton LSD	
	Monroe		Bluffton LSD	
	Richland	Bluffton	Bluffton LSD	
		Beaverdam		
Hancock				Hancock Regional Planning Commission
	Orange		Ada LSD	
			Bluffton LSD	
			Cory Rawson LSD	
	Union		Cory Rawson LSD	
	Van Buren		Cory Rawson LSD	
Hardin				Hardin County Regional Planning Commission
	Liberty		Ada LSD	
Putnam				Putnam County Planning Commission
	Blanchard		Ottawa Glandorf LSD	
			Pandora Gilboa LSD	
	Ottawa		Ottawa Glandorf LSD	
	Pleasant		Ottawa Glandorf LSD	
			Pandora Gilboa LSD	
			Columbus Grove LSD	
	Riley	Pandora	Pandora Gilboa LSD	

Greater Findlay Inc, an economic development arm of the Chamber of Commerce, reports that *Findlay/Hancock County is well positioned for future development and growth. The community's strong business climate will continue to attract a diverse blend of retail, office, manufacturing, and distribution centers. A regional employment hub with direct access to the I-75 corridor, low-cost utilities, quality workforce, and close proximity to both air and rail transportation will provide great resources for future economic growth."*
For more information visit Greater Findlay Inc. website at http://www.findlayhancockchamber.com/

Agricultural Resources

As with the population data, the agricultural data was extrapolated from data for each county and the percent of the watershed in that county. The agricultural land within a county was considered to be evenly distributed throughout the county. County specific data for each county can be found at the website www.agcensus.usda.gov. and in the 2007 Annual Report published by the Ohio Department of Agriculture. Table 4.17 summarizes the agricultural statistics for Riley Creek Watershed.

Table 4.14: Agricultural Statistics for the Riley Creek Watershed

	Allen County	Hancock County	Hardin County	Putnam County	Total
Farm Land In Watershed (acres)	14,922.9 (-0.5)*	16,837.9 (-5.7)*	2121 (+4.1)*	8316 (-8.4)*	42197.8
Number of Farms	75 (-2.3)*	63 (-5.6)*	7 (0)*	36 (-2.4)*	181.0
Average Farm Size (acres)	199 (+3)*	267 (-6)*	303 (+4)*	231 (-6)*	250.0
Average Production per Farm	$92,629 (+117)*	$109,639 (+132)*	$214,668 (+189)*	$111,517 (+59)	
Government Payments	$390,000	$398,475	$53,130	$167,940	$528,453
Government Payments per Farm	$5200 (+0)*	$6325 (+0)*	$7590 (-14)*	$4665 (-17)*	

*Percent of Change from 2202-2007

Source: USDA 2007 Farm Report and ERIN

The following can be extrapolated from the 2007 Annual Report data:

1. The number of farms in Allen County, Hancock County, and Putnam County have decreased.
2. The average farm size has increased by 3% in Allen County and 4% in Hardin County, while decreasing by 6% in both Hancock and Putnam Counties.
3. Soybeans (45%) is the dominant crop in the watershed with corn (36%) second and wheat (12%) third.
4. The majority of the farms had sales under $100,000 Allen (79.4%); Hancock (74.5%); Hardin (73.8%); and Putnam County (73.9%). Data is based on the entire county.
5. Hog and Pigs (44.9%) are the largest livestock commodity in the four county watershed with cattle and calves (10.8%) second.
5. The average age of the principal owner for farms is 55.5 years. Data is based on all four counties.
6. Over 92% of the principal operators are male; over 99% are white.

Table 4.15 quantifies land uses by area within each county in the Riley Creek watershed.

Table 4.15 Agricultural Land Use by Area & County
Riley Creek Watershed

	Allen Co.	Hancock Co.	Hardin Co.	Putnam Co.	Total
Total area in Watershed (acres)	20,924	23,132	2,323	8,494	54,873
Number of Farms	75	63	7	36	181
Farm Land in Watershed (acres)	14,923	16,838	2,121	8,316	42,198
Soybeans (acres	5,809	7,084	773	3,851	17,517
Corn (acres)	5,321	5,486	757	2,422	13,986
Wheat (acres)	1,348	2,272	113	916	4649
Oats (acres)	17	13	7	1	38
Hay (acres)	262	304	32	250	848
Produce (acres)	0	0	0	1,800	1,800
Non-farmland (acres)	6,001	6,294	202	178	12,675

Table 4.16: Estimate of Livestock by County in Riley Creek Watershed

	Estimated Population by County*				
Type of Livestock	Allen	Hancock	Hardin	Putnam	**Total**
Cattle and Calves	551	128	140	382	1201
Sheep and Lambs	65	77	9	28	179
Hogs and Pigs	5014	2196	433	2140	9783
Layers	36	D	D	5402	

*based on USDA 2007 Census for Agriculture

D - cannot be disclosed

Table 4.17: Agricultural Land Use - 12-digit watershed level

12-Digit Watershed / Agriculture Land Use	Binkley Ditch-Little Riley Creek 04100008 04 01	Upper Riley Creek 04100008 04 02	Marsh Run-Little Riley Creek 04100008 04 03	Middle Riley Creek 04100008 04 04	Lower Riley Creek 04100008 04 05
Total Acres	9192	9185	10,405	9996	16,095
Total Acres Cultivated Crops	7052	6735	7422	7258	13,737
% of Land Use In Farmland	76.72	73.33	71.33	72.61	85.35
Total Acres Corn	2393	2202	2645	2392	2462
Total Acres Soybean	2820	3020	2890	3026	5962
Total Acres Wheat	741	889	673	939	1407
Total Acres Pasture/Hay	126	120	130	131	365
Total Acres Oats	10	6	8	6	7
Total Acres Produce	0	0	0	0	1800

Information extrapolated from USDA 2007 Census for Agriculture

Table 4.17 above shows extrapolated data for Agricultural Land Use in the Riley Creek watershed at the 12-digit subwatershed level. Data for livestock at the 12-digit level was not able to be extrapolated.

Conservation Tillage Practices

The Hancock Soil and Water Conservation District (HSWCD) does a conservation tillage survey each year and reports the information to the National Resource Conservation Service (NRCS). Unfortunately, the NRCS does not report the information back to the HSWCD. The HSWCD and the Ohio State Extension Service both agree that 85% of the soybeans in the watershed are planted using No Till; 10% of the corn; and 90% of the wheat. The Putnam Soil and Water Conservation District (PSWCD) reports that in 2011, 61% of the soybeans were planted using Conservation Tillage/No Till; 15% of the corn; and 97% of the wheat. This would extrapolate to 2349 acres for soybeans; 363 acres for corn; and 889 acres for wheat. Allen Soil and Water Conservation District (ASWCD) did not report any data.

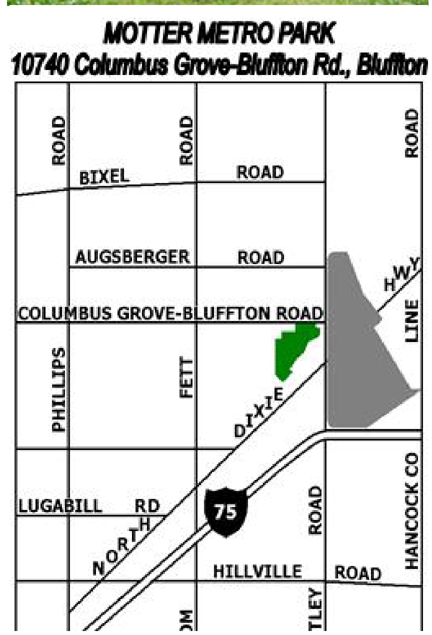
Cultural Resources

(See Table 4.18 on page 4-36)

The cultural resources of the Riley Creek Watershed are few and wide spread. Since Bluffton is the largest village in the watershed, most of the cultural resources are near Bluffton. Table 4.21 on page 4-36 contains information on cultural resources within the watershed broken down at the 12-digit watershed level.

There are three major roads that transect the watershed: Interstate 75 runs through the middle of the watershed from northeast to southwest. I-75 connects the southern part of the watershed with several larger cities, such as Lima and Findlay. State Route 12 runs northeast-southwest through the northern part of the watershed and passes through Pandora; State Route 696 runs along the western part of the watershed from north to south; and State Route 235 runs through a small section of the eastern part of the watershed.

The Johnny Appleseed Metropolitan Park District has developed the Motter Metro Park within the Marsh Run-Little Riley Creek watershed. Motter Metro Park is located at 10740 Columbus Grove-Bluffton Rd in Richland Twp. According to their web site, "the 105 acres open meadow land has been planted in prairie grasses and will restore grassland habitat that is in short supply in Allen and surrounding counties. The Little Riley Creek runs through the park, providing critical habitat for wetland and water species of plant and animals. A wildlife observation deck, wetland mitigation project, and environmental education panels are planned for the future."



The other wildlife area in the Riley Creek Watershed lies in the Upper Riley Creek Watershed. The ODNR has a Wildlife Production Area known as the Montgomery Property. The 47.65 acres were purchased by the ODNR Division of Wildlife in order to enhance the

Picture 4.4 shows the sign for Motter Metro Park at the entrance.
Picture 4.5 shows one of the prairie grass meadows in the park.
Picture 4.6 is a map of the parks location.

(Johnny Appleseed Metropolitan Park District web site) available nesting cover for upland wildlife. These areas are not stocked with any game, farm animals, and are primarily intended to provide native wildlife opportunities for undisturbed nesting. (ODNR)

The only golf course located in the Riley Creek Watershed is the Bluffton Golf Club on North Dixie Highway southwest of Bluffton. The 18-hole course is 6,633 yards in length from the longest tees with a par of 72.

The Village of Bluffton has two parks. The Village Park is located on CR 15 just south of I-75. There are several athletic fields for baseball/softball, soccer, playground equipment, hiking/bike paths, restroom facilities, and shelter houses. **Picture 4.7** shows the entrance to the park. The Buckeye Park is located on Snider Road just east of the Main Street bridge over Riley Creek. This park has hiking/bike paths, basketball courts, shuffleboard courts, playground equipment, restroom facilities, shelter houses and the community pool. The pool offers zero-depth entrance, a 12-foot deep diving well, eight 25-meter competition lanes, and a 35-foot tall waterslide. **Picture 4.8** shows the entrance to the park.

Picture 4.7 Village Park
(Lehman)

Picture 4.8 Buckeye Park
(Lehman)

On the southwest edge of the park is a covered bridge over Marsh Run for hikers and bikers. The bridge is a memorial to Eugene and Evelyn Benroth from Bluffton. Born in Bluffton in 1911, Mr. Benroth was known as “Mr. Bluffton” for his volunteer work in Bluffton and trying to get outsiders interested in Bluffton. **Picture 4.9** to the right shows the bridge.

Picture 4.9 Eugene & Evelyn Benroth Memorial bridge
(Lehman)

The Bluffton Community Sportsmen’s Club was formed in the 1930s by a groups of men who enjoyed hunting, trapping, and fishing. First a coon hunters’ club, this organization was involved in many conservation projects over the years. The Club leased the Buckeye Quarry from the Village of Bluffton in the 1940s. The yearly “Trout Derby” has become a mainstay of the club. **Picture 4.10** shows the Club house. For more information, check out their web site at www.blufftonsportsmenclub.com.

Picture 4.10 Bluffton Community Sportsmen’s Club house

(Lehman)

Situated on the banks of Little Riley Creek, Bluffton University was founded as Central Mennonite College in 1899 by the General Conference Mennonite Church; today the university is affiliated with Mennonite Church USA. Bluffton College was renamed to Bluffton University. Presently, Bluffton University has a 1,115 undergraduate students and 114 students in graduate programs, offering academic study in 40 majors and more than 20 minors. Associated with Bluffton University is the "Swinging Bridge" Nature Preserve located at 10625 Augsburger Road on the northwest edge of campus. A major attraction at the preserve, the swinging bridge, was completed in 1969. People using the preserve must stay on mowed trails and no fishing is allowed at the preserve pond. Bluffton University is the only college or university in the Riley Creek Watershed. For more information about Bluffton university go to their website at www.bluffton.edu.

Picture 4.11: Aerial of Bluffton University located in Bluffton, Ohio (Google Maps)

Picture 4.12: Bluffton University Nature Preserve (Martin)

Located northwest of Bluffton is the Swiss Community Historical Society. The purpose of the Society is to "investigate and study the history of the Bluffton-Pandora community; to provide for the collection, preservation, and dissemination of knowledge and information about the community; to provide for the collection and preservation or display of papers, books, records, relics, and other things of historical interest; to acquire, hold, own, operate, and manage property necessary or advisable for these purposes; and to provide for the marking and preservation of historical sites and buildings." For more information about the Swiss Community Historical, go to the following website at http://www.pandoraoh.com/webpage/swiss/swiss.html

Picture 4.13 This is the Historical Homestead house built in 1843 and owned by the Swiss Community Historical Society. (Lehman)

The Village of Pandora community park is located off West Main Street (SR12) on the north side. Riley Creek forms the west boundary of the park. The park has two shelter houses; playground with equipment; 2 lighted tennis courts; and a lighted basketball court. There are baseball and softball fields adjacent to the park. A short walk over the Riley Creek foot bridge leads to a trail around a wetland area as well soccer fields and a new baseball diamond.

Table 4.18: Cultural Resources in the Riley Creek Watershed at the 12-digit level

HUC 04100008 04 01 Binkley Ditch-Little Riley Creek Watershed				
HUC 04100008 04 02 Upper Riley Creek Watershed				
Resource	***Location***	***County***	***Type***	***Contact Information***
ONDR Wildlife	.5 mile east of	Hancock	Conservation	419-424-5006
Production Area	TR 56 and TR 27		Area	
HUC 04100008 04 03 Marsh Run-Little Riley Creek Watershed				
Resource	***Location***	***County***	***Type***	***Contact Information***
Bluffton Golf Club	8575 N. Dixie Hwy.	Allen	Public Course	419-358-6230
Bluffton Village Park	CR 15	Allen	Park	419-358-2066
Bluffton University	280 W. College Ave.	Allen	University	419-358-3000
Motter Metro Park	10740 Columbus-	Allen	Park	419-221-1232
	Grove-Bluffton Rd.			
HUC 04100008 04 04 Middle Riley Creek				
Resource	***Location***	***County***	***Type***	***Contact Information***
Bluffton Pool	205 Snider Rd.	Hancock	Village Pool	419-358-9661
Bluffton Community	Lake Dr. &	Allen	Private	web site
Sportsmen's Club	Snider Rd.		Recreation	
HUC 04100008 04 05 Lower Riley Creek				
Swiss Community	8350 Bixel Rd.	Allen	Historical Site	419-384-3412
Historical Society				
Pandora Community	300 block W Main St.	Putnam	Park	419-384-3534
Park				

Biological Resources

The Biological Resources in the Riley Creek Watershed are limited by agricultural land use and the channelization of most of the tributaries in the watershed. The two protected areas in the watershed are the Motter Metro Park just west of Bluffton and an ODNR Wildlife Production Area in Orange Township. Picture 4.15 shows an open meadow at the 105-acre Motter Metro Park located off Columbus Grove-Bluffton Rd. According to their website, the open meadow park land has been planted in prairie grasses and will restore grassland habitat that is in short supply in Allen and surrounding counties. The Little Riley Creek runs through the park, providing critical habitat for wetland and water species of plant and animals. For more information go to their website http://www.jampd.com/parks-facilities/motter-metro-park.aspx The ODNR Wildlife Production Area in Orange Township is located .5 mile east of TR 56 and TR 27. The area was purchased by the Division in order to enhance the available nesting cover for upland wildlife. These areas are not stocked with any game, farm animals, and are primarily intended to provide native wildlife opportunities for undisturbed nesting. Hunting hours are the same as that for public hunting areas.

Picture 4.14
Open Meadow at Motter Metro Park near Bluffton.
(Johnny Appleseed Metropolitan Park District web site)

The Village of Bluffton has two fishing areas: Buckeye Lake and Cobb Lake, which is an old quarry. These areas are under the control of Bluffton Community Sportsman Club and the ODNR.

The Lower Riley Creek has been a popular sport fishing destination, according to page 42 of the 2005 TMDL report. During the study in 2005, the Ohio EPA studied 8 sites from June 29 - July 27. Six of these sites violated the maximum criterion and three of those violated the geometric mean criterion (2005 TMDL report). The report maintained the Warmwater Habitat (WWH) designation for Riley Creek from the mouth upstream to the mouth of Little Riley Creek. Beyond this point, Riley Creek’s designation has been changed to Modified Warmwater Habitat (MWH). Lower Riley Creek will be addressed in Chapter 7 to address re-establishing its Public Recreation Use.

Information concerning rare, threatened, and endangered plants and animals can be found in Table 4.19 on the next page and Table 4.20 on page 4-38

A complete list of both animal and plants species can be found in Appendix C. A study of the fresh water mussels in the river was conducted by the URS Corporation for the Army Corp of Engineers and the Northwest Ohio Flood Mitigation Partnership, Inc. A copy of the report can be found in Appendix C. On page 3 of the report, the summary states, "*no living or freshly dead specimens of Ohio endangered or US endangered (or candidate species) were found during the study.*"

According to the U.S. Fish and Wildlife study, the only endangered animals species found in Hancock are the Indiana Bat (*Myotis sodalist)* and the Clubshell (*Pleuroberna clava*). The Rayed bean (*Villosa fabalis*) is listed as a candidate.

Table 4.19 below lists the Rare, Endangered, and Threatened Plants that are found in the watershed. Table 4.20 on the next page lists the Rare, Endangered, and Threatened Animals found in the watershed.

Table 4.19 Rare, Endangered and Threatened Plants - Riley Creek Watershed

Rare Plant List for Allen County (as of 7/1/2011)

Last Recorded	Scientific Name	Common Name	State Status
2011	*Ulmus* thomasii	Rock Elm	P

Rare Plant List for Hancock County (as of 7/5/2011)

Last Recorded	Scientific Name	Common Name	State Status
1977	*Anemone cylindrica*	Prairie Thimbleweed	T
1978	*Arabis hirsute var. adpressipilis*	Southern Hairy Rock Cress	P
1960	*Carex alopecoidea*	Northern Fox Sedge	E
1969	*Cuscuta pentagona*	Five-angled Dodder	T
2009	*Ulmus* thomasii	Rock Elm	P

Rare Plant List for Putnam County (as of 7/6/2011)

Last Recorded	Scientific Name	Common Name	State Status
1969	*Euphorbia serpens*	Round-leaved Spurge	E
1968	*Moehringia lateriflora*	Grove Sandwort	P

E = Endangered

P = Potentially Threatened

T = Threatened

Source: http://www.dnr.state.oh.us/Home/wild_resourcessubhomepage/ResearchandSurveys/OhioBiodiversityDatabase/rareplantsbycounty/tabid/23654/Default.aspx

Table 4.20 Rare, Endangered and Threatened Animals - Riley Creek Watershed

Rare Animals List for Allen County (as of 7/1/2011)

Last Recorded	Scientific Name	Common Name	State Status
1987	*Bartramia longicauda*	Upland Sandpiper	T
1998	*Cyclonaias tuberculata*	Purple Wartyback	SC
2005	*Etheostoma microperca*	Least Darter	SC
2009	*Falco peregrinus*	Peregrine Falcon	T
1998	*Lampsilis fasciola*	Wavy-rayed Lampmussel	SC
2000	*Lasmigona compressa*	Creek Heelsplitter	SC
2000	*Moxostoma valenciennesi*	Greater Redhorse	T
1998	*Pleurobema clava*	Clubshell	E*
1998	*Toxolasma lividus*	Purple Lilliput	E
1998	*Truncilla truncate*	Deertoe	SC

Rare Animal List for Hancock County (as of 7/5/2011)

Last Recorded	Scientific Name	Common Name	State Status
2006	*Acris crepitans*	Eastern Cricket Frog	SC
2009	*Alasmidonta marginata*	Elktoe	SC
1960	*Clonophis kirtlandii*	Kirtland's Snake	T
1997	*Fundulus diaphanous menona*	Western Banded Killfish	E
1991	*Gomphus externus*	Plains Clubtail	E
2010	*Haliaeetus leucocephalus*	Bald Eagle	T
1963	*Hemidactylium scutatum*	Four-toed Salamander	SC
2009	*Ligumia recta*	Black Sandshell	T
1991	*Orconectes virilis*	Northern Crayfish	SC
1994	*Pleurobema clava*	Clubshell	E
2003	*Pleurobema sinotoxia*	Round Pigtoe	SC
2009	*Ptychobranchus fasciolaris*	Kidneyshell	SC
1974	*Rallus limicola*	Virgina Rail	SC
2009	*Simpsonaias ambigua*	Salamander Mussel	SC
1994	*Toxolasma lividus*	Purple Lilliput	E
2009	*Truncilla truncate*	Deertoe	SC
1996	*Vilosa fabalis*	Rayed Bean	E

E = Endangered P = Potentially Threatened T = Threatened SC = Species of Concern
* Federally Endangered

Source: http://www.dnr.state.oh.us/Home/wild_resourcessubhomepage/ResearchandSurveys/OhioBiodiversityDatabase/rareplantsbycounty/tabid/23654/Default.aspx

National Pollutant Discharge Elimination System Permits

Point Source Pollution is not addressed in this plan. The jurisdiction for point source is the duty of the Ohio EPA. The EPA has developed a National Pollutant Discharge Elimination System (NPDES) Permit set of regulations. These permits regulate the amount of discharged waste water while maintaining water quality standards for the water course receiving the waste. By reducing the permitted discharge levels from the total pollutants, in the waterway, a more accurate nonpoint source contribution of a particular pollutant can be obtained.

NPDES permits can be divided into two groups: General and Individual Permits. The General Permits are summarized in Table 4.21 on the next 2 pages, 4-41 and 4-42 General permits fall into one of several categories. The two categories that are found in the Riley Creek watershed are Industrial Storm Water (ISW) and Construction Storm Water (CSW).

There are six individual NPDES permits in the Riley watershed. The data for each site is summarized in Table 4.22 on page 4-42. The allowable annual load varies based on stream flow. There is only one Non-Stormwater NPDES General permit located in the Riley Creek watershed are for Household Sewage. There are no small MS4 communities in the Riley Creek Watershed.

Home Septic Treatment Systems (HSTS)

The TMDL report listed organic enrichment (sewage) biological indicators as a cause for impairment in 4 of the 5 12-digit watersheds. Only the Binkley Ditch -Little Riley Creek watershed did not show evidence organic enrichment (sewage) biological indicators. The source(s) of this impairment could be Combined Sewer Overflows (CSO) or failing Home Septic Treatment Systems (HSTS). Table 4.21 below shows the estimated number of HSTS in each 12-digit watershed based on available information. The percent of failing systems is an estimate by the County Boards of Health. Combined Sewer Overflows could be found in the Village of Bluffton and in the Village of Pandora. The plan to handle the problem of organic enrichment (sewage) biological indicators will discussed in detail in Chapter 7 Implementation Plan for the Riley Creek Watershed Restoration on an individual 12-digit watershed basis.

Table 4.21: Estimated HSTS in the Riley Creek Watershed

12-digit watershed	Estimated HSTS	Estimated HSTS failure rate %	Estimated HSTS failing
Binkley Ditch-Little Riley Creek	213	30	64
Upper Riley Creek	152	50	76
Marsh Run-Little Riley Creek	121	50	61
Middle Riley Creek	202	30	61
Lower Riley Creek	401	30	120

Table 4.22 Summary of General Permits for the Riley Creek Watershed 1

Binkley Ditch-Little Riley Creek (HUC 0410000 04 01)						
OH EPA Permit No.	**Applicant Name**	**Facility Name**	**Facility Address**	**Issue Date**	**Receiving Streams**	**Type**
2GR00150*DG	Marshall Import Cars & Parts	Marshall Import Cars & Parts	481 TR 27 Bluffton, OH.	7/14/2006	Upper Little Riley Creek	ISW
Upper Riley Creek (HUC 0410000 04 02)						
OH EPA Permit No.	**Applicant Name**	**Facility Name**	**Facility Address**	**Issue Date**	**Receiving Streams**	**Type**
None Listed						
Marsh Run-Little Riley Creek (HUC 0410000 04 03)						
OH EPA Permit No.	**Applicant Name**	**Facility Name**	**Facility Address**	**Issue Date**	**Receiving Streams**	**Type**
2GC02678*AG	Village of Bluffton	Main St. & Parkview - Bluffton	Bowling Alley N to Beaver St.	6/29/2010	Little Riley Creek	CSW
2GC02098*AG	Village of Bluffton	Parkview - Bluffton Phase 1	W of Main St. at Bentley Rd.	6/25/2008	Little Riley Creek	CSW
2GC02923*AG	Bluffton University	Health & Fitness Center	205 Rosenberger Dr.	7/11/2011	Little Riley Creek	CSW
2GC00654*AG	Village of Beaverdam	Main St.	Main St. between RR & E of Church St.	11/15/2004	May Ditch	CSW
2GR00118*DG	Bluffton Septic Tank	Bluffton Septic Tank	8950 N. Dixie Hwy.	0/19/2007	Little Riley Creek	ISW
Middle Riley Creek (HUC 0410000 04 04)						
OH EPA Permit No.	**Applicant Name**	**Facility Name**	**Facility Address**	**Issue Date**	**Receiving Streams**	**Type**
		Plant #5	Bluffton, OH. 45817			
2GG00239	Gerken Materials	Gerken Materials Plant #3	310 Quarry Dr. Bluffton, OH. 45817	2006	Riley Creek	ISW
2GG00035	DTR Industries	DTR Industries	320 Snider Rd. Bluffton, OH. 45817	nr	Riley Creek	ISW
2GR00488*DG	Tower Automotive	Tower Automotive	18717 CR 15 Bluffton, OH. 45817	8/23/2006	Marsh Run	ISW
2GR00119*BG	Collins Industries Inc.	Mid Bus Inc.	505 E. Jefferson St. Bluffton, OH. 45817	10/25/2000	Riley Creek	ISW
2GR01488*DG	Collins Industries Inc.	Mid Bus Inc.	505 E. Jefferson St. Bluffton, OH. 45817	nr	Riley Creek	ISW

Table 4.22: Summary of General Permits for the Riley Creek Watershed 2

Lower Riley Creek (HUC 0410000 04 05)						
OH EPA Permit No.	**Applicant Name**	**Facility Name**	**Facility Address**	**Issue Date**	**Receiving Streams**	**Type**
2GR00611*DG	Pandora Mfg. LLC	Pandora Mfg. LLC	501 Basinger Rd. Pandora, OH. 45877	7/7/2006	Riley Creek	ISW
2GC00125*AG	Clemens Development Systems Inc.	Riverbend Sub PH 3	Bluffton, OH. 45817	7/25/2003	Riley Creek	CSW
2GC03001*AG	Mennonite Home Communities of Ohio	Mennonite Home Home-Green Houses	S side Augsburger Rd at Riverbend Dr. Bluffton, OH. 45817	9/28/2011	Riley Creek	CSW
2GG00035	DTR Industries	DTR Industries	320 Snider Rd. Bluffton, OH. 45817	2006	Riley Creek	ISW

Table 4.23: Individual NPDES Permits (Industrial and Municipal Discharges)

Source ID	Facility Name	Address	Receiving Streams	Effluent Limitations (Monthly) NH^3 (mg/l)	Fecal Coliform (#/100 ml)	Tot.P (mg/l)
Binkley Ditch-Little Riley Creek (HUC 0410000 04 01)						
none						
Upper Riley Creek (HUC 0410000 04 02)						
none						
Marsh Run-Little Riley Creek (HUC 0410000 04 03)						
OHL037389	Allen Co Mast Estates	Rhillips & Lugabill Rd.	Little Riley Creek	2	1000	nr
OH0021318	Beaverdam WWTP	N side Dixie Hwy.	May Ditch - Little Riley Creek	nr	nr	nr
Middle Riley Creek (HUC 0410000 04 04)						
OH0003565	Bluffton Stone	310 Quarry Rd.	Riley Creek	nr	nr	nr
Lower Riley Creek (HUC 0410000 04 05)						
OH0020851	Bluffton WWTP	320 Snider Rd.	Riley Creek	1.4/7.9	161	1
OH0021148	Pandora WWTP	207 Krohn St.	Riley Creek	1.14	161	1
OH0038482	Putnam Stone Co Inc	7053 Road M	Riley Creek	nr	nr	nr

Chapter 5: The Riley Creek Watershed Water Resources

Purpose

The focus of this chapter is to reviewy the criteria for determining the water quality of a waterbody. This chapter will also provide an inventory of the water resources in the Riley Creek watershed.

Chapter Acknowledgements
This chapter was prepared using material from The Outlet/Lye Creek Watershed Action Plan and by the watershed coordinator and BRWP partners.

Introduction

Watershed Action Plans (WAP) are designed to look at water resources from a Nonpoint Point Assessment (NPA). In order to better understand what is involved in studying and understanding the general approaches to water resource protection in Ohio, familiarity with the following terms and ideas is essential:

- **Use Designations**
- **Use Attainment/Use Impairment**
- **Water Quality Data (Chemical, Physical, Biological)**
- **Water Quality Standards/Criteria**
- **Causes and Sources of Impairments**
- **Remedial Measures/Watershed Action Plan**

Use Designation: Each of Ohio's streams have been assigned designated uses related to their present and future use: as a source for drinking water, for recreation activities involving contact with water; for agricultural uses (livestock, irrigation); for industrial uses; and as aquatic habitat for fish, insects, and other aquatic organisms. (OSU Extension Bulletin 873-98)

Use Attainment: Use attainment is another way of describing whether or not a stream is meeting Ohio's water quality standards. Ohio EPA has assigned a use designation, or a specific set of water quality standards, to most major streams and rivers throughout the state by dividing each stream into segments and assigning each segment a specific use designation. Ohio EPA assesses use attainment based on aquatic life habitat use designations because they provide the most accurate and comprehensive evaluation of water quality standards associated with the designation. The degrees of use attainment include: full attainment; full attainment but threatened; partial attainment; and non-attainment. (osu extension bulletin 873-98)

Use Impairment: Used when a stream does not meet the full attainment criteria for water quality as determined by the Ohio EPA.

Water Quality Data: The quantitative or qualitative measurements of the chemical, physical or biological characteristics of a stream segment that are used to determine whether or not a particular use is impaired.

One of the measurements to determine whether a stream segment meets the warmwater habitat use designation is a fish community index called the Index of Biological Integrity (IBI).

Water Quality Standards: Under the Clean Water Act, every state must adapt water quality standards to protect, maintain, and improve the quality of the nation's surface waters. These standards represent a level of water quality that will support the goal of "swimmable/fishable" waters. Water quality standards are ambient standards as opposed to discharge-type standards. Ohio's water quality standards include these major components: 1) beneficial use designations; 2) narrative criteria; 3) numeric criteria; and 4) antidegradation policy. (OSU Extension Bulletin 873-98) The term "**criteria**" is often used interchangeably with water quality standard. For a warmwater use designation stream in this subwatershed to be in full attainment for the Index of Biological Integrity (IBI), the criteria requires a score of 40 or higher.

Causes and Sources of Impairments: Anytime a stream does not meet full attainment, there are several possible reasons for the failure. These "reasons" are the **causes and sources of the impairment**. For example, habitat alteration due to stream channel modification may be a cause and source of impairment to the fish community, resulting in IBI values that fall below the standard.

Remedial Measures: Actions to repair or correct a cause and/or source of impairment that is designed to improve the water quality.

Watershed Action Plan (WAP): A WAP identifies the appropriate remedial measures for a watershed and sets forth a comprehensive plan to achieve their implementation.

Use Designations in Ohio: An Overview

The Ohio EPA describes their water use designations as follows:

> *"Beneficial use designations describe existing or potential uses of water bodies. They take into consideration the use and value of water for public water supplies, protection and propagation of aquatic life, recreation in and on the water, agricultural, industrial and other purposes. Ohio EPA assigns beneficial use designations to water bodies in the state. There may be more than one use designation assigned to a water body. Examples of beneficial use designations include: public water supply, primary contact recreation, and aquatic life uses (warmwater habitat, exceptional warmwater habitat, etc.).*

Sidebar 5.1 (see page 5-4), provides a review of the Designated Uses for Water Resources in Ohio. Attainment of aquatic life use is determined by directly measuring fish and aquatic insect populations to see if they are comparable to those seen in least impacted areas of the same ecological region and aquatic life use. Sidebar 5.2 on page 5-5 provides a review of the Aquatic Life Use Designations as they apply the Riley Creek watershed.

Table 5.1: Waterbody Use Designations for the Riley Creek subwatershed (Based on Table 2 of the OEPA 2007 Blanchard River TSD) See Sidebar 5.1 for abbreviations of use designations.

Water Body Segment	Use Designations												
		Aquatic Life Habitat						Water Supply			Recreation		
	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR
Riley Creek -headwaters to upstream Little Riley Creek Upper (RM 20.63)				Δ					Δ	Δ		Δ	
-all other segments		+							+	+		+	
Cranberry Run -headwaters to TR. 7L (RM 3.05)				Δ					Δ	Δ		Δ	
-all other segments		*+							*+	*+		*+	
Little Riley Creek (lower) -headwaters to upstream Marsh Run (RM 4.74)				Δ					Δ	Δ		Δ	
-all other segments		+							+	+		+	
Marsh Run		*							*	*		*	
May Ditch		*							*	*		*	
Marsh Run				Δ					*+	*+		*+	
Little Riley Creek (upper)		*+							*+	*+		*+	
Cummins Ditch		*							*	*		*	
Binkley Ditch		*							*	*		*	

+ Designation based on Ohio EPA biological field assessments
* Designation based on the 1978 and 1985 water quality standards
Δ A new recommendation based on the findings of the Ohio EPA - 2005 TMDL study

Post TMDL Use Designation in the Blanchard River watershed

The 2007 Blanchard River TSD document provides a listing of current and proposed use designations of stream segments in the Blanchard River TMDL area (OEPA, 2007, Table 2). The Riley Creek portion of that table is shown in Table 5.1 above.

Sidebar 5.1 Designated Uses for Water Resources in Ohio

There are two broad use designations for streams and rivers in Ohio - aquatic and non-aquatic.

Aquatic Life Habitat Use Designations*

- *Warmwater (WWH)* - This use designation defines the "typical" warmwater assemblage of aquatic organisms for Ohio rivers and streams; *this use represents the principal restoration target for the majority of water resource management efforts in Ohio.*
- *Exceptional Warmwater Habitat (EWH)* - This use designation is reserved for waters which support "unusual and exceptional" assemblages of aquatic organisms which are characterized by a high diversity of species, particularly those which are highly intolerant and/or rare, threatened, endangered, or special status.
- *Coldwater Habitat (CWH)* - This use is intended for waters which support assemblages of cold water organisms and/or those which are stocked with salmonids with the intent of providing a put-and-take fishery on a year-round basis which is further sanctioned by the ODNR, Division of Wildlife.
- *Modified Warmwater Habitat (MWH)* - This use applies to streams and rivers which have been subjected to extensive, maintained, and essentially permanent hydromodifications such that the biocriteria for the WWH use are not attainable *and where the activities have been sanctioned by state or federal law;* the representative aquatic assemblages are generally composed of species which are tolerant to low dissolved oxygen, silt, nutrient enrichment, and poor quality habitat.
- *Limited Resource Water (LRW)* - this use applies to small streams (usually <3 mi^2 drainage area) and other water courses which have been irretrievably altered to the extent that no appreciable assemblage of aquatic life can be supported; such waterways generally include small streams in extensively urbanized areas, those which lie in watersheds with extensive drainage modifications, those which completely lack water on a recurring annual basis, or other irretrievably altered waterways.

The vast majority of streams and rivers in Ohio are designed as Warmwater Habitat.

Non-Aquatic Habitat Use Designations*

There are two divisions on non-aquatic habitat uses designation; water supply use, and recreation use.

Water Supply Use Designations

- *Public Water Supplies (PWS)* - Refers to those waters which are simply defined as segments within 500 yards of a portable water supply or food processing industry intake.
- *Agricultural Water Supply (AWS)* - Generally this applies to all waters, unless it can clearly be shown that it its not applicable. Normally used for livestock watering and irrigation with no treatment.
- *Industrial Water Supply (IWS)* - General this applies to all waters.

Recreation Use Designations

- *Primary Contact Recreation (PCR)* - These waters have a water depth of at least one meter over an area of at least 100 square feet or, lacking this, where frequent human contact is a reasonable expectation.
- *Secondary Contact Recreation* - These waters include those that do not meet the criteria for PCR.

*Information gathered from the 2005 OEPA Blanchard River Basin TSD

Sidebar 5.2 Aquatic Life Use Designations
(applicable to the Riley Creek Watershed)

Exceptional Warmwater Habitat is the most biologically productive environment. These waters support unusual and exceptional assemblages of aquatic organism, which are characterized by a high diversity of species, particularly those that are highly intolerant and/or rare, threatened, endangered or special status. This use represents a protection goal for water resource management efforts dealing with Ohio's best water resources. The standards for ammonia and dissolved oxygen are more stringent than in the other use designations.

Warmwater Habitat defines the typical warmwater assemblages of aquatic organisms for Ohio rivers and streams. It is the principal restoration target for the majority of water resource management efforts in Ohio. Criteria vary by ecoregion and site type.

Modified Warmwater Habitat applies to streams with extensive and irretrievable physical habitat modifications. The biological criteria for warmwater habitat are not attainable. The activities contributing to the modified warmwater habitat designation have been sanctioned and permitted by state or federal law. The representative aquatic assemblages are generally composed of species that are tolerant to low dissolved oxygen, silt, nutrient enrichment and poor habitat quality. The ammonia and dissolved oxygen standards are less stringent than warmwater habitat. There are three subcategories:

> **Modified Warmwater Habitat - A** for those streams affected by acidic mine runoff;
> **Modified Warmwater Habitat - C** for those streams heavily channelized; and
> **Modified Warmwater Habitat - I** for those streams extensively impounded.

The biocriteria are set separately.

Limited Resource Water applies to streams that have drainage areas of less than three square miles and either may lack water on a recurring annual basis, or have been irretrievably altered to the extent that no appreciable assemblage of aquatic life can be supported; no formal biological criteria are established for this designation. (EPA Guide to Developing Local Watershed Plans in Ohio)

Agricultural Drainage Uses:

As in any of the subwatersheds in the Blanchard River watershed, the reality of the stream networks is that they serve as pathways for agricultural drainage that are essential for the agriculture production within that subwatershed. The natural use of the streams for aquatic life habitat is not viewed as a top priority by many of the farmers. Many of the streams (ditches) are the result of drainage networks that were placed in the farmland to increase the rate of drainage during rainy periods. The ditches were dug to drain the wetlands of the Black Swamp. Those streams that did exist have been modified either as part of drainage practices or as a consequence of agricultural land use in general.

A major concern of the agricultural stakeholders in the watershed is that efforts to achieve designated aquatic life uses in the watershed will interfere with their ability to drain their croplands. If any of these streams are designated as headwaters streams, there are concerns about how OEPA's Headwater Initiative may affect agricultural landscape. While the MWH and LRW use designation do provide some relief to agricultural drainage, even these designations could be a source of problems relative to agricultural drainage provided by headwater stream.

As expanding urban areas encroach upon productive agricultural lands, agricultural demands result in drainage of millions of wetland acres and channelization of thousands of miles of stream courses. The impact of such alterations on aquatic biota can be disastrous. Yet, natural stream reaches within these intensively developed agricultural watersheds can serve as oases for aquatic life, and possibly hold the key to restoration of damaged systems and preservation of threatened ones. (Marsh and Luey, 1982)

Pollutant Export Issues

Pollutant export from the Blanchard River has been monitored by the National Center for Water Quality Research located at Heidelberg University in Tiffin Ohio, since July 2007. The collection site is located at the USGS site at CR 140 about .25 miles south of US 224 and just west of the City of Findlay. This site receives water flow from three of the 11-digit watersheds in the Blanchard River watershed. The three subwatersheds are: Headwaters, The Outlet/Lye Creek, and Eagle Creek. Even though the site covers more than just The Outlet/Lye Creek watershed, the Headwaters' water flows through The Outlet/Lye Creek watershed, and the Eagle Creek watershed have about the same land use. Therefore, the pollutant export data should be indicative of The Outlet/Lye Creek watershed. The 2008 Water Year (WY) includes data from October 1, 2007 - September 30, 2008.

The annual discharge (flow) for the Blanchard River for 2008 was the third highest for the period of discharge measurements, which dates back to 1923 (see Fig. 5.1). The highest annual discharge was in 2007. In general, annual discharges seem to be increasing for the Blanchard River.

As shown in Figure 5.2, the export rate of suspended solids is about average for the Maumee Basin, but is less than average for the Sandusky Watershed.

Table 5.2 shows the total pollutant loads exported from each watershed study during the 2008 Water Year.

Table 5.3 shows the unit area discharge and pollutant loads. Unit area loads allow comparison of export rates from watersheds of differing sizes.

Fig. 5.1 Annual Discharge

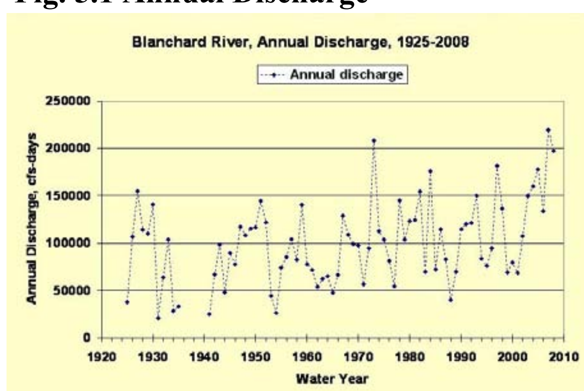


Fig. 5.2

2008 Water Year – Export Rate of Suspended Sediments

River	Suspended solids	
	Kilograms / hectare	pounds/ acre
Maumee	848	758
Tiffin	251	225
Blanchard	812	725
Lost Creek	499	446
Sandusky	1099	981
Honey Creek	684	611
Rock Creek	1607	1435
Cuyahoga	1628	1453
Muskingum	381	341
Scioto	429	383
Great Miami	1223	1092

Relatively low sediment export rate.

Export about average for Maumee watershed.

Relatively low export. May reflect adoption of erosion control measures in this watershed.

Source: Dr David Baker, Heidelberg University

Table 5.2 Total pollutant loads exported from each study watershed during the 2008 WY

2008 WY	Pollutant Loads						
River	Discharge	Suspended solids	Total phosphorus	Dissolved reactive phosphorus	Nitrate	Total Kjeldahl nitrogen	Chloride
	million cubic meters	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Maumee	8,026.0	1,391,000	3,570.0	829.0	30,600.0	12,400.0	184,000
Tiffin	526.0	26,700	99.6	34.3	1,470.0	544.0	12,800
Blanchard	509.0	72,800	255.0	68.3	1,880.0	777.0	13,800
Lost Creek	5.4	549	2.2	0.9	13.3	7.0	64
Sandusky	1,906.0	356,000	877.0	187.0	7,250.0	2,870.0	38,400
Honey Creek	242.0	26,400	96.7	28.1	838.0	307.0	4,180
Rock Creek	53.0	14,400	26.9	4.3	118.0	87.8	962
Cuyahoga	1,174.0	298,000	301.0	44.8	1,700.0	1,160.0	185,000
Muskingum	10,011.0	733,000	1,800.0	400.0	14,300.0	7,040.0	349,000
Scioto	5,345.0	428,000	1,800.0	761.0	14,900.0	5,220.0	229,000
Great Miami	4,301.0	860,000	1,950.0	619.0	15,200.0	5,860.0	178,000
Raisin	1,098.0	20,900	83.6	39.8	334.0	920.0	57,300

Table 5.3 Unit area discharge and pollutants loads

2008 WY	Unit Area Loads						
River	Discharge	Suspended solids	Total phosphorus	Dissolved reactive phosphorus	Nitrate	Total Kjeldahl nitrogen	Chloride
	centimeters	kilograms/ hectare	kilograms/ hectare	kilograms/ hectare	kilograms/ hectare	kilograms/ hectare	kilograms/ hectare
Maumee	49.0	848.4	2.177	0.506	18.66	7.56	112
Tiffin	49.5	251.4	0.938	0.323	13.84	5.12	121
Blanchard	56.8	812.4	2.846	0.762	20.98	8.67	154
Lost Creek	49.2	499.3	2.037	0.855	12.10	6.40	58
Sandusky	58.8	1098.8	2.707	0.577	22.38	8.86	119
Honey Creek	62.7	683.9	2.505	0.728	21.71	7.95	108
Rock Creek	59.2	1607.1	3.002	0.484	13.17	9.80	107
Cuyahoga	64.1	1627.5	1.644	0.245	9.28	6.34	1010
Muskingum	52.1	381.4	0.937	0.208	7.44	3.66	182
Scioto	53.6	429.3	1.805	0.763	14.94	5.24	230
Great Miami	61.2	1223.0	2.773	0.880	21.62	8.33	253
Raisin							

Unit area export rates involve dividing the total export by the total watershed area, resulting in units of tons per square mile. Conversion factors are then used to produce more commonly used units, such as pounds/acre.

Table 5.3 shows that the export rates of total phosphorus for the Blanchard River are higher than those of the Maumee Watershed as a whole and similar to those of the Sandusky Watershed. These export rates are high relative to comparably sized watersheds in the agricultural Midwest. Table 5.3 also shows that the export rates of dissolved reactive phosphorus for the Blanchard River are higher than for the Maumee watershed as a whole and for the Sandusky Watershed. The high dissolved phosphorus export is associated with both the agricultural land uses in the watershed as well as the effluents from the Findlay

Pollution Control Center. Dissolved phosphorus export is a major problem for Lake Erie because of its high bioavailability to algae (Baker, 2009).

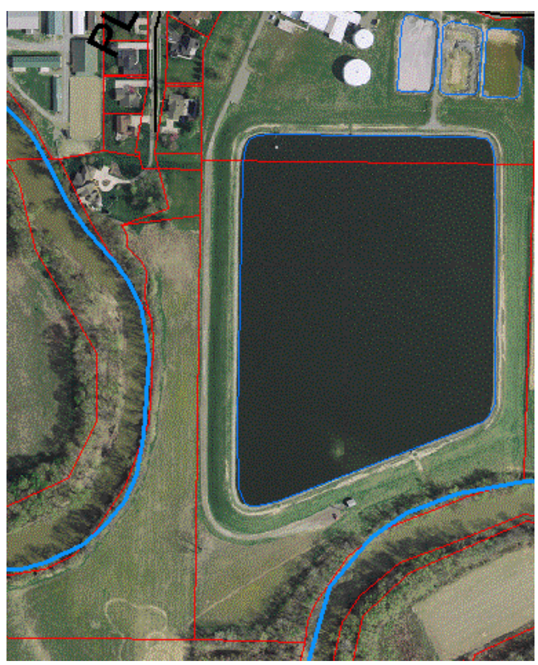
Nitrate and Total Kjeldahl nitrogen export rates for the Blanchard River are comparable to those of the Maumee and Sandusky Watershed (See Table 5.3 on page 5.7). Nitrogen export represents the greatest financial loss of nutrients from cropland in Northwestern Ohio, $14.70 per acre for the entire Maumee watershed (Baker, 2009).

Drinking Water Resources

Ohio has abundant surface and ground water resources. The Riley Creek watershed is located in the Carbonate Aquifers area of Ohio (See Map 5.1 on the next page). Carbonate aquifers generally provide sufficient production for water wells (OEPA).

As in most watersheds, The Riley Creek watershed rural stakeholders obtain their water from private wells. There are roughly 1100 wells located within the watershed. The Village of Bluffton contracts with the Village of Ottawa for their drinking water. Bluffton uses on the average of 500,000 gallons of water per year. All the other villages, Pandora and Beaverdam, obtain their water from wells.

The major water resource for the Village of Ottawa is in the form of an above ground reservoir. The reservoir was built in 1971 and has a capacity of 116 million gallons. The reservoir covers 37.72 acres. The Village of Ottawa is studying the need to build a second reservoir just south of the present reservoir.

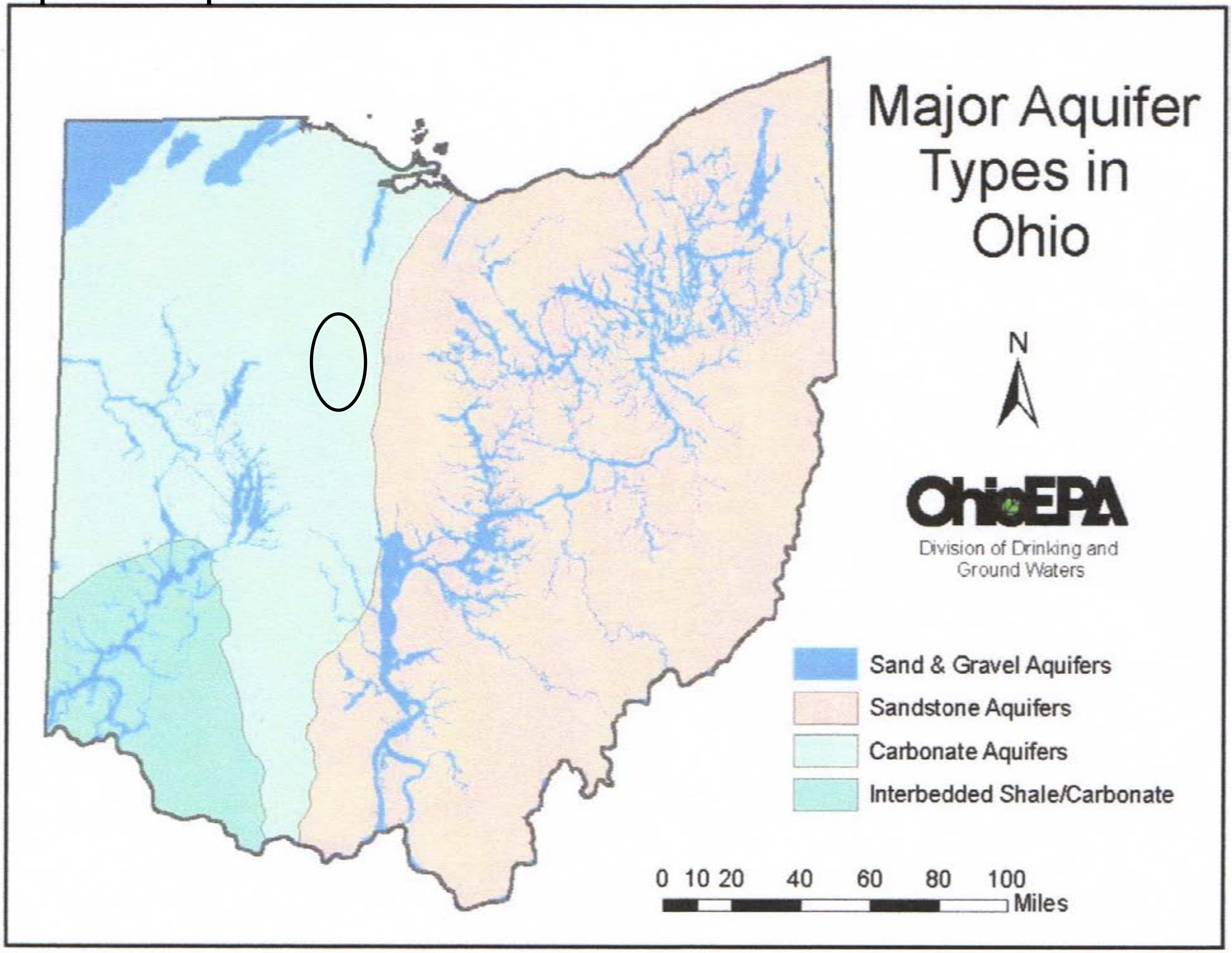


Picture 5.1:

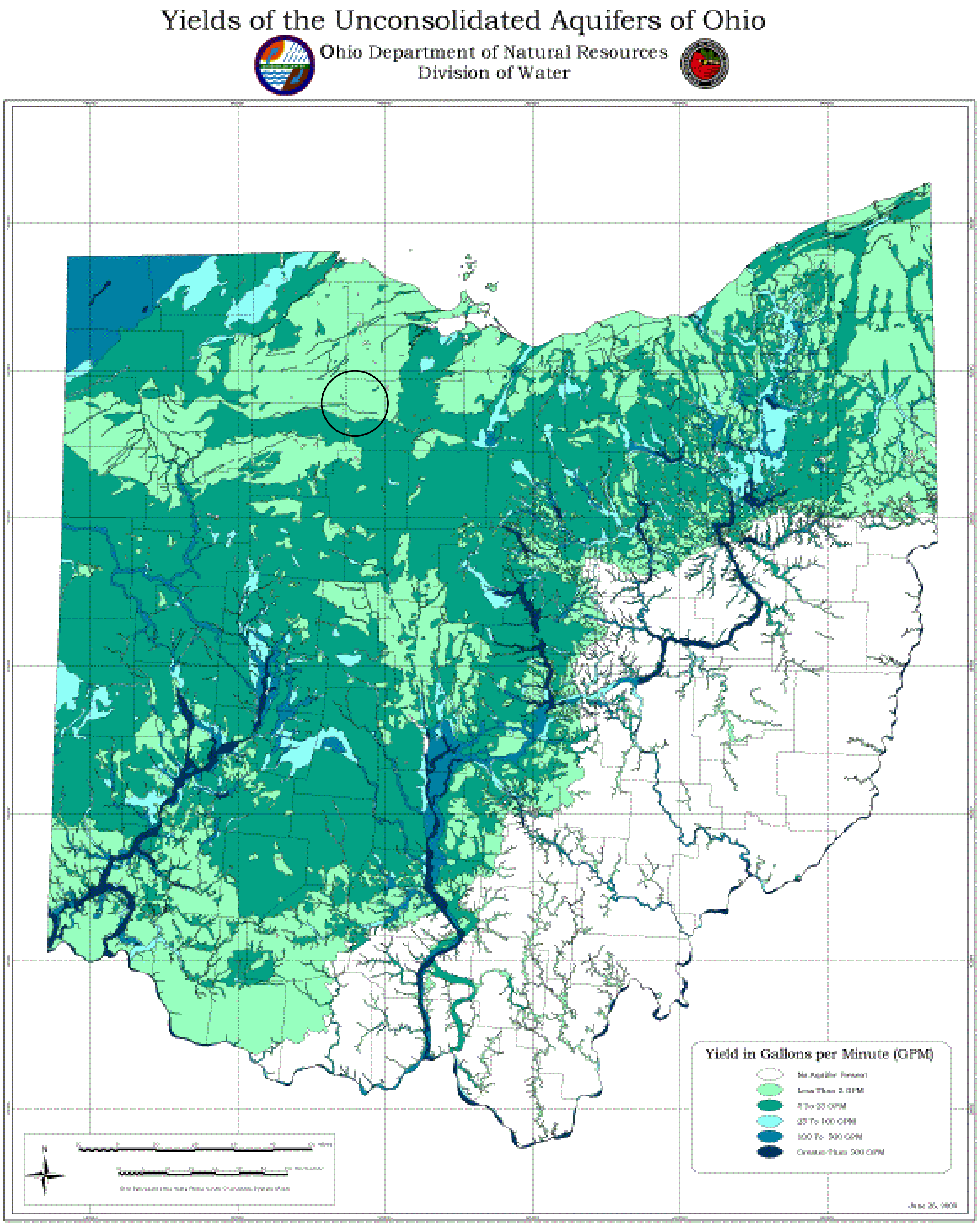
Aerial photograph of the Village of Ottawa's reservoir.

(Putnam County Auditor)

Map 5.1 Ohio Aquifers



Map 5.2 Yields of Aquifers



Source Water Assessment and Protection Plans for Village of Ottawa (SWAPP)

The water that surrounds us - the Blanchard River, streams, ditches, and aquifers - makes up our drinking water sources. The Safe Water Drinking Act (SDWA) was passed by Congress in 1974 to help protect public health by regulating the nation's water supply. Figure 5.3 shows a map of the area of the Blanchard River Watershed that is included in the SWAPP for the Village of Ottawa. Every year the Village of Ottawa prepares a Consumer Confidence Report on Drinking Water for the consumers. Included within this report is general health information, water quality test results, how to participate in decisions concerning drinking water and water systems contacts.

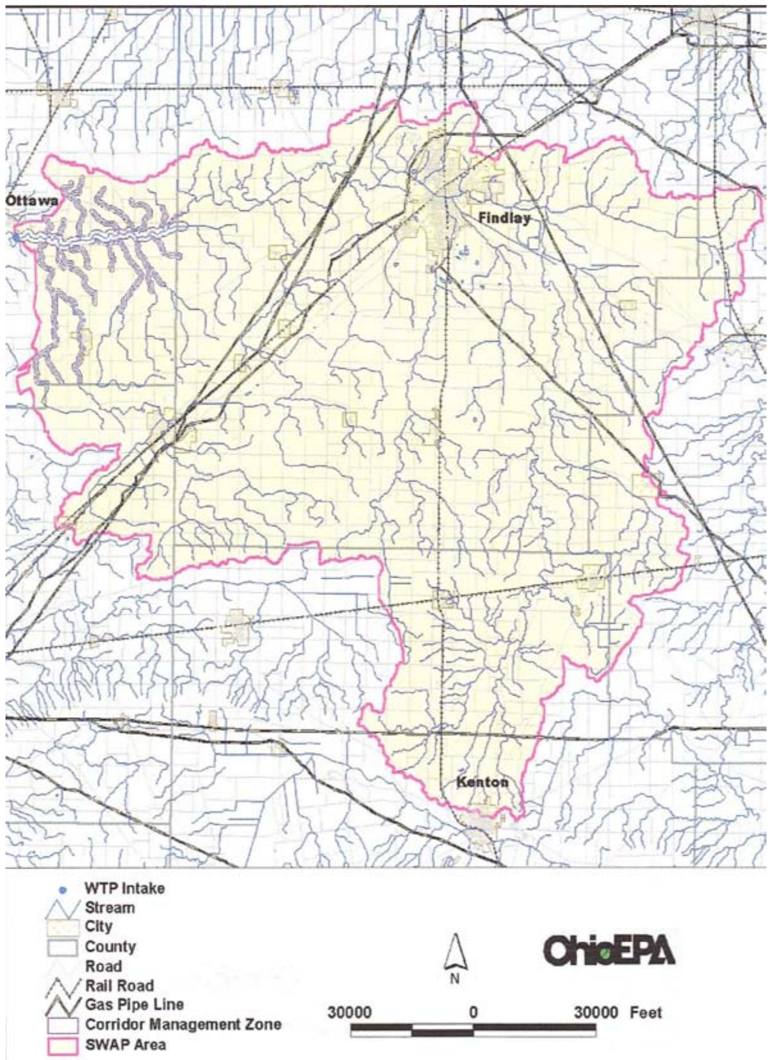


Figure 5.3: Village of Ottawa Drinking Water Source (SWAP) Area

As you can observe in the Figure 5.3 the source water protection area for the Village of Ottawa includes all the 10-digit watersheds (04100008-01, 02, 03, 04, and 05,) This area includes the entire Riley Creek watershed.

The Ohio EPA released a Drinking Water Source Assessment Report for the Village of Ottawa. The report provided a map of protection areas, the potential contaminant sources within it, and an evaluation of how susceptible the Village of Ottawa's drinking water is to contamination. A copy of this report can be obtained from the Village of Ottawa Drinking Water Department. See pgs. 5-14 thru 5-16 for the Village of Ottawa's Drinking Water Consumer Confidence Report for 2010.)

Ohio 2010 Intregrated Water Quality and Assessment Report

In February 2011, the Ohio EPA released their 2010 Integrated Water Quality and Assessment Report - Blanchard River. A copy of this report that deals with the Riley Creek watershed can be found in Appendix E. The report is broken down into the 12-digit watersheds.

Previous and Present Water Quality Studies of the Blanchard River

A. Biological and Water Quality Report of the Blanchard River adapted in 2009. Report can be viewed at http://www.epa.ohio.gov/dsw/tmdl/BlanchardRiverTMDL.aspx

B. NRCS Rapid Assessment of the Blanchard River Watershed Report can be viewed at ftp://ftp-fc.sc.egov.usda.gov/OH/pub/Rapid_Assessments/Blanchard_1-17-08.pdf

C. National Center for Water Quality Research, Heidelberg University. http://www.heidelberg.edu/WQL

D. Western Lake Erie Basin, "Historical Assessment of Streamflow and Water Quality Activities 2009" This report can be viewed at: http://www.wleb.org/watersheds/documents/MOPS_04100008_Blanchard.pdf

E. Western Lake Erie Basin Study Blanchard Watershed Assessment - August 2009. This report can be viewed at: http://www.wleb.org/documents/assessments/Blanchard%20Watershed%20Final%20Assessment%20091509.pdf

F. Ohio 2010 Integrated Water Quality and Assessment Report - Blanchard River. This report can be viewed at: http://wwwapp.epa.ohio.gov/dsw/ir2010/basin.php

G. Blanchard River Watershed Partnership, "Water Quality Study using Macroinvertebrates", The results can be viewed at: http://www.blanchardriver.org.

H. Ground Water Pollution Potential of Allen County, Ohio (2005) http://ohiodnr.com/Portals/7/gwppmaps/pdf_gismap_wreport/allen_pp_report_wmap.pdf

I. Ground Water Pollution Potential of Putnam County, Ohio (2006)
http://ohiodnr.com/Portals/7/gwppmaps/pdf_gismap_wreport/putnam_gwpp_rpt_wmap.pdf

J. Ground Water Pollution Potential of Hancock County, Ohio (September 1994)
http://ohiodnr.com/Portals/7/gwppmaps/pdf_printmap_wreport/hancock_pp_report_wmap.pdf

K. Ground Water Pollution Potential of Hardin County, Ohio (2008)
http://ohiodnr.com/Portals/7/gwppmaps/PDF_GISMap_wReport/Hardin_PP_Report_wMap.pdf

NOTE:

The Village of Ottawa, with the support of the Putnam County Commissioners, has applied for a Local Government Innovation Fund grant to conduct a "*Regional Water and Sanitary Sewer Feasibility Study.*" If the village receives the award, the money will be used to investigate the regionalization of the water and wastewater systems in cooperation with other communities. The study will be conducted by Bowling Green State University in coordination with the Putnam County Educational Service Center.

Village of Ottawa

2010 CONSUMER CONFIDENCE REPORT

The Village of Ottawa has prepared the following report to provide information to you, the consumer, on the quality of our drinking water. Included within this report is general health information, water quality test results, how to participate in decisions concerning your drinking water, and water system contacts.

Ottawa's Water Source

The Village of Ottawa public water system draws its drinking water from the Blanchard River, which runs south of the water treatment plant. For the purposes of source water assessments in Ohio, all surface waters are considered to be susceptible to contamination and require extensive treatment before being used as drinking water. By their nature, surface waters are readily accessible and can be contaminated by chemicals and pathogens, which may rapidly arrive at the public drinking water intake with little warning or time to prepare. The Village of Ottawa's drinking water source protection area contains potential contaminant sources such as agriculture, home construction, septic systems, combined sewer overflows, wastewater treatment discharges, commercial and industrial sources, roadways and railways.

The Village of Ottawa's public water system treats the water to meet drinking water quality standards, but no single treatment technique can address all potential contaminants. Implementing measures to protect the Blanchard River can further decrease the potential for water quality impacts. More detailed information is provided in the Village of Ottawa's Drinking Water Source Assessment report, which can be obtained by calling 419-523-5020.

Possible Source Water Contaminants

The sources of drinking water, both tap water and bottled water, include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive materials, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include: (a) microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife; (b) inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming; (c) pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses; (d) organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm runoff, and septic systems; and (e) radioactive contaminants, which can be naturally-occurring or the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, the USEPA prescribes regulations that limit the amount of certain contaminants in the water provided by public water systems. FDA regulations establish limits for contaminants in bottled water that must provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800) 426-4791.

Potential Water Concerns

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons, such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, persons with HIV/AIDs or other immune system disorders, some elderly, and infants can be particularly at risk. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appro-

For the definitions of scientific terms used throughout this report, please see page 3.

2010 Table of Water Quality Test Results for the Village of Ottawa

Contaminant (units)	MCL	MCLG	Level Found	Range of detections	Violation?	Year Sampled	Typical Source of Contaminant
Microbiological Contaminants							
Total Coliform Bacteris	*See note	0	0	0-1	No	2010	Naturally present in the environment
Total Organic Carbon (TOC)	TT	n/a	2.923	1.51-2.40	No	2010	Naturally present in the environment
Turbidity (NTU)	TT	n/a	0.069	0.05-0.22	No	2010	Soil runoff
Turbidity (% samples meeting standard)	TT	n/a	100%	100-100%	No	2010	Soil runoff
Total Coliform Bacteria MCL: Systems that collect fewer than 40 samples per month, one (1) positive sample.							
Inorganic Contaminants							
Barium (ppm)	2	2	0.0102	n/a	No	2010	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Beryllium (ppb)	4	4	1.000	n/a	No	2010	Discharge from metal refineries and coal burning factories; discharge from electrical, aerospace, and defense industries
Chromium (ppb)	100	100	5.000	n/a	No	2010	Discharge from steel and pulp mills; erosion of natural deposits
Nickel (ppb	100	100	5	n/a	No	2010	Erosion of natural deposits; discharge from electro-plating, stainless steel, and alloy products; mining and refining operations
Copper (ppm)*	AL =1.3	1.3	0.096	n/a	No	2008	Corrosion of household plumbing systems; erosion of natural deposits.
Zero out of twenty-two samples were found to have copper levels in excess of the Action Level of 1.3 ppm.							
Flouride (ppm)	4	4	0.97	0.81-1.01	No	2010	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer & aluminum factories
Lead (ppb)*	AL=15	0	2.84	n/a	No	2008	Corrosion of household plumbing systems; erosion of natural deposits.
Zero out of twenty-two samples were found to have lead levels in excess of the Action Level of 15.0 ppm.							
Nitrate (ppm)	10	10	2.37	0.314—1.90	No	2010	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Synthetic Organic Contaminants including Pesticides and Herbicides							
Alachlor (ppb)	2	0	<0.21	0—<0.21	No	2010	Runoff from herbicide used on row crops
Atrazine (ppb)	3	3	0.493	<0.30—0.69	No	2010	Runoff from herbicide used on row crops
Simazine (ppb)	4	4	<0.40	0—<0.40	No	2010	Herbicide runoff
Volatile Organic Contaminants							
Haloacetic Acids HAA5 (ppb)	60	n/a	41.03	1.43—54.3	No	2010	By-product of drinking water chlorination
Total Trihalomethanes (ppb)	80	n/a	91	43.1—83.1	Yes	2010	By-product of drinking water chlorination
Ethylbenzene (ppb)	700	700	BDL	n/a	No	2010	Discharge from petroleum refineries
Xylenes (ppm)	10	10	1.5	n/a	No	2010	Discharge from petroleum factories; Discharge from chemical factories
Residual Disinfectants							
Total Chlorine (ppm)	MRDL = 4	MRDLG = 4	2.06	1.10—1.46	No	2010	Water additive used to control microbes
Unregulated Contaminants							
Bromodichloromethane (ppb)	n/a	n/a	18.8	n/a	No	2010	By-product of drinking water chlorination
Chlorodibromomethane (ppb)	n/a	n/a	5.78	n/a	No	2010	By-product of drinking water chlorination
Chloroform [trichloromethane] (ppb)	n/a	n/a	61.4	n/a	No	2010	By-product of drinking water chlorination

priate means to lesson the risk of infection by Cryptosporidium and other microbial contaminants are available from the EPA's Safe Drinking Water Hotline (800) 426-4791.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The Village of Ottawa is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at (800) 426-4791 or at http://www.epa.gov/safewater/lead.

Monitoring Drinking Water

The Environmental Protection Agency requires regular sampling to ensure drinking water safety. The Village of Ottawa conducted sampling for total coliform bacteria, inorganics, and synthetic and volatile organic contaminants during 2009. Samples were collected for more than 80 different contaminants, most of which were not detected in the Village of Ottawa Public Water Supply. The Ohio EPA requires the Village of Ottawa to monitor for some contaminants less than once per year because the concentrations of these contaminants do not change frequently. Some of our data, though accurate, may be more than one year old. The data presented within the Consumer Confidence Report is from the most recent testing done in accordance with Ohio EPA Division of Drinking and Ground Water regulations.

Village of Ottawa routinely monitors its drinking water for contaminants to ensure drinking water safety. Contained in this report is summarized information on those agents for which testing has been done on the Village of Ottawa's drinking water. The EPA requires certain terminology and abbreviations and that specific calculations be performed for different contaminants. To help better understand these terms, definitions have been provided. The analytical results presented in the table are the most recent testing results done in accordance with the regulations.

The value reported under "Level Found" for Total Organic Carbon (TOC) is the lowest ratio between the percentage of TOC actually removed to the percentage of TOC removal required by the EPA. A value of greater than one (1) indicates that the water system is in compliance with TOC removal requirements. A value of less than one (1) indicates a violation of the TOC removal requirements.

Turbidity is a measure of the cloudiness of water and an indication of the effectiveness of our filtration system. The turbidity limit set by the EPA is 0.3 NTU in 95% of the daily samples and shall not exceed 1.0 NTU at any time. As reported on the spreadsheet, the Village of Ottawa's highest recorded turbidity result for 2010 was 0.069 NTU and the lowest monthly percentage of samples meeting the turbidity limits was 100%.

Contact and Meeting Information

Public participation and comment are encouraged at regular meetings of the Village Council, which are held the second and fourth Mondays of every month at 8:00 p.m., in the Council Chambers, located in the Municipal Building, 136 North Oak Street, Ottawa, Ohio, 45875. For more information on your drinking water, contact Jason Phillips, Water Director at 419-523-5020.

What Does That Mean?

AL: Action Level; The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

BDL: Below Detectable Levels

MCL: Maximum Contaminant Level; The highest level of a contaminant that is allowed in drinking water. MCL's are set as close to the Maximum Contaminant Level Goals (MCLG's) as feasible using the best available treatment technology.

MCLG: Maximum Contaminant Level Goal; The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLG's allow for a margin of safety.

MRDL: Maximum Residual Disinfectant Level; The highest level of a disinfectant allowed in drinking water.

MRDLG: Maximum Residual Disinfectant Level Goal; Thelevel of drinking water disinfectant below which there is no known or expected risk to health.

TT: Treatment Technique; a required process intended to reduce the level of a contaminant in drinking water.

"<" symbol: A symbol that means "less than"; A result of <5 means that the lowest level that could be detected was 5 and the contaminant in that sample was not detected.

n/a: Not applicable.

NTU: Nephlometric Turbidity Units; A nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

ppb: Parts per Billion (ppb) are units of measure for the concentration of a contaminant. A part per billion corresponds to one second in 31.7 years.

ppm: Parts per Million (ppm) are units of measure for the concentration of a contaminant. A part per million corresponds to one second in a little over 11.5 days.

Chapter 6: Riley Creek Watershed Use Attainment

Purpose

The focus of this chapter is to provide a review of the aquatic life use attainment criteria used by the OEPA and ODNR during the TMDL study. Criteria standards as they apply to the Riley Creek Subwatershed are presented.

Chapter Acknowledgements
This chapter was prepared using material from The Outlet/Lye Creek Watershed Action Plan and by the watershed coordinator and BRWP partners.

Use Attainment

Use Attainment can be divided into sections that describe the use attainment for each of the following three use designations assigned to segments of the Riley Creek Subwatershed in the TMDL report:

I. Aquatic life use
II. Recreation use
III. Public water supply use

I. Aquatic Life Use Attainment

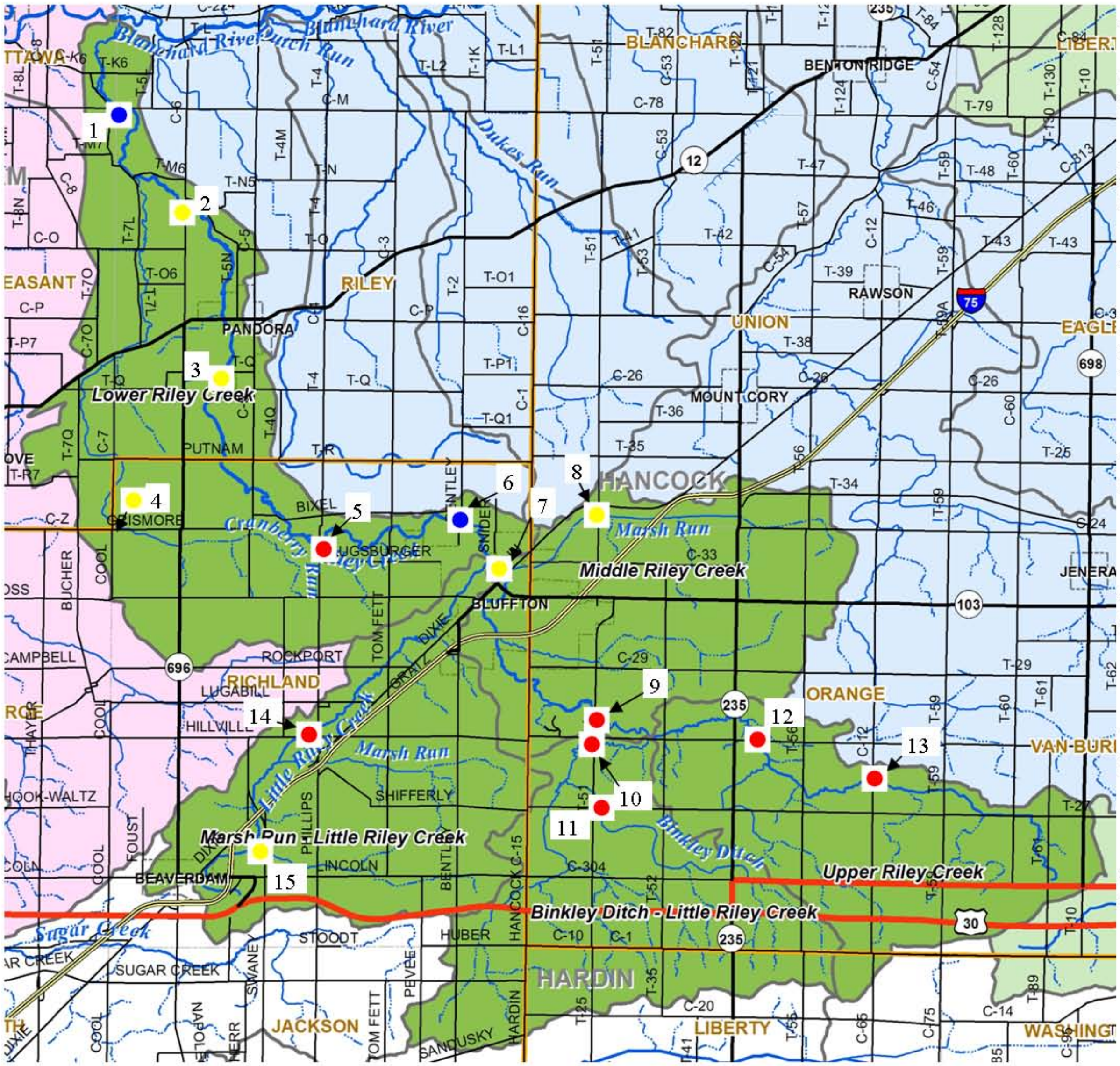
To understand the basis for biological use attainment analyses by the OEPA, additional background information is needed beyond the general concepts introduced in the previous chapters. Much of the information presented below is taken from the OEPA Guide to Developing Local Watershed Action plans in Ohio (OEPA, 1997), the Blanchard River TSD (OEPA 2005), and the Blanchard River TMDL report (OEPA, 2009).

Biological Community Measurements: As a part of the Blanchard River TMDL study, the Ohio EPA conducted detailed studies of the biological communities within the drainage area of the Blanchard River Watershed, which included the Riley Creek subwatershed. The location of the sampling stations are shown on Map 6.1 on page 6-2.

The TMDL study plan called for fish and/or macroinvertebrate sampling at 17 sites in Riley Creek Subwatershed. Fish and macroinvertebrate sampling was planned at each site; however, due to the limitations of resources, timing, and site suitability, a number of locations were sampled for only a single organism group. This resulted in only 15 sites being used for attainment status.

The OEPA utilizes standardized electro-fishing techniques to study fish communities. These techniques are described in the OEPA User's Manual for Biological Field Assessment (OEPA, 1987). Quantitative macroinvertebrate studies involve the placement of artificial substrates in riffle environments of streams. Following a colonization period, the artificial substrates are collected

Map 6.1 TMDL Sampling Sites and Attainment



TMDL Sites:

Lower Riley Creek
(HUC 041000080405)

1. Riley Creek at TR K-6
2. Riley Creek at CR 6
3. Riley Creek at TR Q (Madison Ave.) Pandora
4. Cranberry Run at Cool Rd. (south crossing)
5. Riley Creek at Phillips Rd.
6. Riley Creek at Bentley Rd.
7. Riley Creek upstream of Bluffton WWTP

Middle Riley Creek
(HUC 041000080404)

8. Marsh Run at Union TR 51
9. Riley Creek at Orange TR 51

Binkley Ditch-Little Riley Creek
(HUC 041000080401)

10. Little Riley Creek at Orange TR 51
11. Little Riley Creek at Orange TR 27

Upper Riley Creek
(HUC 041000080402)

12. Riley Creek at Hancock CR. 28
13. Riley Creek at Hancock CR 12

Marsh Run-Little Riley Creek
(HUC 04100080403)

14. Lower Little Riley Creek at Hillville Rd.
15. Lower Little Riley Creek at Swaney Rd.

and the macroinvertebrate communities evaluated relative to species composition and frequency. The qualitative macroinvertebrate studies involve the use of nets to collect representative species present in the stream. The macroinvertebrate methods are also described in the OEPA User's Manual for Biological Field Assessment. (OEPA 1987)

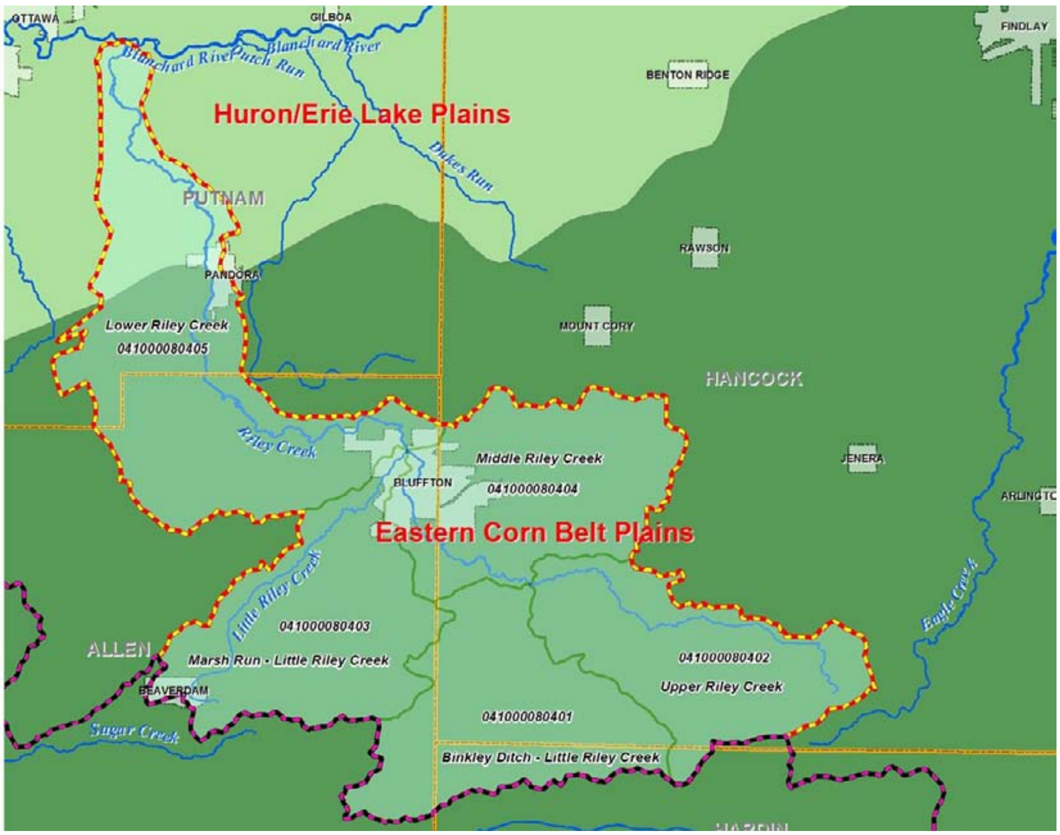
Biological Indices: The fish and macroinvertebrate data from the previously mentioned studies are used to calculate the following three indices, as described in the OEPA Guide and presented below:

- **Index of Biological Integrity (IBI)** - The index of biological integrity is a measure of fish species diversity and species populations. The index is a number that reflects total native species composition, indicator species composition, pollutant intolerant and tolerant species composition, and fish condition. Combined, the higher the calculation, the healthier the aquatic ecosystem; conversely, the lower the index, the poorer the health of the aquatic ecosystem. The highest score is 60.

- **Modified Index of Well Being (Mlwb)** - The modified index of well being factors out 13 pollutant tolerant species of fish and includes fish mass in the final analysis. Thus, if the IBI and the Mlwb are examined together, an even clearer picture of the health of the biological community emerges. For example, if a high IBI is coupled with a low Mlwb, it could tell us that while there is a variety of species and a good number of individuals of each species (high IBI), individual members of these species are smaller than what is expected. This might indicate that while fish are numerous, they are not maturing fully. In turn, this information could be useful in determining which pollution source is impacting the biological community. The high value of the Mlwb is 12. The Mlwb is not applied to stream segments with drainage areas less than 20 square miles.

- **Invertebrate Community Index (ICI)** - The invertebrate community index is based on measurements of the macroinvertebrate communities living in a stream or river. It is particularly useful in evaluating stream health because (1) there are a wide variety of macroinvertebrate taxa, which are known to be pollutant intolerant; and (2) there are a number of macroinvertebrate taxa, which are known to be pollutant tolerant. Like the IBI, the ICI scale is 0-60 with the higher scores representing healthier macroinvertebrate communities and, therefore, more biologically diverse communities.

Biological Standards: In Ohio, numerical standards for the above indices have been incorporated into the state's pollution control laws. The minimum standards vary depending on the use designation and location (Ecoregion) in the state. Most of the Riley Creek Subwatershed is located in the Eastern Corn Belt. All of the Lower Riley Creek is in the Huron/Erie Lake Plains Ecoregion. (See Map 6.2 below for location and description) For streams in this Ecoregion, the standards for the three indices of the aquatic life use designations in the watershed are shown in tabular fashion in Table 6.1 on the next page.



Map 6.2: Ecoregions of Ohio in the Blanchard River Watershed
The Blanchard River Watershed is outlined by the magenta-lack dotted line. The 10-digit watersheds are outlined by the orange-yellow dotted line. The Riley Creek Subwatershed is shown middle shade of green. The 12-digit watersheds are shown within the green boundaries.

The Eastern Corn Belt Plains is primarily a rolling till plain with local end moraines; it had more natural tree cover and has lighter colored soils than the Central Corn Belt Plains. The region has loamier and better drained soils than the Erie Drift Plain. Glacial deposits of Wisconsinan age are extensive. They are not as dissected nor leached as the pre-Wisconsinan till, which is restricted to the southern part of the region. Originally, beech forests and elm-ash swamp forests dominated the wetter pre-Wisconsinan soils. Today, extensive corn, soybeans, and livestock production occurs and has affected stream chemistry and turbidity. (Native Seed Network)

The Huron-Erie Lake Plain (HELP) is discontinuous and is distinguished from surrounding Ecoregions based on poor soil drainage. Most of the Ecoregion was once covered by forested wetlands known as the Black Swamp. Many wetlands are still present, but many have been drained and cleared for agriculture. The Ecoregion consists of broad, nearly level lake plains crossed by beach ridges and low moraines.

Numerous drainage ditches have been constructed and many streams are extensively channelized, allowing for rapid agricultural drainage in flat, poorly drained areas. (Indiana Biological Survey)

Table 6.1: Narrative ranges and WWH biocriteria (bold) for Ohio Eastern Corn Belt Plains and Huron/Erie Lake Plains ecoregion.

Ohio Eastern Corn Belt Plains ecoregion						
	IBI		**MIwb**	**MIwb**	**ICI**	**Narative**
Headwater	Wading	Boat	Wading	Boat	All	**Evaluation**
40-45	40-45	42-43	8.3-8.88	8.5-9.0	36-40	Good
36-39	36-39	38-41	7.8-8.2	8.0-8.4	32-34	Marginally Good
28-35	28-35	26-37	5.9-7.7	6.4-7.9	14-30	Fair
18-27	18-27	16-25	4.5-5.8	5.0-6.3	2-12	Poor
12-17	12-17	12-15	0-4.4	0-4.9	<2	Very Poor
Huron/Erie Lake Plains ecoregion						
	IBI		**MIwb**	**MIwb**	**ICI**	**Narative**
Headwater	Wading	Boat	Wading	Boat	All	**Evaluation**
28-33	32-37	34-35	≥ 7.9	≥ 8.6	34-38	Good
24-27	28-31	30-33	7.4-7.8	8.0-8.5	30-33	Marginally Good
18-23	20-29	22-29	5.4-7.3	6.4-7.9	14-30	Fair
12-17	12-17	12-21	3.9-5.3	5.0-6.3	2-12	Poor
>12	>12	>12	0-3.9	0-4.9	<2	Very Poor

Based on Ohio EPA

Reference Sites: The particular values of the standards shown in table 6.1 are based on biological measurements of reference streams in each Ecoregion of the state. The reference stream segments are selected such that they have minimal pollutant impacts and optimal habitat characteristics for the Ecoregion. The standards used for WWH generally represent the 25th percentile of all of the index values for the reference sites. Thus, if the scores at all of the reference sites for a particular Ecoregion were ranked from the highest to the lowest, the score 25% up from the lowest score is selected as the standard. Separate sets of reference sites are selected for MWH designations. By using ecoregional reference sites, OEPA assures that local streams are evaluated relative to similar streams in terms of soils, geology, and native vegetation.

Degrees of Use Attainment for Ohio Streams and Rivers: The OEPA has developed a standard set of terms to describe the degree to which biological use attainment is being met. These are as follow:

- **FULL Attainment -** A use is considered to be fully attained when all of the biological indices meet the biocriteria value for the applicable use designation, ecoregion, and site type.

- **PARTIAL Attainment -** A use is considered to be partially attained if one or two biological indices indicate attainment, but others do not; for the EWH and WWH use designations, the biological indices that fail to meet the applicable biocriteria must at least fall within the fair range of performance.

- **NON-Attainment** - A use is not attained if all of the biological indices fail to meet the biocriteria, or if either organism group reflects poor or very poor performance, even if the other organism group meets the biocriteria.

Table 6.2: Summary of Blanchard River assessment unit scoring. The assessment unit score is an average grade of aquatic life use status. A maximum unit score of 100 is possible, if all monitored sites meet designated aquatic life uses.

Riley Creek WAU (04100008-050) (04100008-04)	Aquatic Life Attainment Staus							Assessment Unit Score
	Total	Full		Partial		NON		
		#	%	#	%	#	%	
Sites ≤ 50 mi.^{2} drainage area	9	-	-	3	33.3	6	66.7	6.3
Miles of assessed streams with > 50 mi.^{2} and < 500 mi.^{2} drainage area.	8	1	12.5	4	50.0	3	37.5	
Comments: An additional two sites of less than 50 mi.^{2} were sampled but did not meet credible data requirements to completely evaluate aquatic life status but supported WWH attaining macroinvertebrate assemblages								

EPA 2005 TMDL Report

The recommended Aquatic Life Use status for all the sites before the 2005 TMDL study was Warmwater Habitat. As a result of the TMDL study, several of the streams (sites) have had their Aquatic Life Use status changed to Modified Warmwater Habitat (MWH). Table 6.3 on the next page summarizes all the sites and their Aquatic Life Use status.

The causes of impairment identified by the EPA at the monitored sites were dissolved oxygen, nutrient/eutrophication biological indicators, low flow alteration, organic enrichment (sewage) biological indicators, nitrate/nitrite, total phosphorus, sedimentation/siltation, direct habitat alteration, low flow alteration, and temperature. The sources of the impairment were crop production with combined subsurface drainage, streambank modification/stabilization, combined sewer overflow (CSO), and agricultural-related channelization.

The fifteen sites that were studied for attainment status represented approximately 58 assessed stream miles in the Riley Creek subwatershed. In addition to the impairments mentioned in the previous paragraph, several lowhead dams near Pandora impede the natural flow in Riley Creek, and cattle access leads to erosion and elevated nutrient and bacteria concentrations. Low stream flows in headwater streams, especially in the summer, makes it difficult to support good aquatic life communities. (OEPA TMDL Report 2009)

II. Recreational Use Attainment

As reported in the 2009 TMDL Report for the Blanchard River Watershed an overall determination of the recreation use status for the WAU was made by pooling a combination of survey and Monthly Operation Report (MOR) data (Bluffton WWTP, Pandora WWTP). The recreation use is considered impaired because the 75th percentile was 2,200 CFU/100 ml and the 90th percentile was 7,600 CFU/100 ml.

Site specific evaluations of the Primary Contact Recreation (PCR) use were done on Riley Creek because it is a popular sport fishing destination. A set of five samples was collected at eight sites from June 29 - July 27, 2005. Six of these sites violated the maximum criterion, and three of those violated the geometric mean criterion.

An impact from home sewage systems and possibly runoff from livestock is evident at TR 51 (RM 19.40). This was the first site that violated the geometric mean criterion. The highest levels were documented at Spring Street (RM 15.41) just above the Bluffton WWTP. The source here is probably the Jefferson Street CSO, since there were several rainstorms during July that were heavy enough to trigger an overflow. These overflows were also identified as a major problem during the 1991 study, but Bluffton has made major collection system improvements since that time. The last site to violate the geometric mean criterion was outside Bluffton at Fett Road. (RM 13.05) This is probably a lingering impact from CSOs.

Table 6.3 EPA Water Quality Monitoring Sites - 2005 TMDL Study - Riley Creek Watershed

Map 6.1 Site #	Stream Name	Location	Drainage Area (mi^2)	River Mile	IBI	ICI[b]	Mlwb[a]	QHEI	Attainment
		MWH recommended - ECBP Ecore-							
13	Riley Creek	Hancock CR 12	5.8	24.9	$\underline{20}$*	$\underline{P}$*	nr	32.5	NON
		WWH - ECBP Ecoregion							
12	Riley Creek	Hancock CR 28	12.1	22	$\underline{26}$*	$\underline{P}$*	nr	37.0	NON
9	Riley Creek	Orange TR 51 Hancock Co.	29.4	19.5	$\underline{26}$*	MG^{ns}	7.1*	55.5	NON
7	Riley Creek	Spring St. Bluffton	44.4	15.5	34*	MG^{ns}	7.3*	61.0	Partial
5	Riley Creek	Phillips Rd.	64	11.5	$\underline{20}$*	nr	$\underline{4.3}$*	52.0	(NON)
3	Riley Creek	Putnam TR Q	68	7.4	34*	MG^{ns}	8.0^{ns}	77.5	Partial
2	Riley Creek	Putnam CR 6	70	4.4	40	F*	9.3	67.0	Partial
1	Riley Creek	Putnam TR K-6	85	1.2	42	40	10.6	78.0	Full
		WWH recommended - ECBP Ecore-							
11	Little Riley Creek (upper)	Orange TR 27 Hancock Co.	8.5	2.6	30*	F*	nr	50.0	NON
10	Little Riley Creek (upper)	Orange TR 51 Hancock Co.	14.1	1	28*	F*	nr	53.5	NON
		MWH recommended - ECBP Ecore-							
8	Marsh Run	Marsh Run at Orange TR 51	6.2	1.7	$\underline{24}$	LF*	nr	33.0	Partial
15	Little Riley Creek (lower)	Swaney Rd.	5.5	5.4	$\underline{26}$	$\underline{P}$*	nr	25.5	Partial
		WWH - ECBP Ecoregion							
14	Little Riley Creek (lower)	Hillville Rd.	12.3	4.2	$\underline{24}$*	F*	nr	64.5	NON
7	Little Riley Creek (lower)	Spring St. Bluffton	16	0.1	$\underline{24}$*	P*	nr	61.0	NON
		MWH recommended - HELP Ecore-							
4	Cranberry Run	Putnam CoolRd.	28	6.7	28	LF*	nr	31.5	Partial

* - Indicates significant departure from applicable biocriteria ($\underline{<4}$ IBI or ICI units, or < 0.5Mlwb units). Underlined scores are in Poor or Very Poor range.

[ns] - Nonsignificant departure from biocriteria ($\underline{<4}$ IBI or ICI units, or < 0.5Mlwb units).

[a] - Mlwb is not applicable to headwater streams with drainage areas $\leq$ 20 mi^2.

[b] - A narrative evaluation of the qualitative sample based on attributes such as community composition, EPT taxa richness, and number of sensitive taxa was used when quantitative data were not available or considered unreliable due to current velocities less than 0.3 fps flowing over the

III. Public Water Supply Use Attainment

The Ohio EPA 2010 Integrated Water Quality and Assessment reported under Public Drinking Water Supply Assessment reporting category was not applicable for any of the five 12-digit watersheds. The probable reason for a lack of conclusions was due to insufficient data. To find more information about the Ohio EPA 2010 Integrated Water Quality and Assessment report go to this website: http://wwwapp.epa.ohio.gov/dsw/ir2010/basin.php

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Chapter 7: Implementation Plan for the Riley Creek Watershed Restoration

Purpose

This chapter addresses the Problem Areas and presents Problem Statements in the Riley Creek as identified from the 2005 TMDL Study of the Blanchard River Watershed and local stakeholders. Development of goals, action items, and BMPs for each problem statement is discussed. An Implementation Plan for restoration will be the result.

Chapter Acknowledgements
This chapter was prepared using material from *The Outlet/Lye Creek Watershed Action Plan* and by the watershed coordinator and BRWP partners.

Agricultural Programs to Reduce Water Resource Impairments: an Overview

As in most of the subwatersheds in Blanchard River watershed, agriculture dominates the land use in the Riley Creek watershed (75.6%). As a result, many but not all of the causes and sources of water quality problems are associated with agricultural land uses.

Before discussing the specific problem statements, a discussion of Best Management Practices (BMPs) as they apply to Agricultural Nonpoint Source Pollution (AGNSP) is needed.

According to the National Water Program...

> *Best Management Practices (BMPs) are effective, practical, structural, nonstructural methods which prevent or reduce the movement of sediment, nutrients, pesticides, and other pollutants from the land to surface or groundwater, or which otherwise protect water quality from potential adverse effects of agricultural activities. These practices are developed to achieve a balance between water quality protection and agricultural production within natural and economic limitations.*

Sidebars 7.1 and 7.2 on the next two pages, review recommendations for agricultural BMPs as approved by the watershed SWCDs.

Picture 7.1 Erosion

Field erosion from a 2.6 inch rain in January 2012.

Martin

Sidebar 7.1 Blanchard River Watershed Partnership
Agricultural Subcommittee
Recommendations for watershed BMPs 2012

(These recommendations are based on input from Allen, Hancock, Hardin, Putnam, Seneca, and Wyandot SWCDs)

1. Repair broken tile mains in connection with the development of water retention areas and/or controlled drainage. Broken tile mains are often sites of serious erosion and sediment delivery to streams.
2. Increase participation in filter strip programs by increased marketing of existing programs (CRP, CREP) and/or by increasing rental rate payments (from private sources) so that payments would exceed the value of the average crop on nonflooding soils.
3. Use selective logjam removal to alleviate local flooding problems, focusing on large, complete blockage logjams. Allow smaller logjams to remain for stream habitat enhancement.
4. Use rotation incentive payments so that farmers can incorporate small grains, hay, or cover crops into their rotations. Target fields next to water courses; extend the rotation to at least three years; crops must be green (i.e. growing) during the winter. Cost share must cover seed costs, labor and chemical burn down in the spring. Cover crops can be used in this category or as stand alone measures.
5. Innovative equipment - variable rate equipment, manure equipment, yield monitors, etc. Aid to producers for conservation equipment purchase often opens doors for participation in additional conservation programs.

Some Specific BMPs to Promote

1. Filter strips, target all ditches
2. Tillage/planting equipment (non inversion)
3. Continuous No Till
4. Tile blow-out repairs
5. Manure storage
6. Manure spreading equipment
7. Composters
8. Nutrient and pest management
9. Cover crops
10. Waterways and structures
11. Repair old tile mains
12. Natural channel design (demo)
13. Incentive for continuous No Till (tier levels?)
14. Promote 3-4 year rotations (not just a corn/soybean rotation)
15. Reduce use of triazine products (Altrazine)
16. Windbreaks
17. Reduce nitrate delivery via tile (What BMP will achieve this goal?)
18. Filter strip payments/incentives to tenant farmers
19. Buy downs - GPS, yield monitors, mapping systems, geo-referencing equipment
20. Recording keeping software - GIS info software
21. Conservation tillage equipment for corn
22. Log jam removal
23. Field buffers (around whole fields, not just next to streams)
24. Address dissolved reactive phosphorus (DRP) - Combination of Practices

adopted from Sandusky River Coalition with permission

Sidebar 7.2 Guiding Principles for Watershed Action Plan Development Relative to Agricultural Nonpoint Pollution.

1. Plan components must hold promise for meeting water quality objectives:
    - Reduce aquatic life impairments within the rivers and streams of the watershed.
    - Reduce the export of pollutants that impair downstream water uses, drinking water supplies, and downstream flooding.

2. Plan components must be deemed appropriate to watershed farmers and landowners:
    - Must be economically viable to individual farmers.
    - Must recognize the importance of drainage to profitable crop production in this region.
    - Must recognize the diversity of crop and livestock production settings within the watersheds (large versus small operation; owner-operators versus renters, site specificity of BMPs).
    - Should hold promise for providing long-term solutions to problems.

3. Where appropriate, the plan components should be targeted to site specific sources and causes of site specific impairments.

4. Solving drainage problems, such as removal of problem causing logjams or repair of broken tile mains, must be an integral part of improving aquatic habitats in streams.

5. Priority for restoration of woody riparian corridors and/or in-stream habitat will be given to larger streams over smaller streams. We do not expect high quality aquatic communities in man-made drainage ditches where prior land clearing and natural streams were absent.

6. Many water quality problems represent the cumulative impact of multiple upstream sources. For these problems, remedial measures may require widespread adoption throughout the watershed. For example, grass buffer strips on many miles of small streams and ditches may be needed to help reduce sediment and nutrient inputs to streams and subsequent export.

7. Plans will address non-agricultural sources of impairments (point sources, septic tanks, urban nonpoint sources) as well as agricultural sources.

8. Where either the agricultural or environmental desired plan of practices is uncertain, the plan will suggest demonstration projects for evaluation of those practices. Farmers/landowners willing to participate in the demonstrations will be essential for evaluation of these innovative practices. Farmers/landowners participating in demonstration projects will receive extra incentives or protections related to any added risks they encounter.

9. Educational materials and programs will play an integral part in the Watershed Action Plans including their development and their implementation.

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Table 7.1 on the next page shows the impairments listed in the 2010 Ohio Water Quality Assessment Report. The table list the sources and causes of the impairments identified in the 2005 EPA Total Maximum Daily Load study at the 12-digit watershed level. Phosphorus and nitrogen were the two nutrients listed as a source of pollution in the Riley Creek watershed. Since most of the land use in the Riley Creek watershed is agricultural, phosphorus and nitrogen would be the likely nutrients causing pollution. The problems occur when phosphorus and/or nitrogen from animal waste and fertilizers are applied to farm land in amounts that exceed the amount needed by the crop or can be held by the soil. Phosphorus and nitrogen can move through runoff and subsurface drainage systems into the neighboring streams and waterways. Figure 7.1 below shows the Riley Creek watershed had a much higher phosphorus loading than the daily yield during the TMDL study. Developing BMPs to reduce the runoff of these nutrients is necessary to restore and maintain water quality in the Riley Creek watershed.

Table 7.2, on page 7-6 shows the results of the 2005 TMDL study for Total Phosphorus loading. Note in the fourth column, "Target average reduction needed", the report calls for a 38.5% reduction of total phosphorus in wasteload or Point source pollution, and a 90% reduction from household sewage treatment systems for the Riley Creek. The average of the NPS load reduction recommended for each season is 57%. That will be the phosphorus reduction target used in this plan.

Figure 7.1 Blanchard River total phosphorus yield rates from TMDL Modeling results, agriculture runoff only.

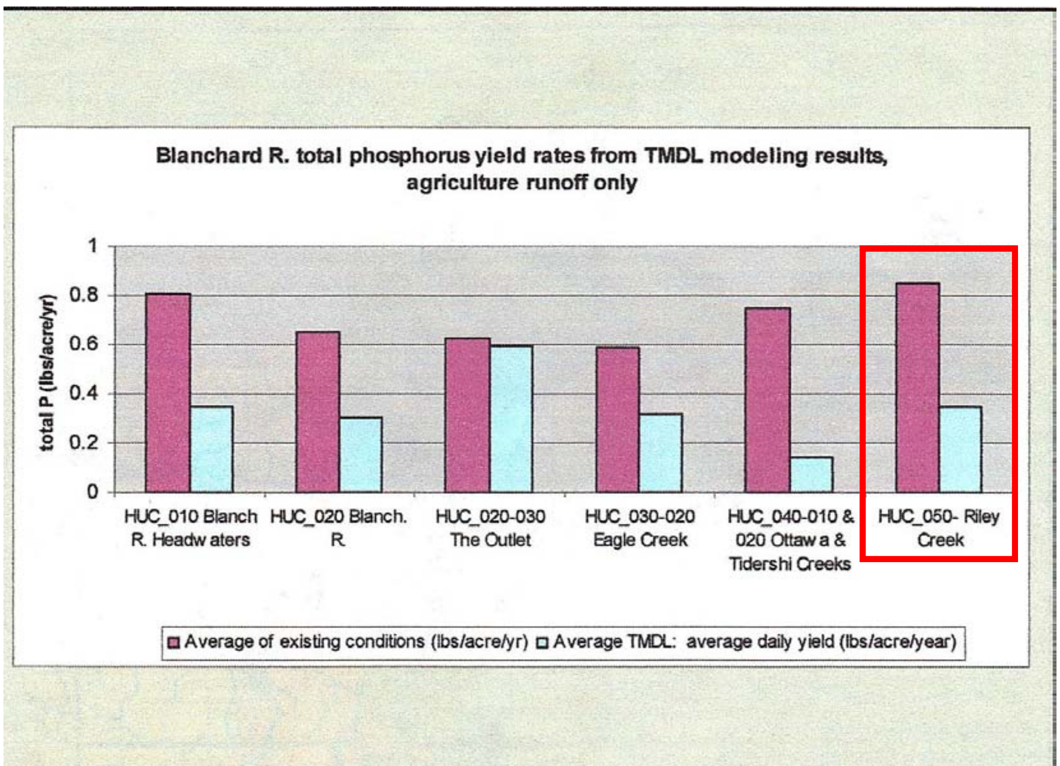


Table 7.1 Causes/Sources of Impairments in the Riley Creek Watershed at the 12-digit watershed level

12-digit watershed	Causes of Impairment	Source of Impairments
Brinkley Ditch-Little Riley Creek 04100008 04 01	direct habitat alterations	channelization
	low flow alterations	crop production with subsurface drainage
	sedimentation/siltation	streambank modifications/destabilization
Upper Riley Creek 04100008 04 02	direct habitat alterations	channelization
	organic enrichment (sewage) biological indicators	crop production with subsurface drainage
	dissolved oxygen	
	total phosphorus	
	sedimentation/siltation	
Marsh Run-Little Riley Creek 04100008 04 03	direct habitat alterations	channelization
	low flow alterations	crop production with subsurface drainage
	organic enrichment (sewage) biological indicators	urban runoff/storm sewers
	total phosphorus	
	sedimentation/siltation	
Middle Riley Creek 04100008 04 04	direct habitat alterations	channelization
	nitrate/nitrite	combined sewer overflows
	nutriemt eutrophication biological indicators	crop production with subsurface drainage
	organic enrichment (sewage) biological indicators	
	dissolved oxygen	
	sedimentation/siltation	
	water temperature	
Lower Riley Creek 04100008 04 05	direct habitat alterations	channelization
	nitrate/nitrite	combined sewer overflows
	nutriemt eutrophication biological indicators	crop production with subsurface drainage
	organic enrichment (sewage) biological indicators	dam impoundment
	total phosphorus	municipal point source discharge
	sedimentation/siltation	urban runoff/storm sewers
	water temperature	

Table 7.2 Total phosphorus TMDL Report - Riley Creek Watershed					
Season	Type of Allocation	Average of Existing Conditions (kg./day)	Target: Average needed reduction (percent)	Average TMDL: avg. daily load (kg./day)	Max. TMDL max. daily load (kg./day)
winter	LA	103.0	66.3	34.7	336.0
spring	LA	44.0	13.0	38.2	270.0
summer	LA	53.2	75.7	11.3	173.0
fall	LA	41.0	74.1	10.6	202.0
annual	WLA	9.6	**38.5**	5.92	11.6
annual	HSTS	1.3	**90.0**	0.13	1.25

LA - load allocation
WLA - wasteload allocation
HSTS - home septic treatment system

Algal Bloom Problem in Lake Erie

Picture 7.2: Algal Bloom on Lake Erie
Satellite image of Lake Erie taken in October 2011. Google images

Lake Erie is entering a very critical stage in its ecological history. The increasing growth of the algal bloom is threatening the overall balance of the lake's ecosystem. The major cause of the algal bloom is thought to be phosphorus loading from crop production. Agriculture comprises 71% of the land use in the Western Lake Erie Basin. Other sources of phosphorus loading are failing home septic treatment systems (HSTS) and urban sources, such as lawn fertilizer and storm sewer runoff from combined storm sewer overflow (CSO). This action plan will concentrate on the agriculture community, HSTS, and CSOs.

For years, it was thought that phosphorus only entered the waterways from surface runoff that carried soil particles with attached phosphorus during rain events or snow melt. Studies being conducted by the National Water Quality Center for Research (NWQCR) at Heidelberg University in Tiffin, Ohio, have shown that as much as 50% of the phosphorus could be entering the waterways as dissolved reactive phosphorus (DRP) through the plastic tile being used for drainage. The increase in DRP loading corresponds with the increase in conservation tillage practices being used by the farmers, Conservation tillage has allowed macrotubules (worm holes) to form a network for water and dissolved phosphorus to enter the drainage tile and be carried to the waterways.

The following problem statements in this chapter's Action Plan address loading from a single source with each BMP listed individually. The final plan developed to prevent the sediment, phosphorus, and nitrogen loading from agriculture fields ***must include*** an overall ***Nutrient Management Plan*** for each farm, which includes several BMPs being used in combination and ***soil testing*** of each field every 2-3 years.

Flood Issues:

Riley Creek, like most of the Blanchard River Basin, has experienced many issue of flooding over the years. One of the worst floods occurred in August of 2007. The Village of Bluffton experienced flooding, that would have been worst except for a ditch that drained a significant amount of water in the stone quarry area on the southwest corner of the village. The Army Corp of Engineers has started a flood study throughout the entire watershed. Two BMPs that are endorsed by the Army Corp of Engineers to aid in flood mitigation are wetlands and two-stage ditches. The URS Corporation was hired by the Army Corp of Engineers to analyze the entire watershed and identify potential project areas. Even though there are no specific places in this chapter calling for wetlands or two-stage ditches, there are areas where these BMPs will be used. The URS Corporation was hired by the Army Corp of Engineers to analyze the entire watershed and identify potential project areas.

Problem Area 1: Binkley Ditch-Little Riley Creek Watershed (HUC 04100008 04 01)

The Binkley Ditch-Little Riley Creek watershed covers 9,193.9 acres or 14.4 square miles. Agriculture is the largest land use (77.2% or 7098.3 acres). The 2005 Ohio TMDL Report and the 2010 Ohio Integrated Water Quality Assessment Report list the impairments for this watershed to be direct habitat alterations; low flow alteration; and sedimentation/siltation.

The source of the direct habitat alteration and low flow alterations are the channelization of the waterways and crop production with subsurface drainage. Most waterways in the Blanchard River watershed have been channelized to allow for better and faster water drainage. This allows the farmers to plan crops earlier following a rain event. Most of sedimentation/siltation is due to streambank modification/destabilization resulting from farming operations and channelization.

The 2005 TMDL Report changed the designation use for the waterways in this watershed from Warmwater Habitat (WWH) to Modified Warmwater Habitat (MWH).

The TMDL Report does not call for a specific goal for sediment reduction. Therefore, a goal of 50.0% will be used to determine the sediment reduction. The goal for phosphorus reduction called for in the TMDL Report was 57%. Figure 7.3 below shows the loadings for sediment, phosphorus, and nitrogen based on the soil in the watershed. The complete analysis can be found in Appendix B on pages B-7 through B-9.

Table 3: Binkley Ditch-Little Riley Creek (0410008 04 01)				
	Calculated loadings			
Crop Acres	Acres to Treat	P Reduction (.753 lbs./ac./yr.)	Sediment Load (.363 tns./ac./yr.	N Reduction (1.5153 lbs./ac./yr.)
7,098	5,455 S / 4046 P	3,047 lbs./yr.	1,290 tns./yr.	5,517 lbs./yr.

In the Binkley Ditch-Little Riley Creek watershed that works out to a goal of reducing Base Sediment Delivery by 1,290 tons/yr. Although Total Phosphorus was not listed as an impairment, 33% of the grabs taken during the TMDL study were high for phosphorus. With the algal bloom problems in Lake Erie from phosphorus loading, the prevention of phosphorus loading will be a included. A 57% goal reduction for phosphorus amounts to 3,047 lbs./year. Reducing the base sediment loading should also result in a nitrate-nitrite loading equal to 5,517 lbs./year.

Problem Statement 1.1: Sediment Loadings: Binkley Ditch-Little Riley Creek watershed (04100008 04 01)

The Binkley Ditch-Little Riley Creek watershed is impaired by sediment loading equal to approximately 2,600 tons of excess sediment eroding from agricultural fields per year.

Goal 1 - Reduce field erosion from agriculture cropland by 1,290 tons per year.

Objective 1 Establish riparian buffers/filter strips that treat 5,455 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQIP. and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers

Objective 2 Increase Conservation Tillage/residual management by 200 acres/yr

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 Increase Cover Crop usage by 100 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide $10/acre for cover crops

Objective 4 Install 1000 linear feet of grass waterways

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

***See Table 7.8 on page 7-36 for a summary of these strategies*.**

Problem Statement 1.2: Phosphorus Loadings: Binkley Ditch-Little Riley Creek watershed (04100008 04 01)

Binkley Ditch-Little Riley Creek watershed is impaired by sediment-associated phosphorus loading equal to approximately 5,346 lbs./yr. of phosphorus from agricultural fields per year.

Goal 1 - Reduce phosphorus loading from agriculture cropland by 3,047 lbs. per year.

Objective 1 Establish riparian buffers/filter strips that treat 4,046 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers

Objective 2 Increase Conservation Tillage/residual management by 200 acres/year

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 Increase Cover Crop usage by 100 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide $10/acre for cover crops

Objective 4 Install 1000 linear feet of grass waterways

Action 1: Local governmental agencies, such as SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

See Table 7.8 on page 7-37 for a summary of these strategies.

Other concerns:

Use of the BMPs discussed in Problem Statements 1.1 and 1.2 should also result in a nitrate-nitrite load reduction of 5,517 lbs./yr.

As mentioned on page 7-6, Dissolved Reactive Phosphorus (DRP) is becoming a major concern in the Western Lake Erie Basin and Lake Erie. The final plan developed to prevent the phosphorus loading from agriculture fields ***must include*** an overall ***Nutrient Management Plan*** for each farm, which includes several BMPs being used in combination and ***soil testing*** of each field every 2-3 years.

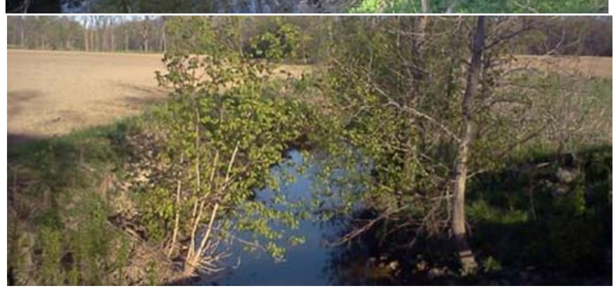
Another area of concern is the potential number of ***failing HSTS*** in this watershed. Although failing systems were not mentioned in the TMDL, they are a concern due to the number that are not permitted and the age of the systems. There is an estimated 64 failing HSTS in the watershed.

The ***direct habitat alterations and low flow alterations*** may be hard to correct, due the channelization of the tributaries and agriculture land use in this watershed. Some of the ditches are under county maintenance and would require an amendment to the maintenance contract. Picture 7.3 shows Little Riley Creek upstream from the deck of the bridge on TR 28. Picture 7.4 shows Binkley Ditch downstream from the deck of the bridge on TR 27. The closeness of the bedrock to the surface has resulted in the trough of the stream being fairly wide. Whether natural channel design, wetlands, or two-stage ditches could be used to restore habitat will be investigated.

Picture 7.3: Little Riley Creek

Little Riley Creek upstream from the deck of the bridge on TR 28.

(Martin)



Picture 7.4: Binkley Ditch

Binkley Ditch downstream from the deck of the bridge on TR 27.

(Martin)

Another area that will be studied is phosphorus coming through field tile as Dissolved Reactive Phosphorus (DRP). Money to install at least one demonstration Tile Discharge Filter (TDF) will be pursued. See Appendix E

The last area of concern that will be studied is the large number of abandoned water wells in the agricultural area. These wells may have failing casing that could increase pollutants entering the ground water.

Problem Area 2: Upper Riley Creek Watershed (HUC 04100008 04 02)

The Upper Riley Creek watershed covers 9,185 acres or 14.4 square miles. Agriculture is the largest land-use (77.4% or 7,109.1 acres). The 2005 Ohio TMDL Report and the 2010 Ohio Integrated Water Quality Assessment Report list the impairments for this watershed to be direct habitat alterations; organic enrichment (sewage) biological indicators; dissolved oxygen; total phosphorus; and sedimentation/siltation.

The source of the direct habitat alteration and low flow alterations are the channelization of the waterways and crop production with subsurface drainage. Most waterways in the Blanchard River watershed have been channelized to allow for better and faster water drainage. This allows the farmers to plan crops earlier following a rain event. Most of sedimentation/siltation is due to streambank modification/destabilization resulting from farming operations and channelization. The source of the total phosphorus is surface runoff and crop production with subsurface drainage. The low dissolved oxygen results from a combination of several sources and may not be able to be restored. The 2005 TMDL Report changed the designation use for the waterways in this watershed from Warmwater Habitat (WWH) to Modified Warmwater Habitat (MWH). Since there are no urban areas in the Upper Riley Creek, the most likely source of the organic enrichment (sewage) biological indicators is failing home septic treatment systems (HSTS).

Table 7.4: Upper Riley Creek watershed (04100008 04 02)				
	Calculated loadings			
Crop Acres	Acres to Treat	P Reduction (.564 lbs./ac./yr.)	Sediment Load (.269 tns./ac./yr.	N Reduction (1.174 lbs./ac./yr.)
7,109	5,444 S 5,815 P	3,047 lbs./yr.	956 tns./yr.	3,213 lbs./yr.

The TMDL Report does not called for a specific goal for sediment reduction. Therefore, the goal of 50.0% will be used to determine the sediment reduction. The goal for phosphorus reduction called for in the TMDL Report was 57%. The complete analysis can be found in Appendix B on pages B-10 and B-11. Table 7.4, above shows the calculated loadings for sediment, phosphorus, and nitrogen in the Upper Riley Creek watershed. In the Upper Riley Creek watershed that works out to a goal of reducing Base Sediment Delivery load by 956 tons/yr. and phosphorus by 3,047 lbs./year.

Problem Statement 2.1: Sediment Loading: Upper Riley Creek watershed (04100008 04 02)

Upper Riley Creek watershed is impaired by sediment loading equal to approximately 1,912 tons of excess sediment eroding from agricultural fields per year.

Goal 1 - Reduce sediment loading from agriculture cropland by 956 tons per year

Objective 1 Establish riparian buffers/filter strips that treat 5,444 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers

Objective 2 Increase Conservation Tillage/residual management by 200 acres/year

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 Increase Cover Crop usage by 100 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide $10/acre for cover crops

Objective 4 Install 1000 linear feet of grass waterways

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

See Table 7.8 on page 7-38 for a summary of these strategies.

Problem Statement 2.2: Phosphorus Loading: Upper Riley Creek Watershed (04100008 04 02)

> ***Upper Riley Creek watershed is impaired by phosphorus loading from sediment-associated equal to approximately 4,013 lbs./yr. of phosphorus from agricultural fields per year.***

Goal 1 - Reduce phosphorus loading from agriculture cropland by 3,047 lbs. per year

Objective 1 — Establish riparian buffers/filter strips that treat 5,815 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers

Objective 2 — Increase Conservation Tillage/residual management by 200 acres/year

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 — Increase Cover Crop usage by 100 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide $10/acre for cover crops

Objective 4 — Install 1000 linear feet of grass waterways

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

See Table 7.8 on page 7-39 for a summary of these strategies.

Background: The TMDL Report lists organic enrichment (sewage) biological indicators as a cause of impairment in the Upper Riley Creek. Since there are no areas with sewers, the only possible source for sewage would be failing home septic treatment systems (HSTS). The Hancock County Board of Health (HCBH) estimates that there are 152 home septic systems in this area. Due to the unknown types of sewage systems in this area, it is possible that the existing systems do not have proper secondary systems, which could be adding nutrients to the waterways. Based on estimated failure rate of 50% and a phosphorus loading estimate of 16.4 lbs./yr./system, the estimated loading of phosphorus from failing HSTS would be 1,246 lbs./yr.

Goal 2 - Reduce phosphorus from failing HSTS by 250 lbs. per year for 5 years.

Objective 1 — Utilize the existing septic permits to identify the type, location, and age of existing septic systems in the problem area

Action 1: Hancock County Health Department will conduct the review of their existing permits.

Action 2: Grants will be pursued to cover the cost of the Inspection.

Action 3: A centralized database will be developed to better keep track of HSTS.

Objective 2 — Collect and document additional missing septic systems data during the course of the Health District's day-to-day activities.

Action 1: Hancock County Health Department will attempt to obtain missing septic system information for homes in the target area while conducting day-to-day activities in the subwatershed.

Action 2: Grants will be pursued to cover the cost of the inspection.

Action 3: The data will be added to the centralized database.

Objective 3 — Repair/replace all individual HSTS that are failing.

Action 1: Hancock County Health Department will develop a plan to replace/repair all failing HSTS.

Action 2: Grants will be pursued to help with the cost of the replacement/repair.

Objective 4 The Hancock County Health Department will develop educational materials to distribute to homeowners.

Action 1: Letters, brochures, educational displays, newspaper articles, and other media sources will be utilized.
Action 2: Grants will be pursued to cover the cost of the materials.

See Table 7.8 on page 7-40 for a summary of these strategies.

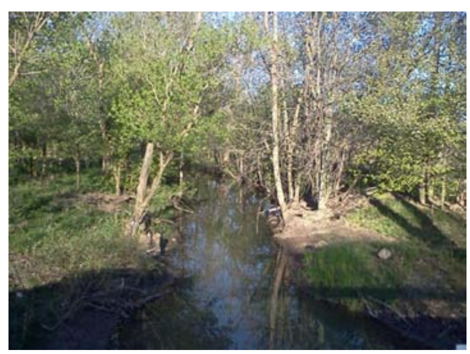
Other concerns:

Use of the BMPs discussed in Problem Statements 2.1 and 2.2 should also result in a nitrate-nitrite load reduction of 2,400 lbs./yr.

As mentioned on page 7-6, Dissolved Reactive Phosphorus (DRP) is becoming a major concern in the Western Lake Erie Basin and Lake Erie. The final plan developed to prevent the phosphorus loading from agriculture fields ***must include*** an overall ***Nutrient Management Plan*** for each farm, which includes several BMPs being used in combination and ***soil testing*** of each field every 2-3 years.

Another area that may need to be address is eroding streambanks. The Upper Riley Creek was not an area that was a part of the Stream Observation Walk conducted by the BRWP.

The ***direct habitat alterations and low flow alterations*** may be hard to correct due the channelization of the tributaries and agriculture land use in this watershed. Some of the ditches are under county maintenance and would require an amendment to the maintenance contract. Picture 7.5 shows Riley Creek upstream from the deck of the bridge on SR 235. The closeness of the bedrock to the surface has resulted in the trough of the stream being fairly wide. Whether natural channel design, wetlands, or two-stage ditches could be used to restore habitat will be investigated.



Picture 7.5: Riley Creek

Riley Creek upstream from the deck of the bridge on SR 235.
(Martin)

Another area to be studied is phosphorus coming through the field tile as Dissolved Reactive Phosphorus (DRP). Money to install at least one demonstration Tile Discharge Filter (TDF) will be pursued. See Appendix E

The last area of concern that will be studied is the large number of abandoned water wells in the agricultural area. These wells may have failing casing that could increase pollutants entering the groundwater.

Problem Area 3: Marsh Run-Little Riley Creek watershed (04100008 04 03)

The Marsh Run-Little Riley Creek watershed covers 10,405 acres or 16.3 square miles. Agriculture is the largest land-use (69.7% or 7,256.3 acres). The downstream section of the watershed is located on the west side of the Village of Bluffton. The upstream section is located in the Village of Beaverdam. The upstream area includes 2 truck stops and a gas station just east of Village Beaverdam. The 2005 Ohio TMDL Report and the 2010 Ohio Integrated Water Quality Assessment Report lists the impairments for this watershed to be direct habitat alterations; low flow alterations; organic enrichment (sewage) biological indicators; total phosphorus; and sedimentation/siltation.

The source of the direct habitat and low flow alterations are the channelization of the waterways and crop production with subsurface drainage. Most waterways in the Blanchard River watershed have been channelized to allow for better and faster water drainage. This allows the farmers to plant crops earlier following a rain event. Most of sedimentation/siltation is due to streambank modification / destabilization resulting from farming operations and channelization. The source of the total phosphorus is surface runoff and crop production with subsurface drainage. The 2005 TMDL Report changed the designation use for the waterways in this watershed from Warmwater Habitat (WWH) to Modified Warmwater Habitat (MWH). The source that caused the organic enrichment (sewage) biological indicators during the TMDL study was thought to be urban runoff/storm sewers. Failing HSTS could possibly be another source for organic enrichment (sewage) biological indicators.

Table 7.5: Marsh Run-Little Riley Creek watershed (04100008 04 03)				
	Calculated loadings			
Crop Acres	Acres to Treat	P Reduction (.768 lbs./ac./yr.)	Sediment Load (.387 tns./ac./yr.)	N Reduction (1.597 lbs./ac./yr.)
7,256	5,402	3,177 lbs./yr.	1,403 tns./yr.	6,233 lbs./yr.

The TMDL Report does not called for a specific goal for sediment reduction. Therefore, the goal of 50.0% will be used to determine the sediment reduction. The goal for phosphorus reduction called for in the TMDL Report was 57%. The complete analysis can be found in Appendix B on pages B-12 through B-13. Table 7.4 above shows the calculated loadings for sediment, phosphorus, and nitrogen in the Marsh Run-Little Riley Creek watershed. In the Marsh Run-Little Riley Creek watershed that works out to a goal of reducing Base Sediment Delivery by 1,403 tons/yr. and phosphorus by 3,177 lbs./year.

Problem Statement 3.1 Sediment loadings: Marsh Run-Little Riley Creek Watershed (04100008 04 03)

> ***The Marsh Run-Little Riley Creek watershed is impaired by sediment loading equal to approximately 2,806 tons of excess sediment eroding from agricultural fields and streambanks per year.***

Goal 1 - Reduce sediment loading from agricultural fields by 1,403 tons per year.

Objective 1 Establish riparian buffers/filter strips that treat 5402 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers

Objective 2 Increase Conservation Tillage/residual management by 200 acres/year

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 Increase Cover Crop usage by 150 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide $10/acre for cover crops

Objective 4 Install 1000 linear feet of grass waterways

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

See Table 7.8 on page 7-41 for a summary of these strategies.

Goal 2 - Reduce sediment loading from streambank erosion by 25 tons per year

<u>Objective 1</u> Stabilize 500 square feet of streambank thus, preventing erosion of 250 cubic feet of soil per year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with landowners to restore streambanks using EQUP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to landowners

See Table 7.8 on page 7-41 for a summary of these strategies.

Picture 7-6: Streambank Erosion - This picture shows typical erosion of banks along any curve on Little Riley Creek west of Bluffton. (Martin)

Problem Statement 3.2: Phosphorus loadings: Marsh Run-Little Riley Creek Watershed (04100008 04 03)

The Marsh Run-Little Riley Creek watershed is impaired by phosphorus loading from sediment associated phosphorus equal to approximately 5,573 tons of phosphorus eroding from agricultural fields per year.

Goal 1 - Reduce sediment-associated phosphorus by 3,177 lbs. per year.

Objective 1 Establish riparian buffers/filter strips that treat 5,254 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers

Objective 2 Increase Conservation Tillage/residual management by 200 acres/year

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 Increase Cover Crop usage by 150 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide $10/acre for cover crops

Objective 4 Install 1,000 linear feet of grass waterways

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

See Table 7.8 on page 7-43 for a summary of these strategies.

Background: The TMDL Report lists organic enrichment (sewage) biological indicators as a cause of impairment in the Marsh Run-Little Riley Creek watershed. The TMDL Report suggested urban runoff/storm sewers was a probable source for the impairment. Since the 2005 TMDL study, the Village of Bluffton has completely separated the storm sewers and sanitary sewers in the area of this watershed being serviced by the Village of Bluffton. The Village of Bluffton and the Allen County Health Department feel that there are probably failing home septic treatment systems (HSTS) in the watershed contributing to the problem. The Allen County Board of Health (ACBH) estimates that there are approximately 121 home septic systems in this area. Due to the unknown types of sewage systems in this area, it is possible that the existing systems do not have proper secondary systems, which could be adding nutrients and pathogens to the waterways. Based on estimated failure rate of 50% and a phosphorus loading estimate of 16.4 lbs./year/system, the estimated loading of phosphorus from failing HSTS would be 984 lbs./year.

Goal 2 - Reduce phosphorus from failing HSTS by 200 lbs. per year for 5 years. This reduction will also reduce the pathogen loading.

<u>Objective 1</u> Utilize the existing septic permits to identify the type, location, and age of existing septic systems in the problem area

Action 1: Allen County Health Department will conduct the review of their existing permits.

Action 2: Grants will be pursued to cover the cost of the inspection.

Action 3: A centralized database will be developed to better keep track of HSTS.

<u>Objective 2</u> Collect and document additional missing septic systems data during the course of the Health District's day-to-day activities

Action 1: Allen County Health Department will attempt to obtain missing septic system information for homes in the target area while conducting day-to-day activities in the watershed.

Action 2: Grants will be pursued to cover the cost of the inspection.

Action 3: The data will be added to the centralized database.

<u>Objective 3</u> Repair/replace all individual HSTS that are failing

Action 1: Allen County Health Department will develop a plan to replace/repair all failing HSTS.

Action 2: Grants will be pursued to help with the cost of the replacement/repair.

Objective 4 The Allen County Health Department will develop educational materials to pass out to homeowners.

Action 1: Letters, brochures, educational displays, newspaper articles, and other media sources will be utilized.

Action 2: Grants will be pursued to cover the cost of the materials.

See Table 7.8 on page 7-44 for a summary of these strategies.

Other concerns:

Use of the BMPs discussed in Problem Statements 3.1 and 3.2 should also result in a nitrate-nitrite load reduction of 3000 lbs./year.

As mentioned on page 7-6, Dissolved Reactive Phosphorus (DRP) is becoming a major concern in the Western Lake Erie Basin and Lake Erie. The final plan developed to prevent the phosphorus loading from agriculture fields ***must include*** an overall ***Nutrient Management Plan*** for each farm, which includes several BMPs being used in combination and ***soil testing*** of each field every 2-3 years.

At the upper end of this watershed at the intersection of I-75 and US 30 are two truck stops and several restaurants. The surface runoff from the impervious surfaces in this area could contribute many pollutants to the waterways in the area. The need to prevent pollutants from these areas will be investigated.

The ***direct habitat alterations and low flow alterations*** may be hard to correct due the channelization of the tributaries and agriculture land use in this watershed. Some of the ditches are under county maintenance and would require an amendment to the maintenance contract. Picture 7.7 shows a ditch upstream from the deck of the bridge on Swaney Rd.. The closeness of the bedrock to the surface has resulted in the trough of the stream being fairly wide. Whether natural channel design, wetlands, or two-stage ditches could be used to restore habitat will be investigated.

Picture 7-7: Truck Stop Area at the I-75 and US 30 Intersection (ERIN)

Picture 7-8: Ditch looking upstream from the deck of the bridge on Swaney Rd. (Martin)

Problem Area 4: Middle Riley Creek watershed 04100008 04 04

The Middle Riley Creek watershed covers 9,995.5 acres or 15.6 square miles. Agriculture is the largest land use (71.8% or 7175.8 acres). The downstream area of the watershed is located on the east side of the Village of Bluffton. The 2005 Ohio TMDL Report and the 2010 Ohio Integrated Water Quality Assessment Report lists the impairments for this watershed to be direct habitat alterations; nitrate/nitrite; nutrient eutrophication biological indicators; organic enrichment (sewage) biological indicators; dissolved oxygen; sedimentation/siltation; and water temperature.

The sources of the direct habitat alteration, low dissolved oxygen, and high water temperature are the channelization of the waterways and crop production with subsurface drainage. Most waterways in the Blanchard River watershed have been channelized to allow for better and faster water drainage. This allows the farmers to plant crops earlier following a rain event. Most of sedimentation/ siltation is due to streambank modification/destabilization resulting from farming operations and channelization.

The 2005 TMDL Report changed the designation use for the waterways in this watershed from Warmwater Habitat (WWH) to Modified Warmwater Habitat (MWH).

Table 7.6: Middle Riley Creek (04100008 04 04)				
	Calculated loadings			
Crop Acres	Acres to Treat	P Reduction (.886 lbs./ac./yr.)	Sediment Load (.416 tns./ac./yr.	N Reduction (1.915 lbs./ac./yr.)
7176	5761	3625 lbs./yr.	1492 tns./yr.	5291 lbs./yr.

The TMDL Report does not called for a specific goal for sediment reduction. Therefore, the goal of 50.0% will be used to determine the sediment reduction. The goal for phosphorus reduction called for in the TMDL Report was 57%. A 38.5% reduction goal will also be used for nitrogen. The complete analysis can be found in Appendix B on pages B-14 through B-16.
Table 7.6 above shows the calculated loadings for sediment, phosphorus, and nitrogen in the Middle Riley Creek watershed. In the Middle Riley Creek watershed, that works out to a goal of reducing Base Sediment Delivery by 1,492 tons/year; phosphorus by 3,625 lbs./year; and nitrate-nitrites by 5,291 lbs./ year.

NOTE OF CONCERN - The Middle Riley Creek watershed empties into the Lower Riley watershed. The Lower Riley enters the Blanchard River at RM. 30.1, which is located above the water intake for the Village of Bluffton reservoir. Any loadings, especially nitrate-nitrites from Riley Creek that enters the river, becomes a potential problem for the Village of Ottawa's water supply. The TMDL study showed nitrate-nitrites level to be above the target of 1.5 mg/L in 2 grabs during June and July of 2005averaging 3.36 mg/L per grab.

Problem Statement 4.1: Sediment loadings: Middle Riley Creek watershed (04100008 04 04)

The Middle Riley Creek watershed is impaired by sediment loading equal to approximately 2,984 tons of excess sediment eroding from agricultural fields per year.

Goal 1 - Reduce sediment loading by 1,492 tons per year.

Objective 1 — Establish riparian buffers/filter strips that treat 5,761 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers.

Objective 2 — Increase Conservation Tillage/residual management by 200 acres/year

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 — Increase Cover Crop usage by 175 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide $10/acre for cover crops

Objective 4 — Install 1000 linear feet of grass waterways.

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

See Table 7.8 on page 7-45 for a summary of these strategies.

Problem Statement 4.2: Phosphorus loadings: Middle Riley Creek watershed (04100008 04 04)

> ***The Middle Riley Creek watershed is impaired by phosphorus loading from sediment associated phosphorus equal to approximately 6,360 lbs. of phosphorus eroding from agricultural fields per year.***

Goal 1 - Reduce sediment-associated phosphorus by 3,625 lbs. per year.

Objective 1 Establish riparian buffers/filter strips that treat 5418 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers

Objective 2 Increase Conservation Tillage/residual management by 125 acres/year

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 Increase Cover Crop usage by 150 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide $10/acre for cover crops

Objective 4 Install 1000 linear feet of grass waterways

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

See Table 7.8 on page 7-46 for a summary of these strategies.

Background: The TMDL Report lists organic enrichment (sewage) biological indicators as a cause of impairment in the Middle Riley Creek watershed. The TMDL Report suggested urban runoff/storm sewers and failing HSTS were the probable sources for the impairment. Since the 2005 TMDL study, the Village of Bluffton has completely separated the storm sewers and sanitary sewers in the area of this watershed being serviced by the Village of Bluffton. The Hancock County Board of Health (HCBH) estimates that there are approximately 202 home septic systems in the Hancock County portion of the watershed. Due to the unknown types of sewage systems in this area, it is possible that the existing systems do not have proper secondary systems, which could be adding nutrients and pathogens to the waterways. Based on estimated failure rate of 30% and a phosphorus loading estimate of 16.4 lbs./year/system, the estimated loading of phosphorus from failing HSTS would be 1,000.4 lbs./year.

Goal 2 - Reduce phosphorus from failing HSTS by 200 lbs. per year for 5 years. This reduction will also reduce the pathogen loading.

<u>Objective 1</u> Utilize the existing septic permits to identify the type, location, and age of existing septic systems in the problem area

Action 1: Hancock County Board of Health will conduct the review of their existing permits.

Action 2: Grants will be pursued to cover the cost of the inspection.

Action 3: A centralized database will be developed to better keep track of HSTS.

<u>Objective 2</u> Collect and document additional missing septic systems data during the course of the Health District's day-to-day activities

Action 1: Hancock County Board Health will attempt to obtain missing septic system information for homes in the target area while conducting day-to-day activities in the watershed.

Action 2: Grants will be pursued to cover the cost of the inspection.

Action 3: The data will be added to the centralized database.

<u>Objective 3</u> Repair/replace all individual HSTS that are failing.

Action 1: Hancock County Board Health will develop a plan to replace/repair all failing HSTS.

Action 2: Grants will be pursued to help with the cost of the replacement/repair.

Objective 4 The Hancock County Board of Health will develop educational materials to pass out to homeowners.

Action 1: Letters, brochures, educational displays, newspaper articles, and other media sources will be utilized.
Action 2: Grants will be pursued to cover the cost of the materials.

See Table 7.8 on page 7-47 for a summary of these strategies.

Problem Statement 4.3: Nitrate-nitrite Loading: Middle Riley Creek watershed (04100008 04 04)

The Middle Riley Creek watershed is impaired by sediment-associated nitrate-nitrite loading equal to approximately 13,742 lbs./year of nitrate-nitrite from agricultural fields per year.

Goal 1 - Reduce nitrate-nitrite loading from agriculture cropland by 5,291 lbs. per year.

Objective 1 Establish riparian buffers/filter strips that treat 3,346 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers

Objective 2 Increase Conservation Tillage/residual management by 200 acres/year

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 Increase Cover Crop usage by 175 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide $10/acre for cover crops.

Objective 4 Install 1000 linear feet of grass waterways

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQIP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

See Table 7.8 on page 7-48 for a summary of these strategies.

Other concerns:

As mentioned on page 7-6, Dissolved Reactive Phosphorus (DRP) is becoming a major concern in the Western Lake Erie Basin and Lake Erie. The final plan developed to prevent the phosphorus loading from agriculture fields ***must include*** an overall ***Nutrient Management Plan*** for each farm, which includes several BMPs being used in combination and ***soil testing*** of each field every 2-3 years.

Problem Area 5: Lower Riley Creek watershed 04100008 04 05

The Lower Riley Creek watershed covers 16,094.6 acres or 20.0 square miles. Agriculture is the largest land use (79.7% or 12,831.1 acres). The upstream area of the watershed is located on the northwest side of the Village of Bluffton at the mouth of Little Riley Creek. The Village of Pandora is located in this watershed. The 2005 Ohio TMDL Report and the 2010 Ohio Integrated Water Quality Assessment Report lists the impairments for this watershed to be direct habitat alterations; nitrate/nitrite; nutrient eutrophication biological indicators; organic enrichment (sewage) biological indicators; total phosphorus; sedimentation/ siltation; and water temperature.

The sources of the direct habitat alteration, total phosphorus, nitrate/nitrite, nutrient eutrophication biological indicators; and high water temperature are the channelization of the waterways; crop production with subsurface drainage; and dam impoundment. Most waterways in the Blanchard River watershed have been channelized to allow for better and faster water drainage. This allows the farmers to plant crops earlier following a rain event. Most of sedimentation/siltation is due to streambank modification/destabilization resulting from farming operations and channelization. The source of the organic enrichment (sewage) biological indicators could be combined sewer overflows (CSO), urban runoff/ storm sewers, animal in the creek, and/or municipal point source discharge.

The 2005 TMDL Report changed the designation use for the waterways in this watershed from Warmwater Habitat (WWH) to Modified Warmwater Habitat (MWH).

Table 7.7: Lower Riley Creek watershed (04100008 04 05)				
	Calculated loadings			
Crop Acres	Acres to Treat	P Reduction (.494 lbs./ac./yr.)	Sediment Load (.550 tns./ac./yr.	N Reduction (1.066 lbs./ac./yr.)
12,831	9866	3615 lbs./yr.	1839 tns./yr.	5291 lbs./yr.

The TMDL Report does not called for a specific goal for sediment reduction. Therefore, the goal of 50.0% will be used to determine the sediment reduction. The goal for phosphorus reduction called for in the TMDL Report was 57%. A 38.5% reduction goal will also be used for nitrogen. The complete analysis can be found in Appendix B on pages B-17 through B-20. Table 7.7, above shows the calculated loadings for sediment, phosphorus, and nitrogen in the Lower Riley Creek watershed. In the Lower Riley Creek watershed that works out to a goal of reducing Base Sediment Delivery by 1,839 tons/year; phosphorus by 3,615 lbs./year; and Nitrogen by 5,291 lbs./year.

NOTE OF CONCERN - The Lower Riley enters the Blanchard River at RM. 30.1, which is located above the water intake for the Village of Bluffton reservoir. Any loadings, especially nitrate-nitrites from Riley Creek that enters the river, becomes a potential problem for the Village of Ottawa's water supply. The TMDL Study showed nitrate-nitrites level to be above the target of 1.5 mg/L in 2 grabs during June and July of 2005averaging 3.36 mg/L per grab.

Problem Statement 5.1: Sediment loading: Lower Riley Creek watershed (04100008 04 05)

The Lower Riley Creek watershed is impaired by sediment loading equal to approximately 3,679 tons of excess sediment eroding from agricultural fields per year.

Goal 1 - Reduce field erosion from agriculture cropland by 1,839 tons per year.

Objective 1 — Establish riparian buffers/filter strips that treat 6,128 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQUP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers

Objective 2 — Increase Conservation Tillage/residual management by 200 acres/year

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 — Increase Cover Crop usage by 175 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQUP and other programs.

Action 2: Seek funding to provide $10/acre for cover crops

Objective 4 — Install 1000 linear feet of grass waterways

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQUP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and Financial incentives to farmers

See Table 7.8 on page 7-49 for a summary of these strategies.

Problem Statement 5.2: Phosphorus loadings: Lower Riley Creek watershed (04100008 04 05)

The Lower Riley Creek watershed is impaired by phosphorus loading from sediment associated phosphorus equal to approximately 6,342 tons of phosphorus eroding from agricultural fields per year.

Goal 1 - Reduce sediment-associated phosphorus by 2,442 lbs. per year.

Objective 1 Establish riparian buffers/filter strips that treat 9866 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQUP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers

Objective 2 Increase Conservation Tillage/residual management by 200 acres/year

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 Increase Cover Crop usage by 175 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQUP and other programs.

Action 2: Seek funding to provide $10/acre for cover crops

Objective 4 Install 1000 linear feet of grass waterways

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQUP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

See Table 7.8 on page 7-50 for a summary of these strategies.

Background: The TMDL Report lists organic enrichment (sewage) biological indicators as a cause of impairment in the Lower Riley Creek watershed. The TMDL Report suggested urban runoff/storm sewers and failing HSTS were the probable sources for the impairment. Since the 2005 TMDL study, the Village of Bluffton has completely separated the storm sewers and sanitary sewers in the area of this watershed being serviced by the Village of Bluffton. The Village of Pandora also has completely separated their storm sewers and sanitary sewers This leaves the probable cause(s) of the organic enrichment (sewage) biological indicators to be failing HSTS and/or animals waste in Riley Creek. The Allen and Putnam County Boards of Health estimate that there are approximately 401 home septic systems in the Lower Riley Creek watershed. Due to the unknown types of sewage systems in this area, it is possible that the existing systems do not have proper secondary systems, which could be adding nutrients and pathogens to the waterways. Based on estimated failure rate of 30% and a phosphorus loading estimate of 16.4 lbs./year/system, the estimated loading of phosphorus from failing HSTS would be 1973 lbs./year.

Goal 2 - Reduce phosphorus from failing HSTS by 400 lbs. per year for 5 years. This reduction will also reduce the pathogen loading.

Objective 1 Utilize the existing septic permits to identify the type, location, and age of existing septic systems in the problem area

Action 1: Allen and Putnam County Boards of Health will conduct the review of their existing permits.

Action 2: Grants will be pursued to cover the cost of the inspection.

Action 3: A centralized database will be developed to better keep track of HSTS.

Objective 2 Collect and document additional missing septic systems data during the course of the Health District's day-to-day activities

Action 1: Allen and Putnam County Boards of Health will attempt to obtain missing septic system information for homes in the target area while conducting day-to-day activities in the watershed.

Action 2: Grants will be pursued to cover the cost of the inspection.

Action 3: The data will be added to the centralized database.

Objective 3 Repair/replace all individual HSTS that are failing.

Action 1: Allen and Putnam County Boards of Health and other interested parties will evaluate and develop a plan for Existing HSTS; the plan will include monitoring, maintenance, and repairs/replacement, as needed.

Action 2: Grants will be pursued to help with the cost of the replacement/repair.

Objective 4 The Allen and Putnam County Boards of Health will develop educational materials to pass out to homeowners.

Action 1: Letters, brochures, educational displays, newspaper articles, and other media sources will be utilized.

Action 2: Grants will be pursued to cover the cost of the materials.

See Table 7.8 on page 7-51 for a summary of these strategies.

Problem Statement 5.3: Nitrate-nitrite Loading: Lower Riley Creek Watershed (04100008 04 05)

The Lower Riley Creek watershed is impaired by sediment-associated nitrate-nitrite loading equal to approximately 13,742 lbs./year of nitrate-nitrite from agricultural fields per year.

Goal 1 - Reduce nitrate-nitrite loading from agriculture cropland by 6,665 lbs. per year.

Objective 1 Establish riparian buffers/filter strips that treat 8,640 acres of cropland

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practices using CRP, CREP, EQUP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

Action 3: Conduct a Conservation Practice Day in the watershed for the farmers

Objective 2 Increase Conservation Tillage/residual management by 200 acres/year

Action 1: Conduct annual no-till day

Action 2: Seek funding to provide $25/acre no-till

Objective 3 Increase Cover Crop usage by 175 acres/year

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using
CRP, CREP, EQUP and other programs.

Objective 4 Install 1000 linear feet of grass waterways

Action 1: Local governmental agencies, such as local SWCDs, ODNR, NRCS, and EDF will work with farmers to install the practice using CRP, CREP, EQUP and other programs.

Action 2: Seek funding to provide Cost Sharing Funding and financial incentives to farmers

See Table 7.8 on page 7-52 for a summary of these strategies.

Other Concerns:

- As mentioned on page 7-6, Dissolved Reactive Phosphorus (DRP) is becoming a major concern in the Western Lake Erie Basin and Lake Erie. The final plan developed to prevent the phosphorus loading from agriculture fields ***must include*** an over-all ***Nutrient Management Plan*** for each farm, which includes several BMPs being used in combination and ***soil testing*** of each field every 2-3 years.

- There are 4 low head dams located at RM. 1.3, RM 4.6, RM 7.3, and RM 7.5. There are 2 small concrete dams located at RM 5.0 and RM 6.0. All of these dams are on private property. Each dam will be studied to see what affect the removal of that dam will have on the flow and aquatic habitat. The owner will be contacted; presented with the data collected; and determine his willingness to have the dam removed. If removal of a dam proves to be beneficial, grant money will be pursued to cover the cost of removal.

- The TMDL mentioned that animals in Riley Creek in this watershed was a source of the cause of organic enrichment (sewage) biological indicators. A survey of farmers along Riley Creek will be conducted to determine if any farmer is still allowing animals assess to Riley Creek. If such a situation is found to exist, the farmer will be contacted to determine the need for allowing animals to be in Riley Creek. A solution to stop the use of Riley Creek will be pursued.

Picture 7.9:

One of the dams on the Riley Creek.

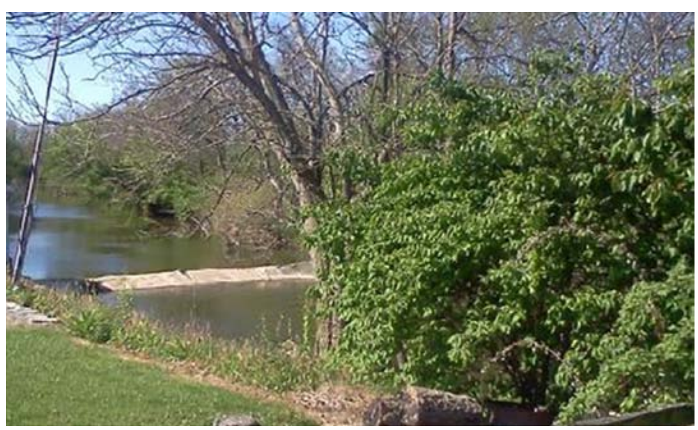


Table 7.8: Strategies for Implementing Restoration projects in the Riley Creek watershed

The purpose of this table is to summarize the restoration strategies for each problem statement in the watershed. The table includes a description, estimated load reduction (where applicable), timeline, what agencies are involved, funding, and performance indicators. The BRWP thanks all the agencies that were involved in completing the watershed action plan.

Acronyms for Table

ACBH - Allen County Board of Health
ACC - Allen County Commissioners
ACE - Allen County Engineers
ASWCD - Allen Soil & Water Conservation District
BRWP - Blanchard River Watershed Partnership
EDF - Environmental Defense Fund
HCBH - Hancock County Board of Health
HCC - Hancock County Commissioners
HCE - Hancock County Engineers
HSWCD - Hancock Soil & Water Conservation District
HrCBH - Hardin County Board of Health
HrCC - Hardin County Commissioners
HrCE - Hardin County Engineers
HrSWCD - Hardin Soil & Water Conservation District
NRCS - National Reserve Conservation Service
ODNR - Ohio Department of Natural Resources
PCC - Putnam County Commissioners
PCE - Putnam County Engineer
PCHD - Putnam County Health Department
PSWCD - Putnam Soil & Water Conservation District
USACE - United States Army Corps of Engineers
VB - Village of Bluffton
VP - Village of Pandora

Table 7.8: Problem Area 1: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Binkley Ditch-Little Riley Creek watershed (HUC 04100008 04 01)

Strategy	Description	Estimated load reduction (Avg.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 1.1 Goal 1	**Reduce field erosion by by 1,290 tons/year**	Total after 5 - years				5 - year implementation
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	1,290 tons/yr (S)	2013-2017	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase filter strip drainage area by 1,100 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	0.50 tons/yr. (S)	2013-2017	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase conservation tillage/residue management by 40 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	0.25 tons/yr. (S)	2013-2017	NRCS, EDF HSWCD, HrSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase cover crop usage by 20 acres/year
Install Grass Waterways where needed	Program to increase sign-up for farm bill programs with additional incentives	0.125 tons/yr. (S)	2013-2017	NRCS, EDF HSWCD ODNR	CREP, CRP, EQIP	Install 200 linear feet/year.
Continue conservation program participation campaign and educational outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing	NRCS, EDF HSWCD, HrSWCD, ODNR, BRWP	Grants Local support	No net loss in current BMP acreage

Table 7.8 Problem Area 1: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Binkley Ditch-Little Riley Creek watershed (HUC 04100008-04-01)

Strategy	Description	Estimated load reduction (Avg.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 1.2 Goal 1	**Reduce Phosphorus loading by 3,047 lbs./year**	Total after 5-years				
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	3047 lbs./yr. (P)	2013-2017	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP CRP EQIP Grants	Increase filter strip drainage area by 810 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	100 lbs./yr. (P)	2013-2017	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP CRP EQIP Grants	Increase conservation tillage/residue management by 40 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	50 lbs./yr. (P)	2013-2017	NRCS, EDF, HSWCD, HRSWCD ODNR	CREP CRP EQIP Grants	Increase cover crop usage by 20 acres/year
Install Grass Waterways where Needed	Program to increase sign-up for farm bill programs with additional incentives	50 lbs./yr. (P)	2013-2017	NRCS, EDF, HSWCD, ODNR,	CREP CRP EQIP grants	Install 200 linear feet/year
Continue conservation program participation cam-Paign and educational outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing	NRCS, EDF, HSWCD, HrSWCD, ODNR, BRWP	Grants Local support	No net loss in current BMP acreage

Table 7.8 Problem Area 2: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Upper Riley Creek watershed (HUC 04100008 04 02)

Strategy	Description	Estimated load reduction (avg./yr.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 2.1 Goal 1	**Reduce field erosion by by 956 tons/year**					
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	956 tons/yr. (S)	2013-2017	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase filter strip drainage area by 5444 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	0.25 tns./ac./yr. (S)	2013-2017	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase conservation tillage/residue management by 40 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	125 lbs./ac./yr. (S)	2013-2016	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase cover crop usage by 20 acres/year
Install Grass Waterways where needed	Program to increase sign-up for farm bill programs with additional incentives	125 lbs./ac./yr. (S)	2013-2016	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP, CRP, EQIP, grants	Install 200 linear feet/year.
Continue conservation program participation campaign and educational outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing	NRCS, EDF, HSWCD, HrSWCD, ODNR, BRWP	Grants Local support	No net loss in current BMP acreage

Table 7.8 Problem Area 2: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Upper Riley Creek watershed (HUC 04100008 04 02)

Strategy	Description	Estimated load reduction (avg./yr.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 2.2 Goal 1	**Reduce Phosphorus loading by 3047 lbs./year**					
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	3047 lbs./yr. (P)	2013-2017	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase filter strip drainage area by 5815 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	100 lbs./yr. (P)	2013-2017	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase conservation tillage/residue management by 40 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	50 lbs./yr. (P)	2013-2017	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase cover crop usage by 20 acres/year
Install Grass Waterways where needed	Program to increase sign-up for farm bill programs with additional incentives	176 lbs./yr. (S)	2013-2016	NRCS, EDF, HSWCD, HrSWCD, ODNR	CREP, CRP, EQIP, grants	Install 200 linear feet/year.
Continue conservation program participation campaign and educational outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing	NRCS, EDF, HSWCD, HrSWCD, ODNR, BRWP	Grants Local support	No net loss in current BMP acreage

Table 7.8 Problem Area 2: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Upper Riley Creek watershed. (HUC 04100008 04 02)

Strategy	Description	Estimated load reduction (avg.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 2.2 Goal 2	**Reduce/eliminate Phosphorus from HSTS**	Total after 5-years				
Inventory all existing HSTS in the problem area	The H/WBH estimates that has many as 50% of the HSTS are nonpermitted or 25 years old or older	N/A	2013-2017	HCBH, HCE, HCC, BRWP	Grants 319 grant	Each time a system is replaced or a tank is pumped, the Health Depts. are notified.
Repair/replace all failing HSTS repaired/replaced	There are several HSTS are in need of being repair/replacement	1250 lbs.	2013-2017	HCBH, HCC, BRWP	Grants 319 grants	Final tally
Provide educational materials on proper care/maintenance of HSTS	Homeowners will be provided information on how to care and maintain their HSTS	not applicable	on going	HCBH, BRWP	local money grants	Final handouts

Table 7.8 Problem Area 3: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Marsh Run - Little Riley Creek watershed (HUC 04100008 04 03)

Strategy	Description	Estimated load reduction (avg./yr.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 3.1 Goal 1	**Reduce field erosion by by 1,403 tons/year**					
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	1,403 tons/yr. (S)	2013-2017	NRCS, EDF, ASWCD, HSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase filter strip drainage area by 5402 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	0.25 tns./ac./yr. (S)	2013-2017	NRCS, EDF, ASWCD, HSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase conservation tillage/residue management by 40 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	140 lbs./ac./yr. (S)	2013-2017	NRCS, EDF, ASWCD, HSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase cover crop usage by 30 acres/year
Install Grass Waterways where needed	Program to increase sign-up for farm bill programs with additional incentives	125 lbs./ac./yr. (S)	2013-2017	NRCS, EDF, ASWCD, HSWCD, ODNR	CREP, CRP, EQIP, grants	Install 200 linear feet/year.
Continue conser-vation program participation cam-paign and educa-tional outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing	NRCS, EDF, ASWCD, HSWCD, ODNR, BRWP	Grants Local support	No net loss in current BMP acreage

Table 7.8 Problem Area 3: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Marsh Run - Little Riley Creek watershed (HUC 04100008 04 03)

Strategy	Description	Estimated load reduction (avg./yr.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 3.1 Goal 2	**Reduce Streambank erosion by 25 tons/year**					
Restore / stabilize Eroding stream-Tillage/residue management	Program to sign up landowners to restore / stabilize eroding streambanks	125 tns./yr. (S)	2013-2017	NRCS, EDF, ASWCD, BRWP	CREP, EQIP, grants ODNR	500 sq. ft.

Table 7.8 Problem Area 3: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Marsh Run-Little Riley Creek watershed (HUC 04100008 04 03)

Strategy	Description	Estimated load reduction (avg./yr.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 3.2 Goal 1	**Reduce Phosphorus by 2,146 lbs./year**					
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	2,146 lbs./yr. (P)	2013-2017	NRCS, EDF, ASWCD, ODNR	CREP, CRP, EQIP, Grants	Increase filter strip drainage area by 3,549 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	200 lbs./yr. (P)	2013-2017	NRCS, EDF, ASWCD, ODNR	CREP, CRP, EQIP, Grants	Increase conservation tillage/residue management by 150 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	150 lbs./yr. (P)	2013-2017	NRCS, EDF, ASWCD, ODNR	CREP, CRP, EQIP, Grants	Increase cover crop usage by 150 acres/year
Install Grass Waterways where needed	Program to increase sign-up for farm bill programs with additional incentives	250 lbs./yr. (P)	2013-2016	NRCS, EDF, ASWCD, ODNR	CREP, CRP, EQIP, grants	Install 1000 linear feet/year.
Continue conservation program participation campaign and educational outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing	NRCS, EDF, ASWCD, ODNR, BRWP	Grants Local support	No net loss in current BMP acreage

Table 7.8 Problem Area 3: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Marsh Run-Little Riley Creek watershed. (HUC 04100008 04 03)

Strategy	Description	Estimated load reduction (avg.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 3.2 Goal 2	**Reduce/eliminate Phosphorus from HSTS**					
Inventory all existing HSTS in the problem area	The H/WBH estimates that has many as 50% of the HSTS are nonpermitted or 25 years old or older	N/A	2013-2017	ACBH, ACE, ACC, BRWP	Grants 319 grant	Each time a system is replaced or a tank is pumped, the Health Dept. are notified.
Repair/replace all failing HSTS repaired/replaced	There are several HSTS are in need of being repair/replacement	984 lbs./yr.	2013-2017	ACBH, ACC, BRWP	Grants 319 grants	Final tally
Provide educational materials on proper care/maintenance of HSTS	Homeowners will be provided information on how to care and maintain their HSTS	not applicable	on going	ACBH, BRWP	local money grants	Final handouts

Table 7.8 Problem Area 4: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Middle Riley Creek watershed (HUC 04100008 04 04)

Strategy	Description	Estimated load reduction (avg./yr.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 4.1 Goal 1	**Reduce field erosion by by 1,492 tons/year**					
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	1,492 tons/yr. (S)	2013-2017	NRCS, EDF, ASWCD, HSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase filter strip drainage area by 5,761 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	1,000lbs./yr. (S)	2013-2017	NRCS, EDF, ASWCD, HSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase conservation tillage/residue management by 200 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	700 lbs./yr. (S)	2013-2017	NRCS, EDF, ASWCD, HSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase cover crop usage by 175 acres/year
Install Grass Waterways where needed	Program to increase sign-up for farm bill programs with additional incentives	500 lbs./yr. (S)	2013-2017	NRCS, EDF, ASWCD, HSWCD, ODNR	CREP, CRP, EQIP, grants	Install 1000 linear feet/year.
Continue conservation program participation campaign and educational outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing	NRCS,EDF, ASWCD, HSWCD, ODNR, BRWP	Grants Local support	No net loss in current BMP acreage

Table 7.8 Problem Area 4: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Middle Riley Creek watershed (HUC 04100008 04 04)

Strategy	Description	Estimated load reduction (avg./yr.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 4.2 Goal 1	**Reduce Phosphorus by 3,625 lbs./year**					
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	3,625 lbs./yr. (P)	2013-2017	NRCS, EDF, ASWCD, ODNR , HSWCD	CREP, CRP, EQIP, Grants	Increase filter strip drainage area by 5,418 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	175 lbs./yr. (P)	2013-2017	NRCS, EDF, ASWCD, ODNR	CREP, CRP, EQIP, Grants	Increase conservation tillage/residue management by 125 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	150 lbs./yr. (P)	2013-2017	NRCS, EDF, ASWCD, ODNR	CREP, CRP, EQIP, Grants	Increase cover crop usage by 150 acres/year
Install Grass Waterways where needed	Program to increase sign-up for farm bill programs with additional incentives	250 lbs./yr. (P)	2013-2016	NRCS, EDF, ASWCD, ODNR	CREP, CRP, EQIP, grants	Install 1000 linear feet/year.
Continue conservation program participation campaign and educational outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing	NRCS, EDF, ASWCD, ODNR, BRWP	Grants Local support	No net loss in current BMP acreage

Table 7.8 Problem Area 4: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Middle Riley Creek watershed. (HUC 04100008 04 04)

Strategy	Description	Estimated load reduction (avg.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 4.2 Goal 2	**Reduce/eliminate Phosphorus from HSTS**					
Inventory all existing HSTS in the problem area	The ACBH/HCBH estimates that has many as 50% of the HSTS are nonpermitted or 25 years old or older	N/A	2013-2017	ACBH, ACC, ACE, BRWP, HCBH, HCC, HCE	Grants 319 grant	Each time a system is replaced or a tank is pumped, the Health Depts. are notified.
Repair/replace all failing HSTS repaired/replaced	There are several HSTS are in need of being repair/replacement	1000 lbs./yr.	2013-2017	ACBH, ACC, ACE, HCC, BRWP, HCE, HCBH	Grants 319 grants	Final tally
Provide educational materials on proper care/maintenance of HSTS	Homeowners will be provided information on how to care and maintain their HSTS	not applicable	on going	ACBH, BRWP	local money grants	Final handouts

Table 7.8 Problem Area 4 : Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Middle Riley Creek watershed (HUC 04100008 04 04)

Strategy	Description	Estimated load reduction (avg./yr.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 4.3 Goal 1	**Reduce Nitrogen loading by 5,291 lbs./year**					
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	5,291 lbs./yr. (N)	2013-2017	NRCS, EDF, ASWCD, ODNR , HSWCD	CREP, CRP, EQIP, Grants	Increase filter strip drainage area by 3,346 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	60 lbs./yr. (N)	2013-2017	NRCS, EDF, ASWCD, ODNR , HSWCD	CREP, CRP, EQIP, Grants	Increase conservation tillage/residue management by 200 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	55 lbs./yr. (N)	2013-2017	NRCS, EDF, ASWCD, ODNR , HSWCD	CREP, CRP, EQIP, Grants	Increase cover crop usage by 175 acres/year
Install Grass Waterways where needed	Program to increase sign-up for farm bill programs with additional incentives	50 lbs./yr. (N)	2013-2017	NRCS, EDF, ASWCD, ODNR , HSWCD	CREP, CRP, EQIP, grants	Install 1000 linear feet/year.
Continue conservation program participation campaign and educational outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing	NRCS, EDF, ASWCD, ODNR, BRWP, HSWCD	Grants Local support	No net loss in current BMP acreage

Table 7.8 Problem Area 5: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Lower Riley Creek watershed (HUC 04100008 04 05)

Strategy	Description	Estimated load reduction (avg./yr.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 5.1 Goal 1	**Reduce field erosion by by 1,839 tons/year**					
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	1,839 tons/yr. (S)	2013-2017	NRCS, ASWCD, PSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase filter strip drainage area by 6,128 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	1,000lbs./yr. (S)	2013-2017	NRCS, ASWCD, PSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase conservation tillage/residue management by 200 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	700 lbs./yr. (S)	2013-2017	NRCS, ASWCD, PSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase cover crop usage by 175 acres/year
Install Grass Waterways where needed	Program to increase sign-up for farm bill programs with additional incentives	500 lbs./yr. (S)	2013-2017	NRCS, ASWCD, PSWCD, ODNR	CREP, CRP, EQIP, grants	Install 1000 linear feet/year.
Continue conser-vation program participation cam-paign and educa-tional outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing	NRCS, ASWCD, PSWCD, ODNR, BRWP	Grants Local support	No net loss in current BMP acreage

Table 7.8 Problem Area 5: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Lower Riley Creek watershed (HUC 04100008 04 05)

Strategy	Description	Estimated load reduction (avg./yr.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 5.2 Goal 1	**Reduce Phosphorus by 2,442 lbs./year**					
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	2,442 lbs./yr. (P)	2013-2017	NRCS, ASWCD, PSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase filter strip drainage area by 9,866 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	175 lbs./yr. (P)	2013-2017	NRCS, ASWCD, PSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase conservation tillage/residue management by 200 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	150 lbs./yr. (P)	2013-2017	NRCS, ASWCD, PSWCD, ODNR	CREP, CRP, EQIP, Grants	Increase cover crop usage by 150 acres/year
Install Grass Waterways where needed	Program to increase sign-up for farm bill programs with additional incentives	250 lbs./yr. (P)	2013-2017	NRCS, ASWCD, PSWCD, ODNR	CREP, CRP, grants	Install 1000 linear feet/year.
Continue conservation program participation campaign and educational outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing,	NRCS, ASWCD, PSWCD, BRWP, ODNR	Grants Local support	No net loss in current BMP acreage

Table 7.8 Problem Area 5: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Lower Riley Creek watershed. (HUC 04100008 04 05)

Strategy	Description	Estimated load reduction (avg.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 5.2 Goal 2	**Reduce/eliminate Phosphorus from HSTS**					
Inventory all existing HSTS in the problem area	The ACBH, HCBH,PCBH estimates that has many as 50% of the HSTS are nonpermitted or 25 years old or older	N/A	2013-2017	ACBH, ACC, ACE, BRWP, PCBH, PCE, PCC	Grants 319 grant	Each time a system is replaced or a tank is pumped, the Health Depts. are notified.
Repair/replace all failing HSTS repaired/replaced	There are several HSTS are in need of being repair/replacement	2000 lbs./yr.	2013-2017	ACBH, ACC, ACE, BRWP, PCBH, PCC, PCE	Grants 319 grants	Final tally
Provide educational materials on proper care/maintenance of HSTS	Homeowners will be provided information on how to care and maintain their HSTS	not applicable	on going	ACBH, BRWP, PCBH,	local money grants	Final handouts

Table 7.8 Problem Area 5: Strategies for Implementation of Restoration Activities for the Riley Creek watershed - Lower Riley Creek watershed (HUC 04100008 04 05)

Strategy	Description	Estimated load reduction (avg./yr.)	Timeline	Resources	Funding	Performance Indicator
Problem Statement 5.3 Goal 1	**Reduce Nitrogen loading by 6,665 lbs./year**					
Increase filters strips and riparian buffers	Program to increase sign-up for farm bill programs with additional incentives	6,665 lbs./yr. (N)	2013-2017	NRCS, ASWCD, ODNR, PSWCD	CREP, CRP, EQIP, Grants	Increase filter strip drainage area by 8,640 acres/yr.
Increase Conservation Tillage/residue management	Program to increase sign-up for farm bill programs with additional incentives	60 lbs./yr. (N)	2013-2017	NRCS, ASWCD, ODNR, PSWCD	CREP, CRP, EQIP, Grants	Increase conservation tillage/residue management by 200 acres/year
Increase cover crop usage	Program to increase sign-up for farm bill programs with additional incentives	55 lbs./yr. (N)	2013-2017	NRCS, ASWCD, ODNR, PSWCD	CREP, CRP, EQIP, Grants	Increase cover crop usage by 175 acres/year
Install Grass Waterways where needed	Program to increase sign-up for farm bill programs with additional incentives	50 lbs./yr. (N)	2013-2017	NRCS, ASWCD, ODNR, PSWCD	CREP, CRP, EQIP, grants	Install 1000 linear feet/year.
Continue conservation program participation campaign and educational outreach	Work to maintain and renew contracts for water quality resource concerns. Continue stakeholder outreach on BMPs.	Not Applicable	ongoing	NRCS, ASWCD, ODNR, BRWP, PSWCD	Grants Local support	No net loss in current BMP acreage

Chapter 8 Coastal Management Measures

Purpose

This chapter will present a review of the applicability of management measures specified in the Coastal Nonpoint Pollution Control Program and implementation strategies to address those measures within the Riley Creek Watershed. Many objectives address more than one management measure. To simplify this review process, only primary objectives are listed for each measure. A table at the end of this chapter identifies where overlap in the objective strategies exist.

Chapter Acknowledgements
This chapter was prepared using material from *The Outlet/Lye Creek Watershed Action Plan* and by the watershed coordinator and BRWP partners.

Coastal Nonpoint Pollution Control in the Riley Creek Watershed

As stated in Chapter 3, the Coastal Nonpoint Pollution Control Program (CNPCP) is a nonpoint source management program for restoring and protecting coastal waters from specific categories of nonpoint source pollution. The CNPCP is administered by the ODNR Division of Soil and Water Conservation. The Division requires that all Watershed Action Plans being developed for the Lake Erie watersheds under the Watershed Coordinator Grant Program are to include implementation strategies to address management measures identified within CNPCP. The entire CNPCP can be found in Appendix G.

The Riley Creek Watershed is a sub-basin of the Blanchard River watershed, which is a sub-basin of both the Maumee River basin and Lake Erie watershed. Thus, the land use and overall health of the watershed has a direct impact on the integrity of Lake Erie, although the Riley Creek watershed is mostly an agricultural watershed. There are three villages located in the watershed. Bluffton is the largest with a population 3944, based on the 2008 census. The Village of Pandora has a population of 1188 in the 2000 census. The northern 3/4 of the Village of Beaverdam is located in the Riley Creek watershed at the most western part of the watershed. Beaverdam has a population of 356 in the 2000 census. All three villages have a sewage treatment system that is separated from their storm sewer system

Applicable Management Measures

- New Development Watershed Protection
- Site Development
- Existing Development
- New Household Treatment Systems
- Operating Household Treatment Systems
- Planning, Siting, Developing Roads, Highways, and Bridges
- Bridges (Local Only)
- Roads, Highways, and Bridge Operation and Maintenance (excludes Inter and Intrastate)

- Roads, Highways, and Bridge Runoff Systems (excludes Inter and Intrastate)
- Operation and Maintenance Program for Existing Channels - Protect Surface Water and Restore In-Stream and Riparian Habitat
- Eroding Streambanks and Shorelines
- Dams - Protection of Surface Water Quality and In-Stream and Riparian Habitat

Non-Applicable Management Measures

- Roads, Highways, and Bridge Operation and Maintenance (Inter and Intrastate Only)
- Roads, Highways, and Bridge Runoff Systems (Inter and Intrastate only)

Inter and Intrastate highways and bridges maintained by the Ohio Department of Transportation (ODOT) are considered a Metropolitan Statistical Area (MSA) by the Ohio EPA and, thus, must comply with the NPDES Phase II program. All areas under Phase II permit are considered exempt from the CNPCP. Although these transportation corridors transect the watershed, they will not be addressed in this section. Information about ODOT's Stormwater Management Program can be accessed at http://www.dot.state.oh.us/stormwater/Pages/default.aspx.

New Development Management Measure

This management measure is intended to accomplish the following:

1. Decrease the erosive potential of increased runoff volumes and velocities associated with development-induced changes in hydrology.
2. Remove suspended solids and associated pollutants entrained in runoff that result from activities occurring during and after development.
3. Retain hydrological conditions to closely resemble those of the predisturbance condition.
4. Preserve natural systems, including in-stream habitat.

Approximately 38% of the watershed is located in Allen County, 42% in Hancock County, 15.5% in Putnam County, and 4% in Hardin County.

On December 21, 2000, the Allen County Commissioners passed Resolution #1022-00 which approved and adopted the Allen County Stormwater Management and Sediment Control Regulations and Stormwater Design Specifications. These regulations were adopted in accordance with and pursuant to the legal authority of Article XVIII, Section 3 of the Ohio Constitution, Section 307.79 of the Ohio Revised Code, and the Rules of 1501: 15-1-01 and 02 of The Ohio Administrative Code.

The regulations are applicable to all non-farm earth-disturbing activities performed on the unincorporated lands of Allen County and the Village of Beaverdam, except Strip Mining Operations regulated under Chapter 1513.01 of the ORC, Surface Mining Operations regulated under Chapter 1514.01 of the

ORC, and public transportation, utilities and drainage improvements or the maintenance thereof undertaken by a government agency. In the event that an earth-disturbing activity occurs within the property of a separate public entity and that entity has its own stormwater and erosion and sediment control requirements, application shall be made to both Allen County and that entity. All Allen County requirements will remain in force. The more stringent of the two entities' requirements will govern.

Additional Information on this mandate can be found on the Allen County Engineers website: http://coengr.co.allen.oh.us/Pictures/Regulations/Stormwater_Regs.pdf , http://coengr.co.allen.oh.us/Pictures/Regulations/Stormwater_Design.pdf, and http://coengr.co.allen.oh.us/Pictures/Regulations/Stormwater%20Permit%20Application.pdf.

There is not a county-wide plan in Hancock County to address this area. The EPA does not require the county to have such a plan at the present time. However, as of March 10, 2003, the EPA mandated that if a project disturbs 1 or more acres of ground, a permit must be issued to discharge storm water from the site. Additional information on this mandate can be found at http://www.epa.ohio.gov/dsw/storm/construction_index.aspx#Background.

Putnam County addresses this area under ***305 Flood Areas and Storm Drain Ditches:***

A) In order to protect the health, safety, and general welfare of the people, the Putnam County Planning Commission shall reject any proposed subdivision located in the area subject to periodic flooding. If the subdivision is located in the area having pool drainage or other adverse physical characteristics, the Commission may approve the Subdivision provided the Subdivider agrees to perform such improvements as will render the area safe of the intended use. In lieu of improvement, the Subdivider shall furnish a surety or certified check covering the cost of the required improvements.

B) Flood control or storm drainage facilities shall be provided as follows:

1. Access to flood control or storm drainage ditches and channels shall be by means of easements. Such easements shall be not less than thirty (30) feet in width, exclusive of the width of the ditch, or channel, and an easement of this type shall be provided on one (1) side of a flood control or storm drainage ditch, channel, retention ponds, or similar type of facility.
2. Flood control or storm drainage easements containing underground facilities shall have a minimum width of ten (10) feet.
3. Whenever a flood control or storm drainage ditch or channel has a depth of five (5) feet or more, or a bank slope of two (2) feet horizontal to one (1) foot vertical or steeper, a five foot high chain link fence may be required by the Commission.

C) Consultation of the Soil Conservation Services' handbook on Water Management and Sediment Control for Urbanizing Areas is recommended when referring to water and sedimentation control.

For further information, go to http://www.putnamcountyohio.gov. Look under county agencies - planning commission.

Primary Objective

- The Blanchard River Watershed Partnership (BRWP) will pursue the development of a stormwater management plan for the entire watershed as a part of the watershed management plan

Watershed Protection Management Measure

The purpose of this management measure is to reduce the generation of nonpoint source pollutants and to mitigate the impact 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. This management measure will develop a watershed protection program to incorporate these practices:

1. Avoid conversion, to the extent practicable, of areas that are particularly susceptible to erosion and sediment loss;
2. Preserve areas that provide important water quality benefits and/ or are necessary to maintain riparian and aquatic biota; and
3. Site development, including roads, highways, and bridges, to protect, to the extent practicable, the natural integrity of waterbodies and natural drainage systems.

To accomplish the goals of this measure, the partners of the BRWP will utilize several strategies that protect critical areas to maintain water quality in the Riley Creek Watershed and work with local communities to guide development in a way that is ecologically and economically sustainable.

Riparian and Wetland Setbacks

In Allen County there is a 25' set back on the Riley Creek portion in the county. Richland township and Jackson township are zoned, but do not have regulations concerning wetland or riparian setbacks. Monroe township is not zoned.

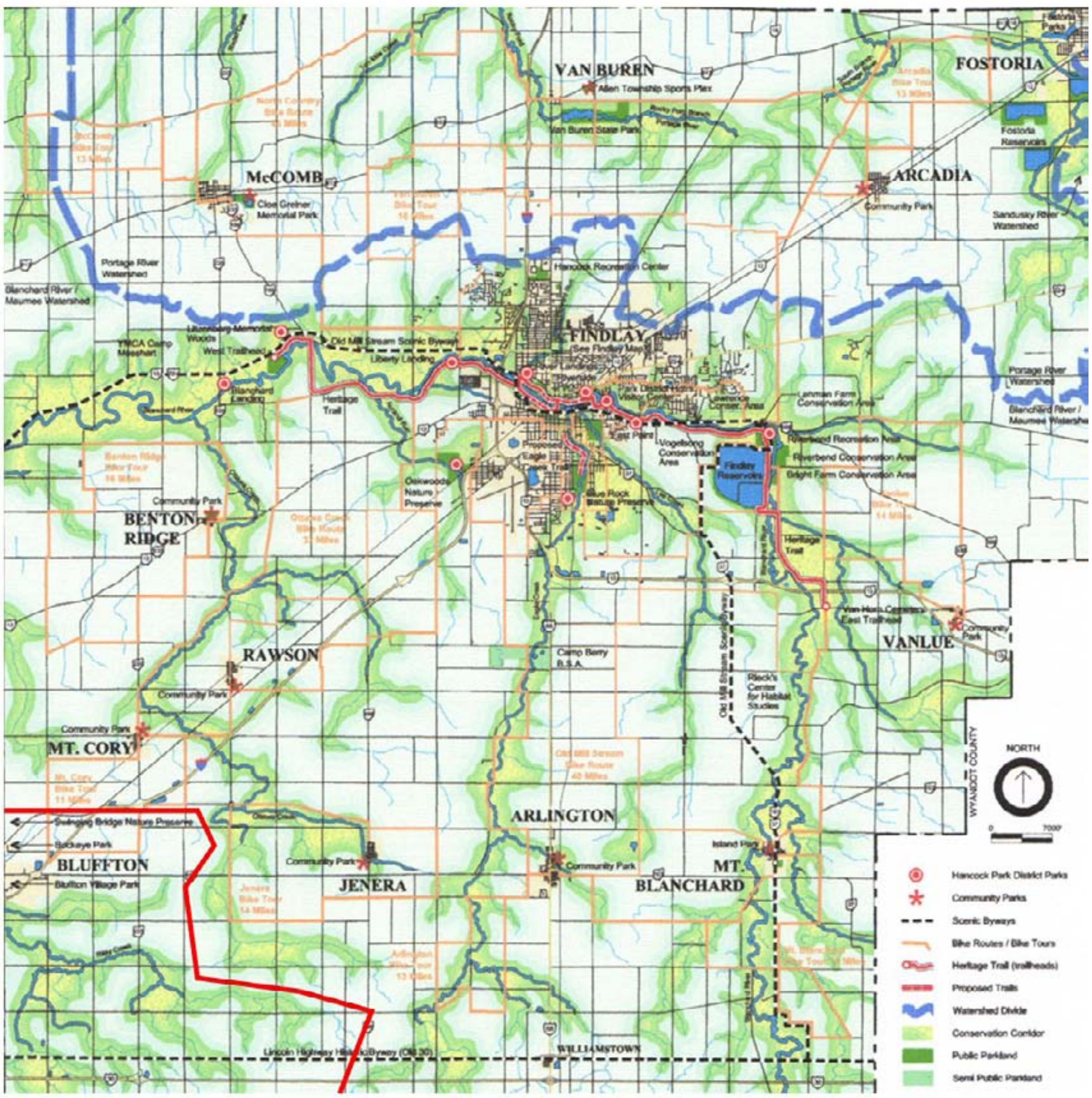
At present, there is no plan in the Hancock County portion that covers Riley Creek. Only Van Buren township in Hancock County is zoned. Neither Orange township or Union is zoned. The setbacks will be based on drainage area, with a NRCS recommended minimum size of 50 feet on upland landscapes and 150 to 300 feet on floodplain soils.

Putnam County also does not have a plan that covers the Riley Creek portion. Neither Riley nor Blanchard townships in Putnam County are zoned. The setbacks will be based on drainage area, with a NRCS recommended minimum size of 50 feet on upland landscapes and 150 to 300 feet on floodplain soils.

Critical Area Protection

Priority areas of conservation have been identified in the Comprehensive Land Use Plan done by the City of Findlay and during the General Investigation Study done by the Northwest Ohio Flood Mitigation Partnership for the Army Corps of Engineers, which specifically includes wetlands for Hancock County. (See Map 8.1 below). The BRWP partners, including the Hancock Regional Planning Commission, the Hancock Park District, Hancock SWCD, and the BRWP will develop land conservation options, which may include easements or acquisition of areas identified as critical to maintaining water quality in the Riley Creek watershed. There has not been a development of a Critical Area Protection map for Allen, Hardin, and Putnam counties portion of the Riley Creek watershed.

Map 8.1 Hancock County Map showing Conservation Corridors



The Riley Creek watershed in Hancock County is outlined in red on the map.

The Riley Creek watershed in Hancock County is outlined in red on the map.

Watershed-based Comprehensive Planning

The BRWP partners will assist in the creation of a comprehensive plan based on a watershed, which will utilize the principles established in the Ohio Balanced Growth Program. The comprehensive plan will direct future development on the existing resources of the watershed area, which encourages preservation of both the cultural and natural heritage unique to the watershed.

Primary Objectives

- Adoption of riparian and wetland setbacks
- Completion of a map that identifies the conservation corridors along the waterways in Riley Creek
- Development of a watershed-based comprehensive plan
- Promotion of land conservation through easements and land acquisition
- Creation of a site development plan

Site Development

The goal of this management measure is to reduce the generation of nonpoint pollution and to mitigate the impact of urban runoff and associated pollutants from all site development, including activities associated with roads, highways, and bridges. Management Measure II.C is intended to provide guidance for controlling nonpoint source pollution through the proper design and development of individual sites. This management measure differs from Management Measure II.A, which applies to post-development runoff, Management Measure II.C is intended to provide controls and policies that are applied during the site planning and review process. These controls and policies are necessary to ensure that when development occurs nonpoint source concerns are incorporated during the site selection and the project design and review phases. While the goals of the Watershed Protection Management Measure (II.B) are similar to watershed basins or regional drainage basins plans, the goals of both the Site Development and Watershed Protection Management Measures are, however, intended to be complementary and the measures should be used within a comprehensive framework to reduce nonpoint source pollution.

Plan, design, and develop sites to accomplish the following:

1. Protect areas that provide important water quality benefits and/or are particularly susceptible to erosion and sediment loss;
2. Limit increases of impervious areas, except where necessary;
3. Limit land disturbance activities, such as cleaning and grading, and cut and fill to reduce erosion and sediment loss; and
4. Limit disturbance of natural drainage features and vegetation.

As stated in the Allen, Hancock, and Putnam County Subdivision Rules and Regulations for storm water regulations for pre-construction and post-construction storm water management plans, there are measures to maintain and improve water quality of developed sites where applicable. These documents stress preserving the use of natural hydrology in the storm water design, maintaining or improving hydrology so as not to negatively impact the receiving waters, and utilizing structural and non-structural BMPs for reducing erosion and sedimentation that may result from the development. These regulations currently cover unincorporated areas of the county, which include much of the Riley Creek Watershed. These regulations do not cover the area of the watershed within the Village of Pandora. Adoption of these regulations or similar documents by the unregulated communities would fully address this management measure within the watershed. This only applies to a subdivision plan and not an individual plan. The Lima Allen County Regional Planning Commission, the Hancock Regional Planning Commission, and the Putnam Planning Commission are responsible for enforcement of Subdivision Rules and Regulations for stormwater in their respective counties. More information can be found at: http:www.lacrpc.com, http://www.http://www.hancockrpc.org/, and http://www.putnamcountyohio.gov/Commissioners/Planning

Primary Objectives:

- Site plans review process to include environmental considerations (wetlands, riparian corridors, TMDL reports, etc.)
- Revisions to be based on the EPA-SP3 model

Existing Development Management

The purpose of this management measure is to protect or improve surface water quality by the development and implementation of watershed management programs that pursue the following objectives:

1. Reduce surface water runoff pollution loadings from areas where development has already occurred;
2. Limit surface water runoff volumes in order to minimize sediment loadings that result from the erosion of streambanks and other natural conveyance systems; and
3. Preserve, enhance, or establish buffers that provide water quality benefits along waterbodies and their tributaries.

The Village of Bluffton currently has the highest amount of impervious surface in the Riley Creek Watershed. The Village of Pandora, the Village of Beaverdam and residential developed areas adjacent to Bluffton have large areas of impervious surface. Installation of stormwater BMP retrofits within these areas would best concentrate efforts to reduce the negative impact on Riley Creek. Opportunities for such retrofits need to be identified within the area and implemented with the purpose of reducing potential runoff impact and increasing individual stewardship of the creek.

In conjunction with reducing stormwater related impact within the urbanized area of the watershed, the BRWP partners will seek out individual partnerships with local landowners to increase preservation and enhancement of Riley Creek's natural corridor. Natural corridors provide many essential benefits to the integrity of the river: to flood storage, to pollutant assimilation, and to habitat. To improve the natural corridor of the Riley Creek, the BRWP will promote a Riparian Buffer Restoration Program within the Riley Creek corridor of the watershed, based on landowner interest.

Primary Objectives

- Identify opportunities and develop cost/benefit report for stormwater retrofits possible within the Village of Bluffton's portion of the Riley Creek watershed and the Village of Pandora. Develop a Riparian Buffer Restoration Program.

New On-Site Disposal Systems (OSDS)

The purpose of this management measure is to protect the Coastal Zone management area from pollutants discharged by OSDS. The measure requires that OSDS be sited, designed, and installed so that the impact to waterbodies will be reduced. Factors such as soil type, soil depth, depth to water table, rate of sea level rise, and topography must be considered in siting and installing a conventional OSDS.

1. Ensure that new Onsite Disposal Systems (OSDS) are located, designed, installed, operated, inspected, and maintained to prevent the discharge of pollutants to the surface of the ground and to reduce, to the extent practicable the discharge of pollutants into ground waters that are closely hydrologically connected to the surface waters. Where necessary to meet these objectives, (a) discourage the installation of garbage disposals to reduce hydraulic and nutrient loadings; and (b) where low volume plumbing fixtures have not been installed in new developments or redevelopments, reduce total hydraulic loadings to the OSDS by 25 percent. Implement OSDS inspection schedules for preconstruction, construction, and postconstruction.

2. Direct placement of OSDS away from unsuitable areas. Where OSDS placement in unsuitable areas is not practical, ensure that the OSDS is designed or sited at a density so as not to adversely affect surface waters or ground water that are closely hydrologically connected to surface water. Unsuitable areas include, but are not limited to areas with poorly or excessive drained soils; areas with shallow water tables, or areas with high seasonal water tables; areas overlaying fractured bedrock that drain directly to ground water; areas with floodplains; or areas where nutrient and/or pathogen concentrations in the effluent cannot be sufficiently treated or reduced before the effluent reaches sensitive waterbodies.

3. Establish protective setbacks from surface waters, wetlands, and floodplains for conventional as well as alternative OSDS. The lateral setbacks should be based on soil type, slope, hydrologic factors, and type of OSDS. Where uniform protective setbacks cannot be achieved, site developments with OSDS should not adversely affect waterbodies and/or contribute to a public health nuisance.
4. Establish protective separation between OSDS system components and groundwater, which is closely, hydrologically connected to surface waters. The separation distances should be based on soil type, distance to ground water, hydrologic factors, and type of OSDS.
5. Where conditions indicate that nitrogen-limited surface waters may be adversely affected by excess nitrogen loadings from ground water. Where conditions require the installation of OSDS that reduce nitrogen loadings by 50% to ground water that is closely hydrologically connected to surface water.

Currently, the Allen, Hancock, and Putnam County Health Departments follow more stringent rules for reviewing and approving the installation of new Home Sewage Treatment Systems (HSTS). For more information on the Allen County Board of Health's Sewage Treatment and Disposal Rules go to: www.allencountyhealthdepartment.org. For Hancock County Board of Health's Sewage Treatment and Disposal Rules go to: http://co.hancock.oh.us/bdhealth/uploads/Files/127/127_1.pdf. For Putnam County Board of Health's Sewage Treatment and Disposal Rules go to: www.putnamhealth.com.

Operating On-Site Disposal Systems

The purpose of this management measure is to minimize pollutant loadings from operating OSDS. This management measure requires that OSDS be modified, operated, repaired, and maintained to reduce nutrient and pathogen loadings in order to protect and enhance surface waters. In the past, it has been a common practice to locate conventional OSDS in coastal areas that have inadequate separation distances to ground water, fractured bedrock, sandy soils, or other conditions that prevent or do not allow adequate treatment of OSDS generated pollutants. Eutrophication in surface waters has also been attributed to the low nitrogen reductions provided by conventional OSDS designs.

1. Establish and implement policies and systems to ensure that existing OSDS are operated and maintained to prevent the discharge of pollutants to the surface of the ground and to the extent practical reduce the discharge of pollutants into ground waters that are closely hydrologically connected to surface waters. Where necessary to meet these objectives, encourage the reduced use of garbage disposals, encourage the use of low-volume plumbing fixtures, and reduce total phosphorus loadings to the OSDS by 15 percent (if the use of low-level phosphate detergents has not been required or widely adopted by OSDS users). Establish and implement policies that require an OSDS to be repaired, replaced, or modified where the OSDS fails, threatens, or impairs surface waters.
2. Inspect OSDS at a frequency adequate to ascertain whether OSDS are failing.
3. Consider replacing or upgrading OSDS to treat effluent so that total nitrogen loadings in the effluent are reduced by 50 percent. This provision applies only:
   - where conditions indicate that nitrogen-limited surface waters may be adversely affected by significant ground water nitrogen loadings from OSDS, and
   - where nitrogen loadings from OSDS are delivered to ground water that is closely, hydrologically connected to surface water.

The Allen, Hancock, and Putnam County Boards of Health currently have the authority to initiate an Operations and Maintenance Program that requires residents to have a service contract for operating and maintaining their system properly. Since 1971, the Allen County Health Department has had a maintenance program on all NPDES Aeration systems. They also follow the guidelines for a general NPDES permit. Each Board of Health does have a central digital database of existing systems in the county that are permitted or have been pumped since 2004. Most inspection of presumed failing HSTS results from a complaint. Creation of this database has streamlined the review process for the maintenance and performance of existing systems and reduced costly source investigation. Completing a data base that includes all systems is still a goal.

For more information on the Allen County Board of Health's Sewage Treatment and Disposal Rules go to: www.allencountyhealthdepartment.org. For the Hancock County Board of Health's Sewage Treatment and Disposal Rules go to: http://co.hancock.oh.us/bdhealth/uploads/Files/127/127_1.pdf. For the Putnam County Board of Health's Sewage Treatment and Disposal Rules go to: www.putnamhealth.com.

Primary Objectives

- Complete central database of HSTS in the Riley Creek watershed, which may include individual inspection and testing of all HSTS.
- Develop an education campaign for proper maintenance of HSTS and use of low-flow plumbing fixtures to reduce discharge of pollutants.

Planning, Siting, and Developing Roads and Highways (Local Only)

The best time to address control of NPS pollution from roads and highways is during the initial planning and design phase. New roads and highways should be located with consideration of natural drainage patterns and planned to avoid encroachment on surface waters and wet areas. Where this is not possible, appropriate controls will be needed to minimize the impacts of NPS runoff on surface waters.

Plan, site, and develop roads and highways to:

1. Protect areas that provide important water quality benefits or are particularly susceptible to erosion or sediment loss;
2. Limit land disturbance, such as clearing, grading, cutting, and filling to reduce erosion and sediment loss; and
3. Limit disturbance of natural drainage features and vegetation.
4. Use BMPs during construction to minimize disturbance.

To address this issue, pollution prevention and habitat loss minimization should be performed in the form of proper stormwater regulations and zoning setbacks.

Bridges (Local Only)

This measure requires that NPS runoff impact on surface waters from bridge decks be assessed and the appropriate management and treatment be employed to protect critical habitats, wetlands, fisheries, shellfish beds, and domestic water supplies. The siting of bridges should be a coordinated effort among the States, the FHWA, the US Coast Guard, and the Army Corps of Engineers. Locating bridges in coastal areas can cause significant erosion and sedimentation, resulting in the loss of wetlands and riparian areas. Additionally, since bridge pavements are extensions of the connecting highway, runoff waters from the bridge decks also deliver loadings of heavy metals, hydrocarbons, toxic substances, and deicing chemicals to the surface waters as a result of discharge through scupper drains with no overland buffering. Bridge maintenance can also

contribute heavy loads of lead, rust particles, paint, abrasives, solvents, and cleaners into surface waters. Protection against possible pollutant overloads can be afforded by minimizing the use of scuppers on bridges transversing very sensitive waters and conveying deck drainage to land for treatment. Whenever practical, bridge structures should be located to avoid crossing over sensitive fisheries and shellfish-harvesting areas to prevent washing polluted runoff through scuppers into the waters below. Also, bridge design should account for potential scour and erosion, which may affect shellfish beds and bottom sediments.
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.

According to the Allen County Engineers, there may be 1-2 bridge projects occurring within the Allen portion of the Riley Creek Watershed in the next 5 years. According to the Hancock County Engineers, there may be one bridge project scheduled within the Hancock portion of the Riley Creek Watershed in the next 5 years. According to the Putnam County Engineers, there are no bridge projects occurring within the Putnam portion of the Riley Creek Watershed in the next 5 years.

Operation and Maintenance of Roads, Highways, and Bridges

Incorporate pollution prevention procedures into the operation and maintenance of roads, highways, and bridges to reduce pollutant loadings to surface waters. Substantial amounts of eroded material and other pollutants can be generated by operation and maintenance procedures for roads, highways, and bridges, and from sparsely vegetated areas, cracked pavements, potholes, and poorly operating urban runoff control structures. This measure is intended to ensure that pollutant loadings from roads, highways, and bridges are minimized by the development and implementation of a program and associated practices to ensure that sediment and toxic substance loadings from operation and maintenance activities do not impair coastal surface waters. The program to be developed, using the practices described in this management measure, should consist of and identify standard operating procedures for nutrient and pesticide management, road salt use minimization, and maintenance guidelines (e.g., capture and contain paint chips and other particulates from bridge maintenance operations, resurfacing, and pothole repairs). Incorporate pollution prevention procedures into the operation and maintenance of roads, highways, and bridges to reduce pollutant loadings to surface waters.

Maintenance of transportation corridors within the Riley Creek Watershed is performed by either ODOT, the County, Village of Bluffton, or local townships. These agencies, particularly ODOT and County Engineers, must follow good housekeeping measures for reducing nonpoint pollution in relation to general maintenance of the roads as part of their NPDES permit obligations. The ODOT Storm Water Management Plan can be found at: http://www.dot.state.oh.us/stormwater/Pages/default.aspx.

To expand the best management measure of roadway maintenance to township roads and county roads, the BRWP partners will assist local townships and County Engineers in reviewing current operation standards/ methods and providing suggestions for good housekeeping practices that reduce water pollution.

Primary Objectives:

- Review current transportation corridor maintenance operation practices performed by local townships within the watershed.
- Investigate the need for an Emergency Spill Response Plan for the entire watershed on a county basis.

Runoff Systems for Roads, Highways, and Bridges

Develop and implement runoff management systems for existing roads, highways, and bridges to reduce runoff pollutant concentrations and volumes entering surface waters.

This measure requires that operation and maintenance systems include the development of retrofit projects, where needed, to collect NPS pollutant loadings from existing, reconstructed, and rehabilitated roads, highways, and bridges. Poorly designed or maintained roads and bridges can generate significant erosion and pollution loads containing heavy metals, hydrocarbons, sediment, and debris that threaten the quality of surface waters and their tributaries. In areas where such adverse impacts to surface waters can be attributed to adjacent roads or bridges, retrofit management projects to protect these waters may be needed (e.g., installation of structural or nonstructural pollution controls). Retrofit projects can be located in existing rights-of-way, within the interchange loops, or adjacent land areas. Areas with severe erosion and pollution runoff problems may require relocation or reconstruction to mitigate these impacts. Runoff management systems are a combination of nonstructural and structural practices selected to reduce nonpoint source loadings from roads, highways, and bridges. These systems are expected to include structural improvements to existing runoff control structures for water quality purposes; construction of new runoff control devices, where necessary to protect water quality; and scheduled operation and maintenance activities for these runoff control practices. Typical runoff controls for roads, highways, and bridges include vegetated filter strips, grassed swales, detention basins, constructed wetlands, and infiltration trenches.

Although most pollutant loading occurring in the Riley Creek Watershed is the result of agricultural runoff, there are a few bridges where concentrated flows have eroded the streambank. The BRWP partners will categorize these areas where stormwater improvements protect the bank and reduce sediment loading to the waterway and will develop associated costs for implementing various control features.

These systems will include structural improvements to existing runoff control structures for water quality purposes; construction of new runoff control devices, where necessary to protect water quality; and scheduled operation and maintenance activities for runoff control practices. Typical runoff controls for roads, highways, and bridges include vegetated filter strips, grassed swales, detention basins, constructed wetlands, and infiltration trenches.

Although most pollutant loading occurs in the Riley Creek Watershed as the result of agricultural run-off, there are a few bridges where concentrated flows have eroded the streambank. The BRWP partners will categorize those areas where stormwater improvements will protect the bank and reduce sediment loading to the waterway and will develop associated costs for implementing various control features.

1. Identify priority and watershed pollutant reduction opportunities (e.g., improvements to existing urban runoff control structures); and
2. Establish schedules for implementing appropriate controls.

Primary Objective

- Identify opportunities and develop cost/benefits analysis report for stormwater retrofits for inter/intrastate transportation infrastructure transecting the watershed for the purpose of reducing runoff-related pollution

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 B (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 or 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 for new projects will require a two-pronged approach:

1. Evaluate, with numerical models for some situations, the types of NPS pollution-related to in-stream changes and watershed development.
2. Address some types of NPS problems stemming from in-stream changes or watershed development with a combination of nonstructural and structural practices.

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 impact of channelization and channel modification projects. Implementation of this management measure is intended to occur concurrently with the implementation of Management Measure A (Physical and Chemical Characteristics of Surface Water) 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. Levees set back away from the streambank (setback levees) can be constructed to allow for overbank 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-channel 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 overbank with suitable vegetation completes the design.

Preservation of ecosystem benefits can be achieved by site-specific design to obtain predefined 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.

Primary Objective

- Enhance riparian habitat and wetland enhancement
- Establish Watershed Monitoring program
- Complete one demonstration project using natural design
- Work with flood mitigation efforts to ensure that levees and earthen mounds protect the water quality of the watershed

Eroding Streambanks and Shorelines
(Note: there are no shorelines in the watershed)

Several streambank and stabilization techniques will be effective in controlling streambank erosion wherever it is a source of nonpoint pollution. Techniques involving vegetative bank stabilization ("soil bioengineering") will usually be effective at sites with limited exposure to strong currents. In other cases, the use of engineering approaches may need to be considered. In addition to controlling those sources of sediment input to the surface waters which are causing NPS pollution, these techniques can halt the destruction of wetlands and riparian areas located along the river and tributaries. Once these features are protected, they can serve as a filter for surface water runoff from upland areas, or as a sink for nutrients, contaminants, or sediment already present as NPS pollution in surface waters.

As listed in Chapter 7, there are some areas in need of streambank stabilization. Changes in hydrologic patterns and channel morphology have subsequently altered a portion of the Little Riley Creek within the watershed. These alterations combined with higher gradient and highly erodible soils make stabilization of streambanks a priority project.

The BRWP will seek financial assistance to stabilize eroding banks by natural channel design. The use of natural channel design allows greater interface between water and vegetation, which helps filter out pollutants and disperses the high energy of peak flows as well as reduces streambank erosion. The work will be done under the guidance of the SWCDs and County Engineers.

Primary Objectives

- Establish Riparian Buffer Restoration Program
- Restore natural flow regimes in a watershed using a Watertable management program
- Seek grant money to help streambank restoration

Dams (Protection of Surface Water Quality and Instream and Riparian Habitat)

NOTE: The lowhead dams below Pandora on Riley Creek do not meet the height requirement. Handling of these dams will still be included.

The purpose of this management measure is to protect the quality of surface waters and aquatic habitat in reservoirs and in 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 impact to surface water quality and aquatic and riparian habitat caused by the implementation of practices should 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 water quality and riparian habitat where economically feasible.

According to the TMDL Report, the four lowhead dams at RM 1.3, 4.6, 7.3, and 7.5 below Pandora on the Lower Riley Creek have resulted in unpounded sections. There are also two small concrete dams at RM 5.0 and 6.0. Some degree of water quality and habitat degradation was documented at each site. Since all four dams are lowhead constructed, they do not create “tailwater” flow from the reservoir. However, each dam does change the aquatic habitat and water quality both upstream and downstream of the dam.

Primary Objectives

- The dams will be studied to see if removal is feasible and would improve the aquatic habitat and water quality.

Table 8.1 Summary of implementation strategies associated with the Coastal Nonpoint Pollution Control Program Management Measures.

Strategies	Coastal Nonpoint Pollution Control Management Measure														Implementation			
	New Development	Watershed Protection	Site Development	Existing Development	New On-Site Disposal System	Operating On-Site Disposal System	Planning, Sitting, Developing Roads and Highways	Bridges (local only)	Operation and Maintenance of Roads, Highways, and Bridges	Runoff Systems for Roads, Highways, and Bridges	Channelization and Channel Modification (Physical and Chemical Characteristics of Surface Waters)	Channelization and Channel Modification (in-stream and Riparian Habitat	Dams	Timeline	Cost (estimates)	Reference WAP Chapter 7	Lead Agencies
Site plan reviews to include environmental considerations (wetlands, riparian corridors, TMDL reports, etc.)		X	X				X							2012 - ongoing	$ 11,000		ACE, HCE, PCE, ACC, HCC, ACC, PCC, TWPs
Adoption of Riparian and Wetland Setback Regulations		X	X					X						2012 - 2015	$ 10,000		ACE, HCE, PCE, ACC, HCC, ACC, PCC, TWPs
Comprehensive planning for the Blanchard River Watershed utilizing Balanced Growth Principles	X	X	X	X			X	X						2012 - 2017	$ 25,000		ACE, HCE, PCE, ACC, HCC, ACC, PCC, HRPC, LARPC, PPC BRWP
Land conservation through easements and land acquisition utilizing areas outlined in the Hancock Regional Land Use Plan & identified in the Allen and Putnam County areas		X	X	X										Dependent on willing sellers	Site Specific		WCOLC, HSWCD, PSWCD, HRPC, PPC, LARPC
Identify opportunities and develop cost/benefit report for stormwater retrofits in applicable areas in the Riley Creek watershed		X	X											2012 - 2017	$12,000		ACE, HCE, PCE

Table 8.1 Summary of implementation strategies associated with the Coastal Nonpoint Pollution Control Program Management Measures.

Strategies	Coastal Nonpoint Pollution Control Management Measure													Implementation			
	New Development	Watershed Protection	Site Development	Existing Development	New On-Site Disposal System	Operating On-Site Disposal System	Planning, Sitting, Developing Roads and Highways	Bridges (local only)	Operation and Maintenance of Roads, Highways, and Bridges	Runoff Systems for Roads, Highways, and Bridges	Channelization and Channel Modification (Physical and Chemical Characteristics of Surface Waters)	Channelization and Channel Modification (in-stream and Riparian Habitat	Dams	Timeline	Cost (estimates)	Reference WAP Chapter 7	Lead Agencies
Riparian Buffer Restoration Program				X							X	X		2013-2016	$80,000	X	NRCS, HSWCD, PSWCD
Complete a central database of HSTS In the Riley Creek watershed					X	X								2013-2016	$3000	X	ABH, HBH, PBH
Develop an education campaign for proper maintenance of HSTS and use of low-flow plumbing fixtures to reduce discharge of pollutants		X			X	X								2013-2016	$2000	X	ABH, HBH, PBH

Table 8.1 Summary of implementation strategies associated with the Coastal Nonpoint Pollution Control Program Management Measures.

Strategies	Coastal Nonpoint Pollution Control Management Measure													Implementation			
	New Development	Watershed Protection	Site Development	Existing Development	New On-Site Disposal System	Operating On-Site Disposal System	Planning, Sitting, Developing Roads and Highways	Bridges (local only)	Operation and Maintenance of Roads, Highways, and Bridges	Runoff Systems for Roads, Highways, and Bridges	Channelization and Channel Modification (Physical and Chemical Characteristics of Surface Waters)	Chamelization and Channel Modification (in-stream and Riparian Habitat	Dams	Timeline	Cost (estimates)	Reference WAP Chapter 7	Lead Agencies
Review current transportation corridor maintenance operation practices performed by local townships within the watershed									X					2013	N/A		ACE, HCE, PCE, Twps.
Investigate to see if there is a need for an Emergency Spill Response Plan for the entire watershed on a county basis.									X	X				2013	N/A		AEMA, HEMA, PEMA
Identify opportunities and develop cost/benefits analysis report for stormwater retrofits for inter/ intrastate transportation infrastructure transecting the watershed for the purpose of reducing run0off related pollution										X				2014-2015	$10,000		ODOT, ACE, HCE, PCE
Riparian and Wetland enhancement											X	X		2013-2018	$14,000	X	NRCS, HSWCD, PSWCD,

Table 8.1 Summary of implementation strategies associated with the Coastal Nonpoint Pollution Control Program Management Measures.

Strategies	Coastal Nonpoint Pollution Control Management Measure													Implementation			
	New Development	Watershed Protection	Site Development	Existing Development	New On-Site Disposal System	Operating On-Site Disposal System	Planning, Sitting, Developing Roads and Highways	Bridges (local only)	Operation and Maintenance of Roads, Highways, and Bridges	Runoff Systems for Roads, Highways, and Bridges	Channelization and Channel Modification (Physical and Chemical Characteristics of Surface Waters)	Channelization and Channel Modification (in-stream and Riparian Habitat	Dams	Timeline	Cost (estimates)	Reference WAP Chapter 7	Lead Agencies
Watershed Monitoring Program (Biological, Chemical, & Physical parameters)							X	X	X	X	X	X		2013-2016	$120,000	2013-2016	BRWP & ONU
Complete one demonstration project using natural design - two stage ditch											X	X		2013-2016	$60,000	2013-2016	BRWP, HSWCD, PSWCD
Work with flood mitigation efforts to ensure that levees and earthen mounds protect the water quality of the watershed											X	X		2013-2016	not applicable	2013-2016	ACE, HCE, PCE

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Chapter 9: Budget

Purpose

This chapter will address the budget for the implementation plan and the BRWP during the next five years. The budget will project the cost estimate of implementing the BMPs outlined in Chapter 7 and operating the BRWP.

Chapter Acknowledgements
This chapter was prepared using material from *The Outlet/Lye Creek Watershed Action Plan* and by the watershed coordinator and BRWP partners.

The budget was calculated using static estimates for various implementation strategies identified in the previous chapter. As such, this budget does not reflect potential increases due to inflation. Agricultural BMP estimates are taken from SWCD previous projects, EDF consultant, NRCS unit cost projects, and other documented case studies.

The budget is represented in several ways including total budget for the BRWP, the Riley Creek Watershed Action Plan, and a more detailed breakdown of each implementation strategy's project cost. The cost projections for each strategy are grouped by each Problem Area and Statement.

Table 9.1 BRWP Program Budget (5 year coordinator employment)

Category	Cost	Contingency 10%	Total Cost
Coordinator Salary and Benefits	$250,000	$25,000	$275,000
BRWP Operations	100,000	10,000	$110,000
Total			**$385,000**

Picture 9.1 The BRWP Steering Committee at their 2012 Planning Meeting for the year. This active group will be responsible for implementing this WAP.

Martin

Table 9.2: The Riley Creek Watershed Action Plan Implementation Budget Summary		
Table	**Project Category Detail**	**Total Cost**
	Problem Area 1: Binkley Ditch-Little Riley Creek watershed (HUC 04100008 04 01)	
Table 9.3	Problem Statement 1.1 & 1.2 Goal 1: Sediment and Phosphorus reduction	$529,708
	Other Concerns	$768,186
	Total Cost for Problem Area 1	**$1,297,894**
	Problem Area 2 Upper Riley Creek watershed (HUC 04100008 04 02)	
Table 9.4	Problem Statement 2.1 & 2.2 Goal 1: Sediment and Phosphorus reduction	$625,303
	Other Concerns	$40,124
Table 9.5	Problem Statement 2.2 Goal 2: Failing HSTS	$858,000
	Total Cost for Problem Area 2	**$1,523,427**
	Problem Area 3: Marsh Run-Little Riley Creek watershed (HUC 04100008 04 03	
Table 9.6	Problem Statement 3.1 & 3.2 Goal 1: Sediment and Phosphorus reduction	$574,983
Table 9.7	Problem Statement 3.1 Goal 1: Streambank Restoration	$16,005
	Problem Statement 3.2 Goal 2: Failing HSTS	$701,800
	Other Concerns	$26,401
	Total Cost for Problem Area 3	**$1,319,189**
	Problem Area 4: Middle Riley Creek watershed (HUC 04100008 04 04)	
Table 9.8	Problem Statement 4.1, 4.2, & 4.3 Goal 1: Sediment, Phosphorus &Nitrogen	$770,993
	Other Concerns	$26,401
Table 9.9	Problem Statement 4.2 Goal 2: Failing HSTS	$709,500
	Total Cost for Problem Area 4	**$1,506,894**
	Problem Area 5: Lower Riley Creek watershed (HUC 04100008 02 05)	
Table 9.10	Problem Statement 5.1, 5.2, & 5.3 Goal 1: Sediment, Phosphorus, & Nitrogen	$730,788
	Other Concerns	$26,401
Table 9.11	Problem Statement 5.2 Goal 2: Failing HSTS	$1,381,600
	Total Cost for Problem Area 5	**$2,138,789**
	Total Cost for all Problem Statements	**$7,786,193**

In addition to the Implementation Plan budget, the Blanchard River Watershed Partnership also will be conducting activities in four main areas during the next five years. These areas are: educational opportunities, planning and research strategies, volunteer programs, and land conservation strategies. Tables 9.19-9.22 on pages 9-12 and 9-13 show the estimated budget for these activities.

Table 9.3: Problem Area 1: Strategies for Implementation of Restoration Activities for the Binkley Ditch-Little Riley Creek watershed (HUC 04100008 04 01) (5 year budget)

Problem Statement 1.1 & 1.2 Goal 1 Implementation Action	Contractor/ Technician	BMP Cost Unit	Unit	Project Size	Total BMP	Printing	Marketing/ Mailings	Travel	Subtotal	Contingency 10%	Total
1. Increase Filter Strips	$38,500	$240	acre	1000	$240,000	$100	$400	$375	$279,375	$27,938	$267,938
2. Increase Riparian Buffers											
(Hardwood)	$23,500	$650	acre	150	$97,500	$50	$100	$125	$121,275	$12,128	$133,403
3. Increase Conservation Tillage/											
Residue Management	$18,750	$10	acre	1000	$10,000	$100	$500	$375	$29,725	$2,973	$32,698
4. Increase Cover Crop Usage	$18,750	$40	acre	500	$20,000	$100	$300	$375	$39,525	$3,953	$43,478
5. Grass Waterways	$16,000	$9,600	acre	11	$105,600	$100	$400	$375	$122,475	$12,248	$134,723
6. Continue conservation program											
participation & educational outreach	$10,000					$500	$1,000	$375	$11,875	$1,188	$13,063
										subtotal	**$625,303**
Other Concerns											
1. Increase Nutrient Management											
Practices	$1,500	$30	acre	400	$12,000	$100	$100	$375	$14,075	$1,408	$15,483
2. Soil Testing	$5,000	$25	NA	100	$2,500	$100	$200	$375	$8,175	$818	$8,993
3. Tile Discharge Filter (demonstration)	$2,000	$10,000	NA	1	$12,000	$50	$50	$375	$12,475	$1,248	$13,723
										subtotal	**$38,199**
										Total	**$663,502**

Table 9.4: Problem Area 2: Strategies for Implementation of Restoration Activities for the Upper Riley Creek watershed (HUC 04100008 04 02) (5 year budget)

Problem Statement 2.1 & 2.2 Goal 1 Implementation Action	Contractor/ Technician	BMP Cost Unit	Unit	Project Size	Total BMP	Printing	Marketing/ Mailings	Travel	Subtotal	Contingency 10%	Total
1. Increase Filter Strips	$38,500	$240	acre	1000	$240,000	$100	$400	$375	$279,375	$27,938	$267,938
2. Increase Riparian Buffers											
(Hardwood)	$23,500	$650	acre	150	$97,500	$50	$100	$125	$121,275	$12,128	$133,403
3. Increase Conservation Tillage/											
Residue Management	$18,750	$10	acre	1000	$10,000	$100	$500	$375	$29,725	$2,973	$32,698
4. Increase Cover Crop Usage	$18,750	$40	acre	500	$20,000	$100	$300	$375	$39,525	$3,953	$43,478
5. Grass Waterways	$16,000	$9,600	acre	11	$105,600	$100	$400	$375	$122,475	$12,248	$134,723
6. Continue conservation program											
participation & educational outreach	$10,000					$500	$1,000	$375	$11,875	$1,188	$13,063
										subtotal	**$625,303**
Other Concerns											
1. Increase Nutrient Management											
Practices	$1,500	$30	acre	500	$15,000	$100	$100	$375	$17,075	$1,708	$18,783
2. Soil Testing	$5,000	$25	NA	100	$2,500	$100	$200	$375	$6,925	$693	$7,618
3. Tile Discharge Filter (demonstration)	$2,000	$10,000	NA	1	$12,000	$50	$50	$375	$12,475	$1,248	$13,723
										subtotal	**$40,124**
										Total	**$665,427**

Table 9.5: Problem Area 2: **Strategies for Implementation Activities for the Upper Riley Creek watershed. (HUC 04100008 04 02) (5 year budget)**

Problem Statement 2.2 Goal 2 Implementation Action	Program Manager	Contractor/ Consultant	Units	Replace/ Cost	Printing	Marketing/ Mailings	Subtotal	Contingency -10%	Total
1. Inventory all existing HSTS in the problem area	$5,000	$5,000	152		$3,000	$1,000	$14,000	$1,400	$15,400
2. Repair/replace all failing HSTS	$5,000	$10,000	76*	$760,000	$1,000	$1,000	$762,000	$76,200	$838,200
3. Educational materials on proper care/maintenance of HSTS	$2,000				$1,000	$1,000	$4,000	$400	$4,400
**estimated on 50% failure*								**Total**	**$858,000**

Table 9.6: Problem Area 3: **Strategies for Implementation of Restoration Activities for the Marsh Run-Little Riley Creek watershed (HUC 04100008 04 03) (5 year budget)**

Problem Statement 3.1 & 3.2 Goal 1 Implementation Action	Contractor/ Technician	BMP Cost Unit	Unit	Project Size	Total BMP	Printing	Marketing/ Mailings	Travel	Subtotal	Contingency 10%	Total
1. Increase Filter Strips	$38,500	$240	acre	1000	$240,000	$100	$400	$375	$279,375	$27,938	$267,938
2. Increase Riparian Buffers (Hardwood)	$23,500	$650	acre	140	$91,000	$50	$100	$125	$114,775	$7,028	$121,803
3. Increase Conservation Tillage/ Residue Management	$18,750	$10	acre	1000	$10,000	$100	$500	$375	$29,725	$2,973	$32,698
4. Increase Cover Crop Usage	$18,750	$40	acre	700	$28,000	$100	$300	$375	$47,525	$4,753	$52,278
5. Grass Waterways	$16,000	$9,600	acre	11	$78,400	$100	$400	$375	$79,275	$7,928	$87,203
6. Continue conservation program participation & educational outreach	$10,000					$500	$1,000	$375	$11,875	$1,188	$13,063
										Total	**$574,983**

Table 9.7: Problem Area 3: Strategies for Implementation of Restoration Activities for the Marsh Run-Little Riley Creek watershed (HUC 04100008 04 03) (5 year budget)

Problem Statement 3.1 Goal 2	**Contractor/**	**BMP**		**Project**	**Total**		**Marketing/**			**Contingency**	
Implementation Action	**Technician**	**Cost Unit**	**Unit**	**Size**	**BMP**	**Printing**	**Mailings**	**Travel**	**Subtotal**	**10%**	**Total**
1. Streambank Restoration	$10,500	$1.5/ft^2	sq. ft.	2500	$14,250	$50	$50	$200	$14,550	$1,455	**$16,005**
Problem Statement 3.2 Goal 2	**Program**	**Contractor/**		**Replace**					**Contingency**		
	Manager	**Consultant**	**Units**	**Cost**	**Printing**	**Mailings**	**Travel**	**Subtotal**	**10%**	**Total**	
1. Inventory all existing HSTS in											
the problem area	$10,000	$5,000	121		$2000	$500	$500	$18,000	$1,800	$19,800	
2. Repair/replace all failing HSTS	$10,000	$10,000	60	$610,000	$2000	$1000	$1000	$614,000	$61,400	$675,400	
3. Educational materials on proper											
care/maintenance of HSTS	$3000				$1500	$1500		$6000	$600	$6600	
									Total	**$701,800**	
Other Concerns											
1. Increase Nutrient Management											
Practices	$1,500	$30	acre	500	$15,000	$100	$100	$375	$17,075	$1,708	$18,783
2. Soil Testing	$5,000	$25	NA	50	$1,250	$100	$200	$375	$6,925	$693	$7,618
										Total	**$26,401**

Table 9.8: Problem Area 4: Strategies for Implementation of Restoration Activities for the Middle Riley Creek watershed (HUC 04100008 04 04) (5 year budget)

Problem Statement 4.1, 4.2, & 4.3 Implementation Action	Contractor/ Technician	BMP Cost Unit	Unit	Project Size	Total BMP	Printing	Marketing/ Mailings	Travel	Subtotal	Contingency 10%	Total
1. Increase Filter Strips	$40,500	$240	acre	1100	$264,000	$100	$400	$375	$305,375	$30,538	$335,913
2. Increase Riparian Buffers											
(Hardwood)	$24,500	$650	acre	175	$113,750	$50	$100	$125	$138,525	$13,853	$152,378
3. Increase Conservation Tillage/											
Residue Management	$18,750	$10	acre	1000	$10,000	$100	$500	$375	$29,725	$2,973	$32,698
4. Increase Cover Crop Usage	$18,750	$40	acre	875	$35,000	$100	$300	$375	$54,525	$5,453	$59,978
5. Grass Waterways	$16,000	$9,600	acre	15	$144,000	$100	$400	$375	$160,875	$16,088	$176,963
6. Continue conservation program											
participation & educational outreach	$10,000					$500	$1,000	$375	$11,875	$1,188	$13,063
										subtotal	**$770,993**
Other Concerns											
1. Increase Nutrient Management											
Practices	$1,500	$30	acre	500	$15,000	$100	$100	$375	$17,075	$1,708	$18,783
2. Soil Testing	$5,000	$25	NA	100	$2,500	$100	$200	$375	$8,175	$818	$8993
										subtotal	**$26,401**
										Total	**$797,394**

Table 9.9: Problem Area 4: Strategies for Implementation Activities for the Middle Riley Creek watershed. (HUC 04100008 04 04) (5 year budget)

Problem Statement 4.2 Goal 2 Implementation Action	Program Manager	Contractor/ Consultant	Units	Replace/ Cost	Printing	Marketing/ Mailings	Subtotal	Contingency -10%	Total
1. Inventory all existing HSTS in the problem area	$5,000	$5,000	202		$3,000	$1,000	$14,000	$1,400	$15,400
2. Repair/replace all failing HSTS	$5,000	$10,000	61*	$610,000	$1,000	$1,000	$627,000	$62,700	$689,700
3. Educational materials on proper care/maintenance of HSTS	$2,000				$1,000	$1,000	$4,000	$400	$4,400
**estimated on 30% failure*								**Total**	**$709,500**

Table 9.10: Problem Area 5: Strategies for Implementation of Restoration Activities for the Lower Riley Creek watershed (HUC 04100008 04 05) (5 year budget)

Problem Statement 5.1, 5.2, & 5.3 Goal 1 Implementation Action	Contractor/ Technician	BMP Cost Unit	Unit	Project Size	Total BMP	Printing	Marketing/ Mailings	Travel	Subtotal	Contingency 10%	Total
1. Increase Filter Strips	$40,500	$240	acre	850	$204,000	$100	$400	$375	$245,375	$24,538	$269,913
2. Increase Riparian Buffers (Hardwood)	$24,500	$650	acre	150	$97,500	$50	$100	$125	$122,275	$12,228	$134,503
3. Increase Conservation Tillage/ Residue Management	$18,750	$10	acre	1000	$10,000	$100	$500	$375	$29,725	$2,973	$32,698
4. Increase Cover Crop Usage	$18,750	$40	acre	875	$35,000	$100	$300	$375	$54,525	$5,453	$59,978
5. Grass Waterways	$16,000	$9,600	acre	11	$105,600	$100	$400	$375	$108,075	$10,808	$118,883
6. Continue conservation program participation & educational outreach	$10,000					$500	$1,000	$375	$11,875	$1,188	$13,063
										subtotal	**$629,038**
Other Concerns											
1. Increase Nutrient Management Practices	$1,500	$30	acre	500	$15,000	$100	$100	$375	$17,075	$1,708	$18,783
2. Soil Testing	$5,000	$25	NA	50	$1,250	$100	$200	$375	$6,925	$693	$7618
										subtotal	**$26,401**
										Total	**$655,439**

Table 9.11: Problem Area 5: Strategies for Implementation Activities for the Lower Riley Creek watershed. (HUC 04100008 04 05) (5 year budget)

Problem Statement 5.2 Goal 2 Implementation Action	Program Manager	Contractor/ Consultant	Units	Replace/ Cost	Printing	Marketing/ Mailings	Subtotal	Contingency 10%	Total
1. Inventory all existing HSTS in the problem area	$10,000	$10,000	401		$6,000	$2,000	$28,000	$2,800	$30,800
2. Repair/replace all failing HSTS	$10,000	$10,000	120*	$1,200,000	$2,000	$2,000	$1,224,000	$122,400	$1,346,400
3. Educational materials on proper care/maintenance of HSTS	$4,000				$1,000	$1,000	$4,000	$400	$4,400
estimated on 30% failure								**Total**	**$1,381,600**

Table 9.12: Other Concerns - Lowhead Dams Strategies for Implementation of Restoration Activities for the Lower Riley Creek Watershed (HUC 04100008 04 05)

There are four low head dams located at RM 1.3, RM 4.6, RM 7.3, and RM 7.5. In additional, there are two small concrete located at RM 5.0 and RM 6.0. All of these dams are on private property. Each dam will be studies to see if the removal of the dam will have any benefits to the aquatic habitat and flow of the river. Determining the cost for the removal of any one of the dams depends on many factors. The estimated cost for the removal of any one of these dams would be between $500,000 and $2,000,000.

Chapter 10 Evaluation and Revision

Purpose

This chapter will outline of how the Implementation Plan will be evaluated and revised when needed. The Education/Outreach aspect is also included.

Chapter Acknowledgements: The Blanchard River watershed coordinator and BRWP partners.

The main objective of the Riley Creek Watershed Action Plan is to improve the water quality and ecological integrity of the waterways that are not meeting attainment status as defined in the Ohio EPA's 2009 TMDL Report.

The BRWP partners recognize that accomplishment of these goals depends not only on use of conservation practices, such as BMPs, but also on the involvement and development of a sense of ownership among the people living in and near the watershed. Evaluation of this plan will address both water quality and community engagement.

Water Quality

The evaluation portion of this chapter outlines how the BRWP and its partners will evaluate how successfully the implementation plan outlined in Chapter 7 is being accomplished.

Chemical testing is being planned at seven sites. The seven sites correspond to the Problem Areas outlined in Chapter 7. Map 10.1 on page 10-3 shows the location of the sites for chemical testing. The chemical testing plan is being developed using input from the University of Findlay, Owens Community College, Ohio Northern University, and the Ohio EPA. The testing will be used to form a baseline data level for each site. Additional test results will add to the baseline data and to give the level of improvement achieved after the BMPs proposed in the Implementation Plan are completed. Water Quality monitoring, by use of macroinvertebrate identification, will continue in the spring and fall of each year. Map 10.1 on page 10-3 shows the sites that are being monitoring in this watershed. Table 7.10 includes a column marked "Performance Indicator" that points how each strategy will be evaluated. A report of how much has been accomplished in implementing the Plan will be prepared annually for the stakeholders.

Community Engagement

The participation of the stakeholders is essential to the lasting success of water quality improvement projects. The BRWP plans to utilize its partners to continue the education and outreach efforts of watershed stewardship within the watershed. A summary of the BRWP's community engagement can be found in Table 10.1 on page 10-4.

Review and Revision

The BRWP will conduct an internal review of the plan strategies each year. This review will be conducted by the BRWP coordinator and the Board of Directors. Accomplishments and challenges will be discussed and the WAP timeline adjusted accordingly. After this annual review, a "State of the Watershed" report will be presented to Riley Creek watershed stakeholders and will be included in the next newsletter and posted on the web site. An update of the plan will be initiated by the Board of Directors after five years (2017), unless otherwise stated by the Board. This update will include input from residents, business owners, civic groups, public officials, and the Steering Committee of the Blanchard River Watershed Partnership.

Education/Outreach

The BRWP has always included Education/Outreach has a main focus. The Partnership publishes a quarterly newsletter that is sent to nearly 100 people and agencies in Northwest Ohio. The BRWP has a display at the Putnam, Allen, Hancock, and Hardin County fairs each year. The Partnership presents an educational program to many groups each year, including a Stormwater Forum in Findlay, Ohio in September 2011. The group also hosted a ODNR Level One Macroinvertebrate Training session in September 2011. The BRWP maintains a web site at www.blanchardriver.org. The site has several tabs for educational information. The BRWP has received grants to help fund these activities over the years.

The BRWP has written series of articles on "What is a Watershed?" that will be used to further educate the stakeholders. A copy of the articles can be found in Appendix H.

The Education Committee is working on the "2012 Watershed Report Card" that will be handed out at our Annual Meeting in November 2012. The Report Card will be placed on the web site when finished.

The BRWP is always looking to reach out to the area schools. Several education activities are being planned, such rain barrels, stormwater, and Best Management Plans for all occasions.

Map 10.1 Chemical Testing & Macroinvertebrate Sites

Potential Chemical Testing Sites - Riley Creek watershed

(TMDL target - phosphorus = 0.10 mg/L; nitrate/nitrite = 1.00 mg/L pg. 71 TSD Report
Site 1: Riley Creek @ Road K 6 east of Road L (phosphorus and nitrate-nitrite)
Site 2: Riley Creek @ Road R east of Road 5 (phosphorus and nitrate-nitrite)
Site 3: Little Riley Creek (lower) @ Spring St (phosphorus only)
Site 4: Marsh Run @ Main St. (phosphorus and nitrate-nitrite)
Site 5: Little Riley Creek (upper) @ TR 28 (phosphorus only)
Site 6: Riley Creek @ SR 235 (phosphorus only)
Site 7: Little Riley Creek @ Swaney Road (petroleum products)

Water Quality (Macroinvertebrate) Monitoring Sites

Map 10.1: Chemical Testing and Macroinvertebrate Sites

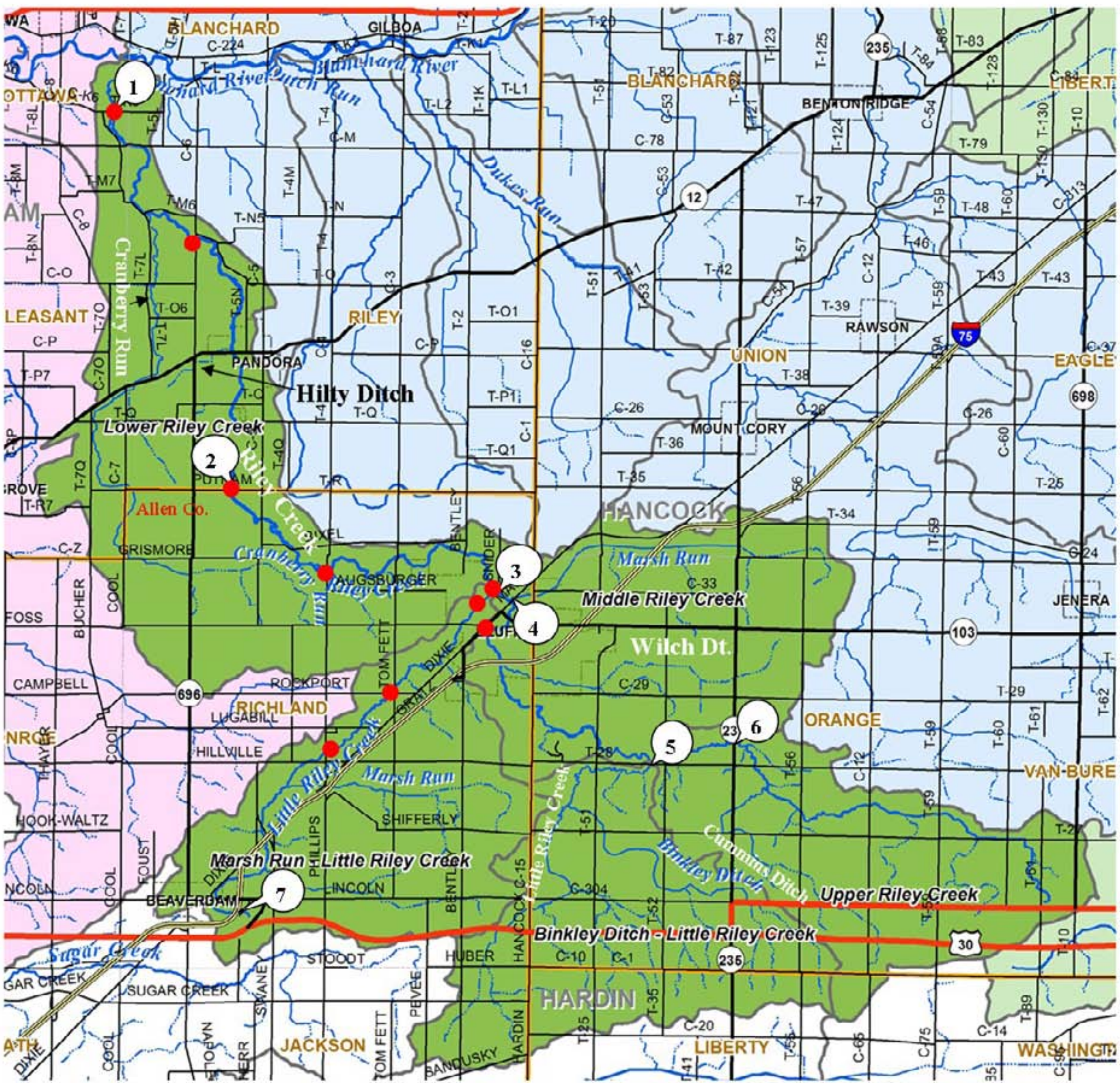

Table 10.1: Overview of Community Engagement Tools Utilized in 2012 - 2013

Engagement Tool	Opportunity Type	Mode of engagement	Benefits	Challenges
Website	Education/outreach	Indirect	Provide a source for detailed information	Internet is not a main tool for information in this local context
BRWP Times (newsletter)	Education/outreach	Indirect	Ability to educate, inform, highlight events, and accomplishments,	No guarantee it is read
County Fair Displays	Education/outreach	Indirect	Ability to educate, inform, highlight events, and accomplishments,	No guarantee it is read
Printed Materials - brochures, placemats, etc.	Education/outreach	Indirect	Ability to educate, inform, highlight events, and accomplishments,	No guarantee it is read
Technical subcommittees	Technical Advisory	Direct	Utilizes stakeholder knowledge and skills	Time commitment makes it difficult to recruit and retain
Annual Meeting	Education/outreach	Direct	Opportunity for public to hear and discussion issues	May not be well attended
Official Public Meetings	Education/outreach	Direct	Opportunity for public to hear and discussion issues	May not be well attended
Riley Creek Stakeholder Survey	Feedback	Direct	Allows for a broad range of questions	Volunteer participation required
Volunteer Opportunities	Education/Active Involvement	Direct	Data collection, clean-up, etc.	Requires commitment of time, may require training
Professional/Support Agencies	Technical Advisory & Grant Sources	Direct/ Indirect	Utilize professional knowledge & money	Working with professional agencies and having enough money to fund the budget

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Appendix A

Summary of Riley Creek Watershed Survey

October 2010

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Summary of Riley Creek
Watershed Survey

An online survey of 500 stakeholders in the Riley Creek Watershed was conducted between October 1-30, 2010. Postcards were sent to the landowners along Riley Creek and Little Riley Creek, plus XXX randomly selected landowners in the watershed. Twenty two postcards were returned as undeliverable. Two Stakeholders requested a hard copy of the survey. Both returned their surveys. Forty nine stakeholders completed the survey. The results of these respondents is summarized below.

Questions 1: Do you feel there is a problem with water quality in your area?

48 answered - 46% (22) Yes; 44% (21) No; and 10% (5) No Opinion

Question 2: The following is a list of water quality problems that sometimes occur in rural watersheds. Which of the following do you consider to be a problem in your area? (choose all that apply)

43 answered -	**Flooding**	**72% (31)**
	Agricultural Runoff - from fields	**58% (25)**
	Failed Septic Systems	**35% (15)**
	Chemical Pollutants	**30% (13)**
	Illegal Dumping	**30% (13)**
	Industrial sources	**12% (5)**
	Dams	**9% (4)**
	Erosion from construction sites	**5% (2)**

Question 3: What best describes the streams in your area?

46 answered -	**They are an asset and landowners are proud of them**	**57% (26)**
	They could be an asset, but currently have poor water quality	**28% (13)**
	Other	**9% (4)**
	They are an eye sore and a detriment to our community	**4% (2)**
	They have no impact on the quality of our community	**2% (1)**

Question 4: What do you consider the most beneficial use of our local streams?

46 answered -	**Drainage**	**41% (19)**
	Wildlife and Birding	**24% (11)**
	Aesthetic and Beauty	**22% (10)**
	Other	**7% (3)**
	Fishing	**4% (2)**
	Drinking Water	**2% (1)**
	Swimming	**0% (0)**
	Waste Removal	**0% (0)**
	Tourism	**0% (0)**

Question 5: Do you drink tap water in your home?

46 answered -	**Yes, always**	**70% (32)**
	We drink mostly tapwater	**22% (10)**
	We drink water mostly from other sources (bottled, etc.	**7% (3)**
	We never drink the tapwater	**2% (1)**

Summary of Riley Creek
Watershed Survey

Questions 6: Do you filter your tap water in your home?

46 answered -	**No**	**52% (24)**
	Yes, always	**28% (13)**
	Sometimes yes, sometimes no	**20% (9)**
	We do not drink tapwater	**0% (0)**

Question 7: Is there a problem with flooding in your area?

46 answered - 54% (25) Yes; 43% (20) No; and 2% (1) No Opinion

Question 8: Streams are considered to have a high flashiness if the water level rises quickly in reaction to storm runoff. Which of the following do you feel might be causing (flashiness in the stream).

46 answered -	**An increase in the use of tile to drain agricultural fields**	**43% (20)**
	An increase in paved surfaces in urban areas	**30% (14)**
	An increase in drainage related to rural residential development	**26% (12)**
	Channelization of streams	**20% (9)**
	I have not noticed this problem	**20% (9)**
	Overaggressive maintenance of ditches	**11% (5)**
	Other	**11% (5)**
	Installation of new ditches	**4% (2)**

Question 9: If you feel flashiness is a problem, which of the following practices would you like to see implemented in the watershed as possible solutions?

46 answered -	**Planting trees**	**37% (17)**
	Creation of wetlands	**30% (14)**
	Use of controlled drainage to help recharge ground water	**28% (13)**
	Stormwater retention basins	**22% (10)**
	I haven't noticed the problem	**22% (10)**
	Improved soil tillage (e.g. conservation tillage, cover crops, crop rotation)	**22% (10)**
	Ordinances requiring pervious paved surfaces to be used on parking lots	**13% (6)**
	Ordinances to limit the amount of paved surfaces on parking lots	**13% (6)**
	Other	**9% (4)**
	Installation of field tile to reduce surface runoff	**9% (4)**

Question 10: Do you feel the farmers are doing enough to limit how much water pollution they cause?

46 answered -	**Most are doing enough**	**46% (21)**
	Yes, they are doing enough	**26% (12)**
	Very few are doing enough	**26% (12)**
	Farmers do not cause any water pollution	**2% (1)**
	None of them are doing enough	**0% (0)**

Summary of Riley Creek
Watershed Survey

Question 11: Do you feel industries are doing enough to limit how much water pollution they cause?

46 answered -	**Most are doing enough**	**54% (25)**
	Very few are doing enough	**28% (13)**
	Yes, they are doing enough	**9% (9)**
	None of them are doing enough	**7% (3)**
	Industries do not cause any water pollution	**2% (1)**

Question 12: Do you feel local government is doing enough to limit pollution in local streams?

46 answered -	**Most are doing enough**	**37% (17)**
	Very few are doing enough	**35% (16)**
	Yes, they are doing enough	**20% (9)**
	It is not a local government issue	**7% (3)**
	None of them are doing enough	**2% (1)**

Question 13: Do you feel work needs to be done to improve the quality local streams?

45 answered - 44% (20) Yes; 38% (17) No; and 18% (8) Not Sure

Question 14: Do you feel there are neighbors in your area that create pollution that impacts local streams?

45 answered - 20% (9) Yes; 51% (23) No; and 29% (13) Not Sure

Question 15: What kind of impact to you have on local water quality?

46 answered -	**I have a small positive impact**	**46% (21)**
	I have no impact	**37% (17)**
	I have a large positive impact	**11% (5)**
	I have a small negative impact	**7% (3)**
	I have a large negative impact	**0% (0)**

Question 16: Putting a watercourse on ditch maintenance will most likely… (choose all that apply)

38 answered -	**Improve my drainage**	**39% (15)**
	Improve water quality	**21% (8)**
	Improve the aesthetics of my neighborhood	**21% (8)**
	Reduce the aesthetics of my neighborhood	**18% (7)**
	Reduce real estate value (residential)	**16% (6)**
	Improve real estate value (agricultural)	**16% (6)**
	Improve real estate value (residential)	**13% (5)**
	Reduce property value (agricultural)	**13% (5)**
	Reduce water quality	**13% (5)**
	Impair my drainage	**8% (3)**
	Improve other	**5% (2)**
	Reduce other	**3% (1)**

Summary of Riley Creek
Watershed Survey

Question 17: Which of the following approaches would you like to see used to protect local streams? (choose all that apply)

46 answered -

Protection and preservation of floodplains	**41% (19)**
Education landowners on ways to protect stream quality	**41% (19)**
Incentive programs to help landowners reduce pollution	**30% (14)**
Incentive payments to farmers to implement conservation practices	**30% (14)**
Increased enforcement of our present laws	**28% (13)**
Fines and penalties for polluters	**26% (12)**
Conservation contracts to protect streamside vegetation and limit development	**26% (12)**
Cost share to help landowners replace failed home septic systems	**24% (11)**
Enough is being done already	**17% (8)**
Other	**11% (5)**
Creation of new laws and ordinances to protect water quality	**0% (0)**

Question 18: Ohio EPA listed sediment caused by erosion as the number one cause of pollution in your watershed. Which of the following do you feel are the most significant sources of this erosion? (Choose all that apply)

44 answered -

Agricultural fields	**48% (21)**
Stream bank erosion	**45% (20)**
I don't agree that erosion is a problem	**14% (6)**
Other	**9% (4)**
Construction sites (residential and commercial)	**7% (3)**
Pastures were livestock have access to streams	**5% (2)**

Question 19: Which of the following potential solutions would yo u like to see implemented to reduce erosion in this watershed? (choose all that apply)

42 answered -

Filter strips/buffer strips on streams	**55% (23)**
Removal of log jams	**52% (22)**
Financial incentives for landowners to control erosion	**38% (16)**
Increase use of conservation tillage practices	**31% (13)**
Education of how landowners can reduce erosion	**31% (13)**
Fines and penalties for polluters	**12% (5)**
Better enforcement of current regulations at construction sites	**10% (4)**
New regulations to help reduce erosion at construction sites	**2% (1)**
There is no need to reduce erosion	**2% (1)**
Other	**2% (1)**

Summary of Riley Creek
Watershed Survey

Question 20: A goal of reducing phosphorus levels in streams has been suggested by the Ohio EPA. Which of the following do you feel are the most significant sources of this phosphorus? (choose all that apply)

44 answered -	**Runoff from agricultural fields**	**57% (25)**
	Over application of fertilizers	**30% (13)**
	Failed septic systems	**27% (12)**
	Urban storm sewer overflows	**16% (7)**
	I don't agree that phosphorus is a problem	**16% (7)**
	Livestock waste	**14% (6)**
	Other	**5% (2)**

Question 21 Which of the following practices would you like to see implemented in this watershed to reduce phosphorus in streams? (choose all that apply)

42 answered -	**Installation of streamside buffer/filter strips**	**45% (19)**
	Use of cover crops	**43% (18)**
	Improved fertilizer use efficiencies by farmers (i.e. soil testing)	**38% (16)**
	Increased use of conservation tillage	**29% (12)**
	Improved fertilizer use efficiencies by residential homeowners (i.e. soil testing)	**19% (8)**
	There is no need to reduce phosphorus	**19% (8)**
	Improved storage, handling, and application of livestock waste	**17% (7)**
	Replacement of septic systems	**17% (7)**
	Fine and penalties for polluters	**10% (4)**
	New regulations to reduce residential sources	**7% (3)**
	New regulations to reduce agricultural sources	**7% (3)**
	New regulations to reduce urban sources	**5% (2)**
	Other	**0% (0)**

Question 22: Where do you feel it is acceptable to have trees? (choose all that apply)

46 answered -	**On large creeks, such as Riley Creek**	**70% (32)**
	On medium creeks, such as Little Riley Creek	**57% (26)**
	On maintained ditches, on both sides	**41% (19)**
	On small creeks, such as Marsh Run	**37% (17)**
	On agricultural ditches in fields	**28% (13)**
	Trees should not be allowed near any watercourse	**15% (7)**
	On maintained ditches, on one side	

Question 23: What sex are you?

46 answered - Male 80% (37); Female 20% (9)

Question 24: How many people live in your home?

47 answered - 2-60% (28); 4-19% (9); 3-11% (5); 4-6% (3); 6 or more 4% (2)

Question 25: How many acres of land do you own, rent, farm, or have controlling interest in?

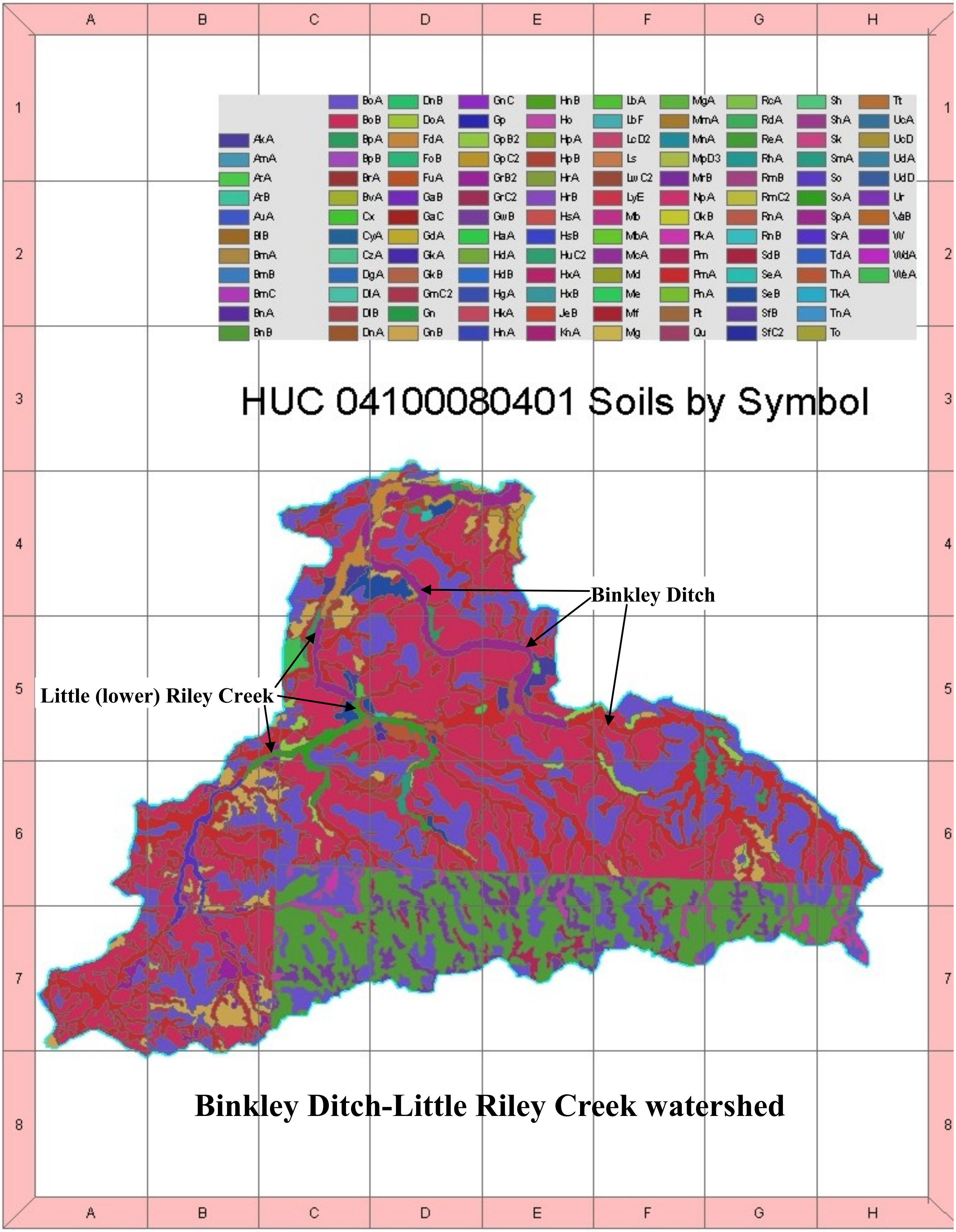
47 answered -	**less than 5.0 acres**	**45% (21)**
	25.01 - 100 acres	**23% (11)**
	100.01 - 250 acres	**19% (9)**
	250.01 - 1000 acres	**11% (5)**
	5.01 - 15 acres	**2% (1)**

Question 26: Which of the following best describes you?

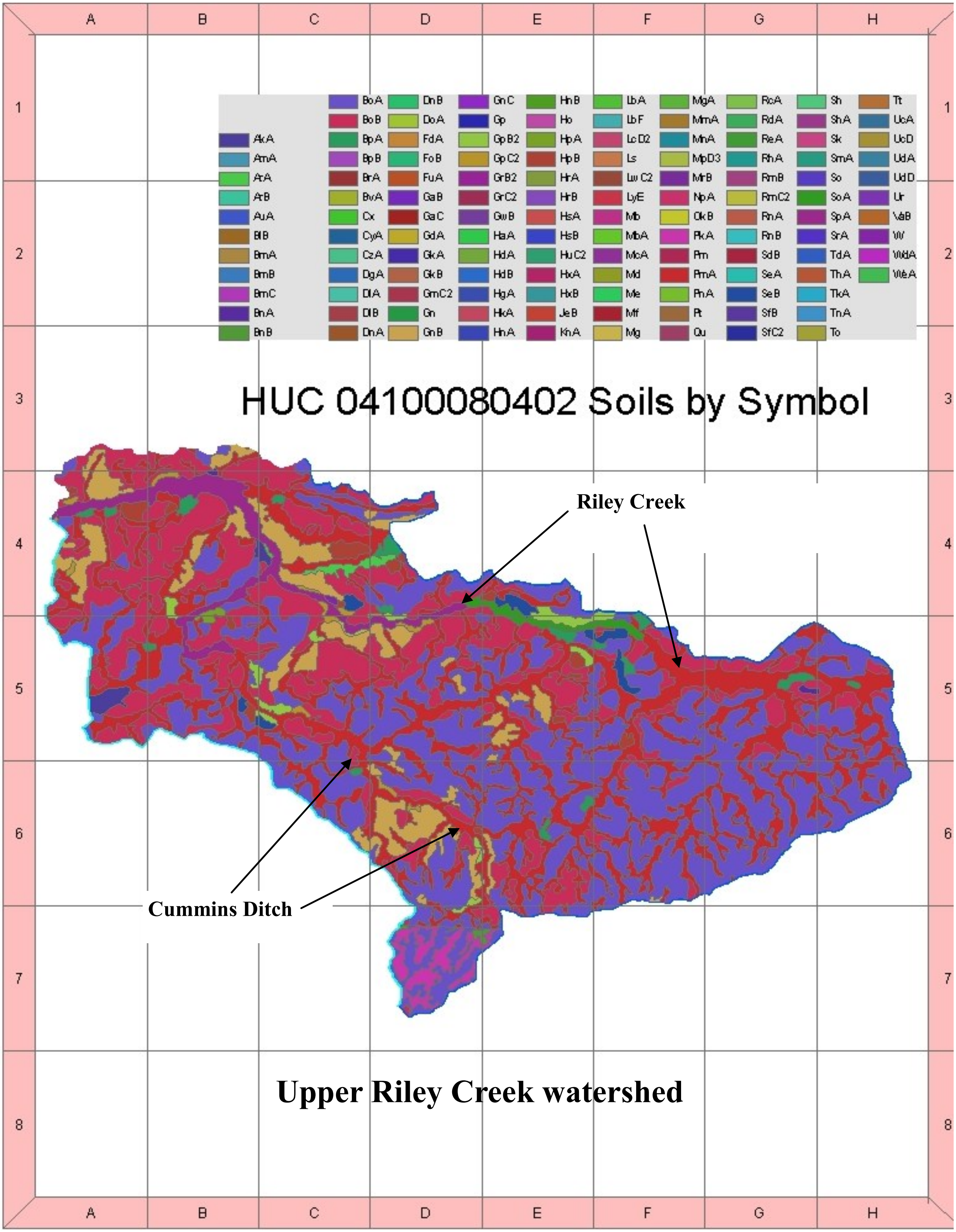
47 answered -	**resident of Riley Creek Watershed, owning multiple properties in the watershed**	**53% (25)**
	other, please specify	**32% (15)**
	non-resident of Riley Creek Watershed, owning multiple properties in the watershed	**13% (6)**
	elected official from within the Riley Creek Watershed	**2% (1)**
	representative of an agency that works within the Riley Creek Watershed	**0% (0)**

Appendix B - Soils

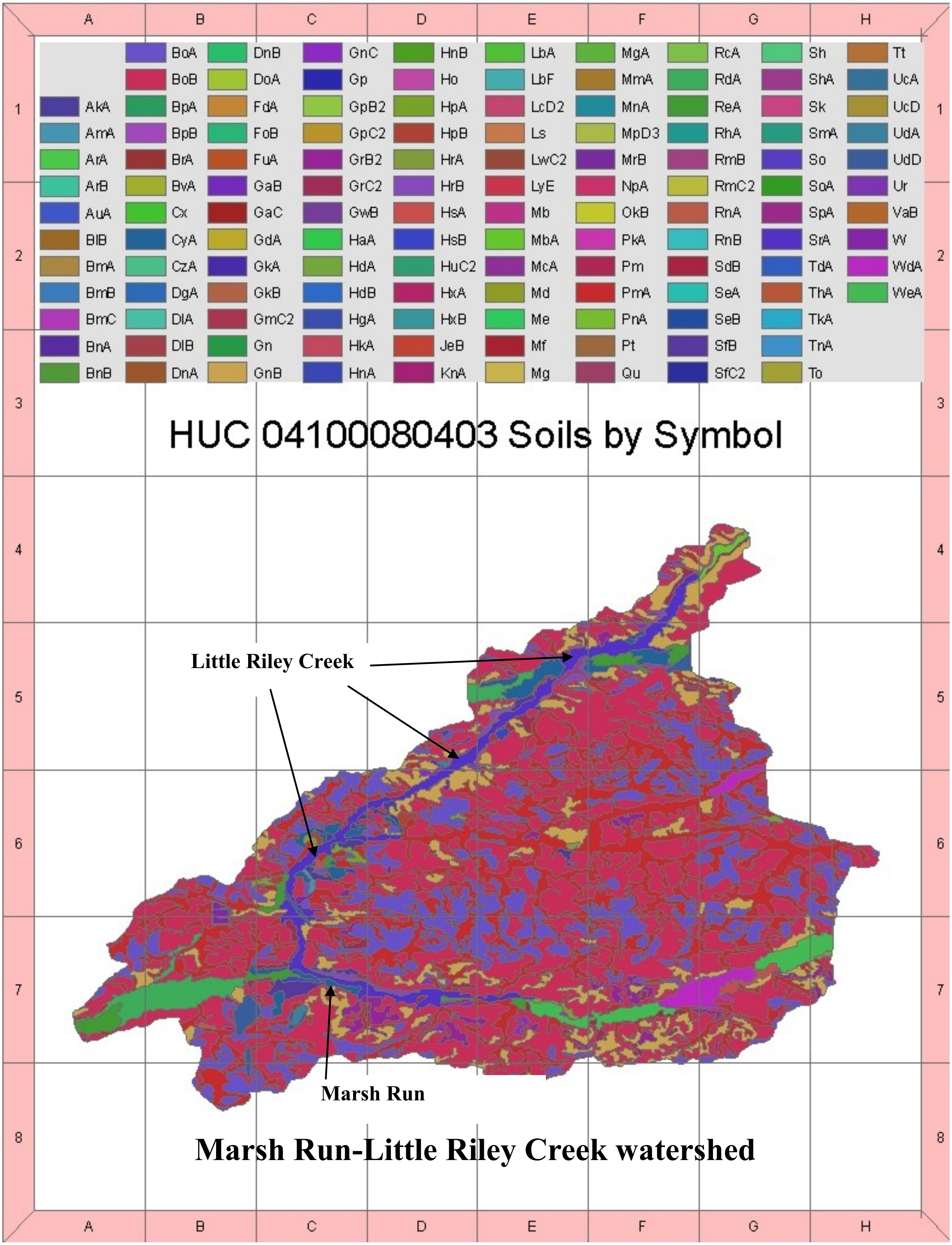
Riley Creek Watershed
Soils by 12-digit watersheds
& Analysis

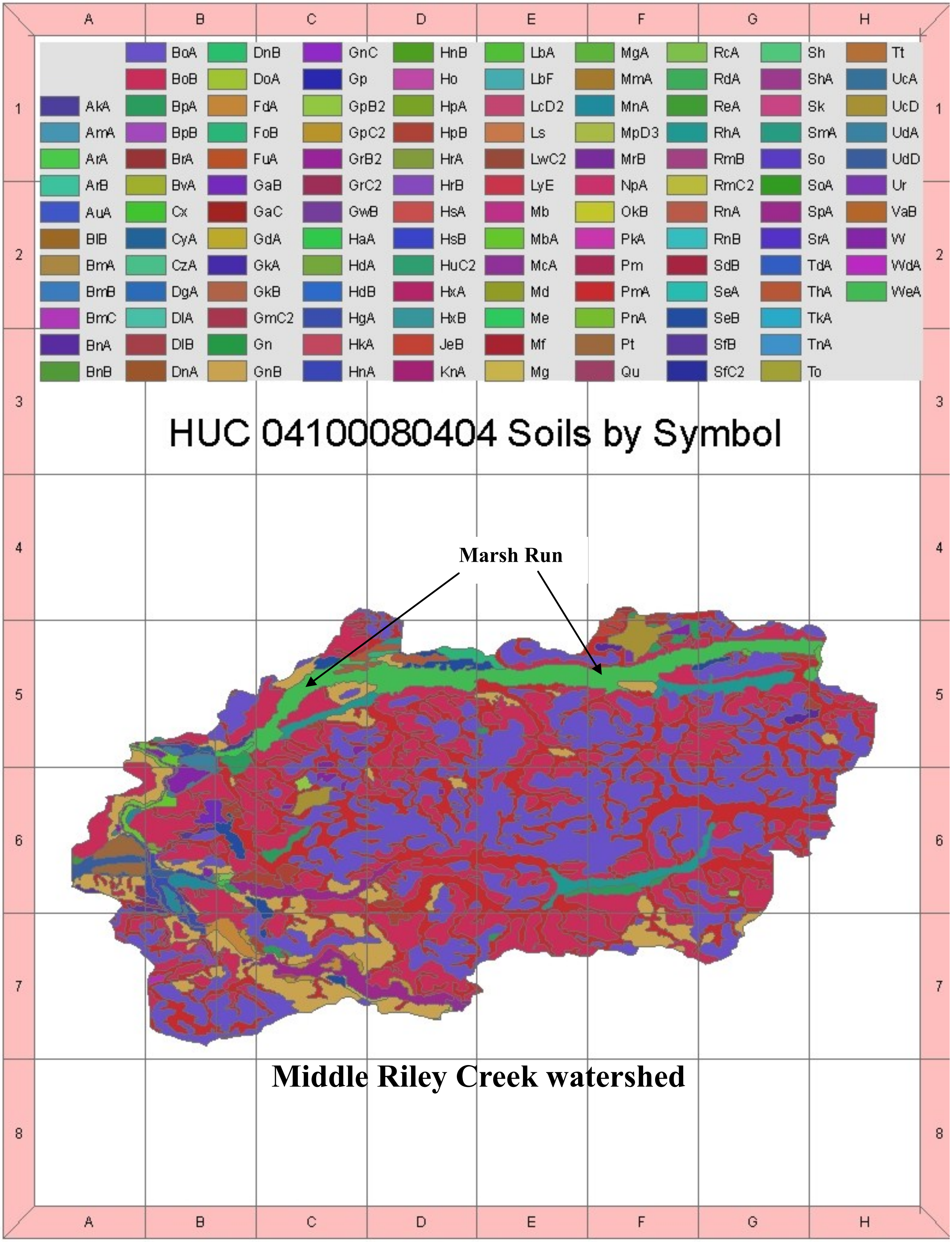


Binkley Ditch-Little Riley Creek watershed



Upper Riley Creek watershed


A B C D E F G H
1 2 3 4 5 6 7 8
AkA AmA ArA ArB AuA BlB BmA BmB BmC BnA BnB
BoA BoB BpA BpB BrA BvA Cx CyA CzA DgA DlA DlB DnA
DnB DoA FdA FoB FuA GaB GaC GdA GkA GkB GmC2 Gn GnB
GnC Gp GpB2 GpC2 GrB2 GrC2 GwB HaA HdA HdB HgA HkA HnA
HnB Ho HpA HpB HrA HrB HsA HsB HuC2 HxA HxB JeB KnA
LbA LbF LcD2 Ls LwC2 LyE Mb MbA McA Md Me Mf Mg
MgA MmA MnA MpD3 MrB NpA OkB PkA Pm PmA PnA Pt Qu
RcA RdA ReA RhA RmB RmC2 RnA RnB SdB SeA SeB SfB SfC2
Sh ShA Sk SmA So SoA SpA SrA TdA ThA TkA TnA To
Tt UcA UcD UdA UdD Ur VaB W WdA WeA
HUC 04100080403 Soils by Symbol
Little Riley Creek
Marsh Run
Marsh Run-Little Riley Creek watershed



AkA
AmA
ArA
ArB
AuA
BlB
BmA
BmB
BmC
BnA
BnB
BoA
BoB
BpA
BpB
BrA
BvA
Cx
CyA
CzA
DgA
DlA
DlB
DnA
DnB
DoA
FdA
FoB
FuA
GaB
GaC
GdA
GkA
GkB
GmC2
Gn
GnB
GnC
Gp
GpB2
GpC2
GrB2
GrC2
GwB
HaA
HdA
HdB
HgA
HkA
HnA
HnB
Ho
HpA
HpB
HrA
HrB
HsA
HsB
HuC2
HxA
HxB
JeB
KnA
LbA
LbF
LcD2
Ls
LwC2
LyE
Mb
MbA
McA
Md
Me
Mf
Mg
MgA
MmA
MnA
MpD3
MrB
NpA
OkB
PkA
Pm
PmA
PnA
Pt
Qu
RcA
RdA
ReA
RhA
RmB
RmC2
RnA
RnB
SdB
SeA
SeB
SfB
SfC2
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SmA
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SoA
SpA
SrA
TdA
ThA
TkA
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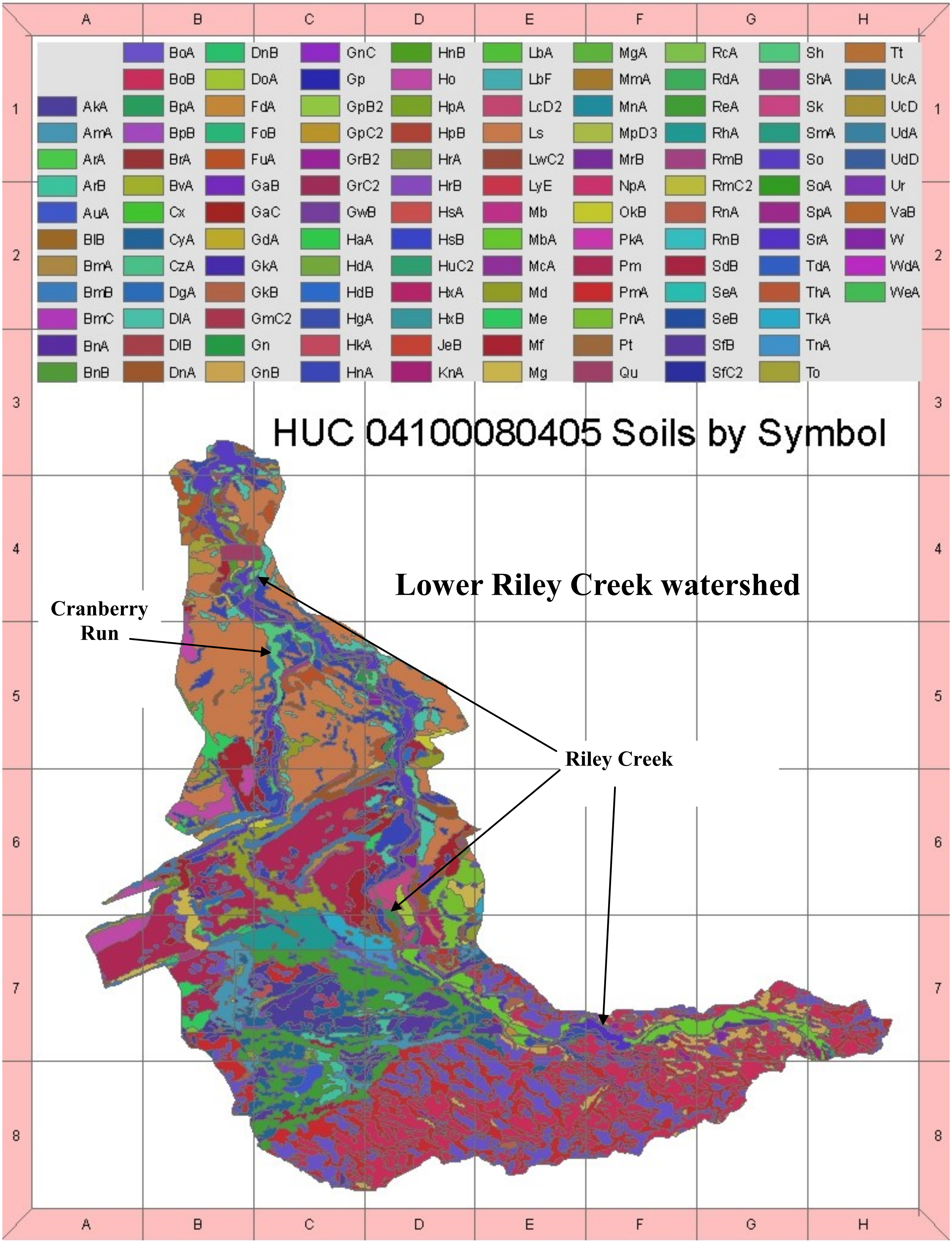
WeA
HUC 04100080404 Soils by Symbol
Marsh Run
Middle Riley Creek watershed


HUC 04100080405 Soils by Symbol
Lower Riley Creek watershed
Cranberry Run
Riley Creek
A
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AkA
AmA
ArA
ArB
AuA
BlB
BmA
BmB
BmC
BnA
BnB
BoA
BoB
BpA
BpB
BrA
BvA
Cx
CyA
CzA
DgA
DlA
DlB
DnA
DnB
DoA
FdA
FoB
FuA
GaB
GaC
GdA
GkA
GkB
GmC2
Gn
GnB
GnC
Gp
GpB2
GpC2
GrB2
GrC2
GwB
HaA
HdA
HdB
HgA
HkA
HnA
HnB
Ho
HpA
HpB
HrA
HrB
HsA
HsB
HuC2
HxA
HxB
JeB
KnA
LbA
LbF
LcD2
Ls
LwC2
LyE
Mb
MbA
McA
Md
Me
Mf
Mg
MgA
MmA
MnA
MpD3
MrB
NpA
OkB
PkA
Pm
PmA
PnA
Pt
Qu
RcA
RdA
ReA
RhA
RmB
RmC2
RnA
RnB
SdB
SeA
SeB
SfB
SfC2
Sh
ShA
Sk
SmA
So
SoA
SpA
SrA
TdA
ThA
TkA
TnA
To
Tt
UcA
UcD
UdA
UdD
Ur
VaB
W
WdA
WeA

Analysis of Load Reductions
Riley Creek watershed - 12 digit watersheds

04 01 Binkley Ditch-Little Riley Creek

Ag. Land Use: 77.2% or 7098.3 acres

Sediment:

Base Sediment Delivery: 3422.6 tns./yr. / 9453.2684 ac. = .3631 tns./ac.

Sediment Reduction goal: 50%

Base Sediment Delivery from Ag.: .3631 tns./ac./yr. X 7098.3 ac. = 2577 tns./yr.

Sediment Reduction/year 50% goal: 2577 tns./yr. X .5 = 1288.5 tns./yr.

Sediment Reduction using Filter Strips/Riparian Buffers: 2232.4 tns./yr./9453.3 ac. = .2362 tns.

Acres of Filter Strips/Riparian Buffers needed to treat: 1288.5 tns./yr. / .2362 tns./ac. = 5455 acres

Phosphorus:

P-Associated with Sediment: 7119.1 lbs./yr. / 9453.3 ac. = .7531 lbs./ac.

P loading from sediment Association: 7098.3 ac. X .7531 lbs./ac./yr. = 5346 lbs.

P-Associated goal: 57%

P Reduction/year 57%: 5346 lbs./yr. X .57 = 3047 lbs.

Phosphorus Reduction using:

Filter Strips/Riparian Buffers: 5389.8 lbs./ac./yr. / 9453.3 ac. = .5702 lbs./ac./yr.

Acres of Filter Strips/Riparian Buffers needed to treat: 3047 lbs./yr. / .5702 lbs./ac./yr. = 5344 ac.

Binkley Ditch-Little Riley Creek

HUC 04100008 04-01

Soil Symbols	Area Acres	Base Sheet & rill erosion (tns/yr)	Base Sediment Delivery (tns/yr)	N Associated w/sediment (tns/yr)	NPAssociated w/sediment (tns/yr)	Sediment Reduction w/BMPs Filter Strips	Sediment Reduction w/BMPs Riparian Buffer	Nitrogen Reduction w/BMPs Filter Strips	Nitrogen Reduction w/BMPs Riparian Buffer	Phosphorus Reduction w/BMPs Filter Strips	Phosphorus Reduction w/BMPs Riparian Buffer
BoB	2802.7150	3260.4	1632.0	6126.9	2955.3	1060.8	1060.8	42388.2	42388.2	2217.3	2217.3
BoA	1876.2350	672.7	336.5	1634.1	776.4	218.6	218.6	1143.9	1143.9	582.1	582.1
PmA	1655.7860	390.3	195.1	1039.2	491.0	126.8	126.8	727.4	727.4	368.3	368.3
BnB	1161.2690	937.3	472.8	2496.7	1177.9	306.9	306.9	1750.2	1750.2	887.5	887.5
GnB	389.4283	443.4	221.7	36.3	403.4	144.1	144.1	585.5	585.5	302.5	302.5
GwB	256.6685	295.2	147.6	1026.7	365.8	96.3	96.3	539.0	539.0	275.9	275.9
SpA	198.3611	46.9	23.7	125.1	59.1	15.3	15.3	87.7	87.7	44.2	44.2
PkA	157.3241	37.1	18.5	98.7	46.7	12.1	12.1	69.1	69.1	35.0	35.0
Pm	104.3187	35.5	17.8	86.9	41.3	11.6	11.6	61.0	61.0	30.9	30.9
GrB2	89.5879	80.2	41.8	223.4	105.4	29.8	29.8	156.2	156.2	79.1	79.1
WeA	89.4421	20.6	10.3	55.5	25.9	6.7	6.7	38.9	38.9	20.6	20.6
SoA	85.7203	23.9	12.0	46.6	22.5	7.7	7.7	32.7	32.7	16.8	16.8
SeB	76.1477	64.1	32.0	128.8	61.9	20.9	20.9	90.1	90.1	46.3	90.1
AkA	72.4362	19.1	9.6	44.2	21.0	6.2	6.2	30.9	30.9	50.8	50.8
GpB2	67.7626	63.5	31.6	168.9	79.7	20.6	20.6	118.1	118.1	59.9	59.9
GpC2	61.2756	166.6	83.5	348.9	183.4	54.0	54.0	269.1	269.1	137.5	137.5
FdA	57.3792	26.9	13.4	38.8	19.0	8.7	8.7	27.1	27.1	14.3	14.3
BpA	54.6156	25.1	12.6	57.8	27.6	8.2	8.2	40.5	40.5	20.7	20.7
SrA	45.4141	12.7	6.4	24.0	11.6	4.1	4.1	16.8	16.8	8.7	8.7
HpB	44.6004	38.4	19.2	77.0	37.0	12.4	12.4	54.0	54.0	27.7	27.7
ThA	35.30973	12.6	6.3	33.5	15.8	4.1	4.1	23.5	23.5	11.9	11.9
SmA	12.4109	2.9	1.5	7.8	3.7	0.9	0.9	5.4	5.4	2.8	2.8
LbA	10.7161	3.1	1.6	2.7	1.3	1.0	1.0	1.9	1.9	1.0	1.0
SeA	6.7346	2.1	1.0	3.7	1.7	0.7	0.7	2.6	2.6	1.3	1.3
LyE	6.5589	129.2	64.3	313.5	148.9	42.0	42.0	219.7	219.7	111.5	111.5
MpD3	6.5619	1.9	1.0	4.9	2.3	0.6	0.6	3.4	3.4	1.8	1.8
BrA	5.6962	2.6	4.6	5.7	0.9	0.9	0.9	4.0	4.0	0.6	0.6
McA	5.4905	1.6	0.8	3.1	1.5	0.5	0.5	2.2	2.2	1.1	1.1
HrA	4.7151	1.2	0.6	3.3	1.6	0.4	0.4	2.3	2.3	4.7	4.7
HsA	3.5630	0.9	0.5	2.5	1.2	0.4	0.4	1.7	1.7	3.9	3.9
BnA	2.5137	1.0	0.5	2.3	1.1	0.8	0.8	1.6	1.6	0.9	0.9
LcD2	2.1055	20.6	10.3	50.3	24.0	6.7	6.7	35.2	35.2	17.9	17.9
HrB	1.8515	2.2	0.8	3.2	1.5	0.5	0.5	2.2	2.2	1.2	1.2

Binkley Ditch-Little Riley Creek

HUC 04100008 04 01

Soil Symbols	Area Acres	Base Sheet & rill erosion (tns/yr)	Base Sediment Delivery (tns/yr)	N Associated w/sediment (tns/yr)	P Associated w/sediment (tns/yr)	Sediment Reduction w/BMPs Filter Strips	Sediment Reduction w/BMPs Riparian Buffer	Nitrogen Reduction w/BMPs Filter Strips	Nitrogen Reduction w/BMPs Riparian Buffer	Phosphorus Reduction w/BMPs Filter Strips	Phosphorus Reduction w/BMPs Riparian Buffer
HsB	1.2935	1.0	0.5	2.2	1.1	0.3	0.3	1.5	1.5	2.7	2.7
HpA	0.7394	0.3	0.2	0.6	0.3	0.8	0.8	0.4	0.4	0.2	0.2
ReA	0.5207	0.1	0.1	0.4	0.3	0.04	0.04	0.3	0.3	0.1	0.1
Total	9453.2684	6843.1	3432.6	14324.2	7119.1	2232.4	2232.4	48534.3	48534.3	5389.8	5433.6

Reduction when using wetlands is the same as Filter Strips

Analysis of Load Reductions
Riley Creek watershed - 12 digit watersheds

04 02 Upper Riley Creek

Ag. Land Use: 77.4% or 7109.1 acres

Sediment:

Base Sediment Delivery: 2441.1 tns./yr. / 9063.7278 ac. = .269 tns./ac.

Sediment Reduction goal: 50%

Base Sediment Delivery from Ag.: .269 tns./ac./yr. X 7109.1 ac. = 1912 tns./yr.

Sediment Reduction/year 50% goal: 1912 tns./yr. X .5 = 956 tns./yr.

Sediment Reduction using Filter Strips/Riparian Buffers: 1592.2 tns./yr. / 9063.7278 ac = .1756 tns./ac.

Acres of Filter Strips/Riparian Buffers needed to treat: 956 tns./yr. / .1756 tns./ac. = 5444 acres

Phosphorus:

P-Associated with Sediment: 5116.3 lbs./yr. / 9063.7278 ac. = .5645 lbs./ac.

P loading from sediment Association: 7109.1 ac. X .5645 lbs./ac./yr. = 4013 lbs.

P-Associated goal: 57%

P Reduction/year 57%: 5346 lbs./yr. X .57 = 3047 lbs.

Phosphorus Reduction using:

Filter Strips/Riparian Buffers: 4749.8 lbs./ac./yr. / 9063.7278 ac = .5240 lbs./ac./yr.

Acres of Filter Strips/Riparian Buffers needed to treat: 3047 lbs./yr. / .5240 lbs./ac./yr. = 5815 ac.

Nitrogen

N-Associated with Sediment: 10638.3 lbs./yr. / 9063.7278 ac. = 1.174 lbs./ac.

N-loading from sediment Association: 7109.1 ac. X 1.174 lbs./ac./yr. = 8346 lbs.

N-Associated goal: 38.5%

N-Reduction/year 38.5%: 8346 lbs./yr. X .385 = 3213 lbs.

Nitrogen Reduction using:

Filter Strips/Riparian Buffers: 7397.2 lbs./ac./yr. / 9063.7278 ac. = .816 lbs./ac./yr.

Acres of Filter Strips/Riparian Buffers needed to treat: 3213 lbs./yr. / .816 lbs./ac./yr. = 3938 ac.

Upper Riley Creek

HUC 04100008 04 02

Soil Symbols	Area Acres	Base Sheet & rill erosion (tns/yr)	Base Delivery (tns/yr)	N Associated w/sediment (tns/yr)	P Associated w/sediment (tns/yr)	Sediment Reduction w/BMPs Filter Strips	Sediment Reduction w/BMPs Riparian Buffer	Nitrogen Reduction w/BMPs Filter Strips	Nitrogen Reduction w/BMPs Riparian Buffer	Phosphorus Reduction w/BMPs Filter Strips	Phosphorus Reduction w/BMPs Riparian Buffer
BoA	3268.4490	1171.9024	586.0329	2846.4922	1352.4842	380.774	380.774	1992.773	1992.773	1014.200	1014.200
PmA	2474.3620	583.2071	291.4798	1552.9096	733.6483	190.526	190.526	1086.987	1086.987	550.298	550.298
BoB	1869.2000	2174.4404	1088.4352	4086.0712	1970.1368	706.558	706.558	2861.745	2861.745	1478.724	1478.724
GnB	571.7296	444.6913	222.3456	984.6327	495.5157	146.134	146.134	686.076	686.076	1181.594	1181.594
SpA	248.6960	58.8166	29.6446	156.8770	74.1363	19.125	19.125	109.973	109.973	151.282	151.282
PkA	113.3551	26.8152	13.3646	71.1417	33.6098	8.683	8.683	49.806	49.806	25.102	25.102
BpA	95.1091	43.7692	21.8941	100.7015	47.9921	14.228	14.228	70.476	70.476	35.989	35.989
HpB	91.4472	106.3805	39.3406	157.9019	75.9195	25.514	25.514	110.587	110.587	56.889	56.889
GpB2	86.9381	81.4349	40.5740	216.7628	102.3001	26.683	26.683	151.533	151.533	76.792	76.792
SeB	67.9844	57.2225	28.6078	115.0092	55.2373	18.696	18.696	8.043	8.043	41.355	41.355
SoA	51.9668	14.5091	7.2546	28.2595	13.6413	4.656	4.656	19.815	19.815	10.175	10.175
GpC2	42.0302	114.2717	57.2661	263.9497	126.6437	37.041	37.041	184.672	184.672	94.307	94.307
AkA	26.4722	6.9873	3.4996	16.1446	7.6928	2.271	2.271	11.304	11.304	5.771	5.771
ArA	25.2935	8.6529	4.3277	21.2668	10.0845	2.995	2.995	14.878	14.878	7.555	7.555
HpA	9.2786	3.1955	1.5978	7.2679	3.3505	3.479	3.479	19.485	19.485	9.974	9.974
BnB	7.3811	5.9573	3.0048	1.5869	7.4866	1.951	1.951	11.123	11.123	5.641	5.641
BnA	7.1055	2.7783	1.3904	6.6290	3.1512	2.274	2.274	4.640	4.640	2.406	2.406
MpD3	3.6570	1.0824	0.5449	2.7464	2.3759	0.351	0.351	1.922	1.922	1.011	1.011
W	3.2234	0.7414	0.3707	1.9989	0.9348	0.242	0.242	1.402	1.402	0.741	0.741
LbA	1.6885	0.3439	0.1716	0.9466	0.4461	0.112	0.112	0.663	0.663	0.335	0.335
FdA	0.8448	0.3957	0.1975	0.5708	0.2795	0.129	0.129	0.399	0.399	0.210	0.210
McA	0.7391	0.2112	0.1056	0.4236	0.2037	0.068	0.068	0.297	0.297	0.153	0.153
Total	9066.9512	4907.8	2441.5	10640.3	5117.3	1592.5	1592.5	7398.6	7398.6	4750.5	4750.5

Reduction when using wetlands is the same as Filter Strips

Analysis of Load Reductions
Riley Creek watershed - 12 digit watersheds

04 03 Marsh Run-Little Riley Creek

Ag. Land Use: 69.7% or 7256.3 acres

Sediment:

Base Sediment Delivery: 3919.2938 tns./yr. / 10,136.1188 ac = .3867 tns./ac.

Sediment Reduction goal: 50%

Base Sediment Delivery from Ag.: .3867 tns./ac./yr. X 7256.3 ac = 2806 tns./yr.

Sediment Reduction/year 50% goal: 2806 tns./yr. X .5 = 1403 tns./yr.

Sediment Reduction using Filter Strips/Riparian Buffers: 2632.3796 tns./yr. / 10,136.1188 ac = .2597 tns./ac.

Acres of Filter Strips/Riparian Buffers needed to treat: 1403 tns./yr. / .2597 tns./ac. = 5402 acres

Phosphorus:

P-Associated with Sediment: 7784.6268 lbs./yr. / 10,136.1188 ac = .7680 lbs./ac.

P loading from sediment Association: 7256.3 ac. X .7680 lbs./ac./yr. = 5573 lbs.

P-Associated goal: 57%

P Reduction/year 57%: 5573 lbs./yr. X .57 = 3177 lbs.

Phosphorus Reduction using:

Filter Strips/Riparian Buffers: 6129.1 lbs./ac./yr. / 10136.1188 ac. = ..6047 lbs./ac./yr.

Acres of Filter Strips/Riparian Buffers needed to treat: 3177/yr. / .6047 lbs./ac./yr. = 5254 ac.

Marsh Run-Little Riley Creek

HUC 04100008 04 03

Soil Symbols	Area Acres	Base Sheet & rill erosion (tns/yr)	Base Sediment Delivery (tns/yr)	N Associated w/sediment (tns/yr)	P Associated w/sediment (tns/yr)	Sediment Reduction w/BMPs Filter Strips	Sediment Reduction Riparian Buffer	Nitrogen Reduction w/BMPs Filter Strips	Nitrogen Reduction Riparian Buffer	Phosphorus Reduction w/BMPs Filter Strips	Phosphorus Reduction Riparian Buffer
BoB	3963.6610	4610.9287	2308.0398	8664.5629	4177.6987	1498.264	1498.264	6064.401	6064.401	3135.652	3135.652
PmA	2166.6040	510.6686	255.2260	1359.7607	642.3981	166.829	166.829	951.789	951.789	481.527	481.527
BoA	1504.9170	540.0395	269.8316	1310.6322	622.7347	175.366	175.366	917.548	917.548	466.976	466.976
GnB	850.6413	968.0298	484.2701	1826.8373	881.2644	314.737	314.737	1278.854	1278.854	660.778	660.778
SrA	357.1908	100.1920	49.9353	188.7753	90.9051	32.540	32.540	132.125	132.125	68.259	68.259
RdA	187.7526	31.9179	15.8651	76.4716	10.4203	10.514	10.514	53.509	53.509	33.906	33.906
GrB2	162.8468	152.539	76.0006	406.0259	191.6218	49.391	49.391	715.516	715.516	365.396	365.396
CyA	156.9998	50.9307	25.4402	127.2012	80.3368	31.683	31.683	90.181	90.181	46.205	46.205
ReA	114.5087	17.1763	5.7524	40.0780	17.1763	5.725	5.725	28.627	28.627	11.451	11.451
WdA	108.5993	35.2296	17.5974	87.9872	55.5703	21.915	21.915	62.379	62.379	31.961	31.961
GrC2	102.9955	280.0242	140.3314	646.8117	302.6007	90.770	90.770	452.542	452.542	231.101	231.101
WeA	74.7679	17.1966	8.5983	46.3561	21.6827	5.608	5.608	35.524	35.524	17.197	17.197
hHrB	73.6103	63.3417	31.6672	127.1029	61.1113	20.537	20.537	112.624	112.624	45.793	45.793
SfB	42.2470	44.2453	22.1332	84.8066	40.8444	14.402	14.402	59.344	59.344	30.633	30.633
AkA	41.2976	10.8984	5.4595	25.1862	12.0011	3.543	3.543	17.634	17.634	9.003	9.003
GnC	34.7610	75.7373	47.3619	218.2999	104.0675	30.809	30.809	152.733	152.733	77.997	77.997
HrA	26.5114	8.6003	4.2959	21.4795	13.5659	5.350	5.350	15.228	15.228	7.802	7.802
HpB	25.3967	22.4685	11.2279	48.9344	18.3110	7.299	7.299	34.280	34.280	13.836	13.836
LcD2	22.5724	221.2095	110.6048	539.4804	257.3254	72.232	72.232	376.959	376.959	191.865	191.865
hHsA	19.6886	5.1190	2.5595	13.5851	6.4972	1.772	1.772	9.451	9.451	21.461	21.461
MbA	17.6488	5.221	2.610	10.314	4.908	1.696	1.696	7.224	7.224	3.703	3.703
hHsB	14.5600	11.3277	5.6624	235.0752	12.6192	3.722	3.722	17.472	17.472	30.091	30.091
BrA	13.4523	2.9218	1.4381	5.1024	123.3562	43.047	43.047	224.653	224.653	114.345	114.345
HpA	12.7355	4.3861	2.1931	9.9757	4.5988	14.150	14.150	7.005	7.005	3.467	3.467
ShA	11.1076	3.2856	1.6428	6.4913	3.0890	1.067	1.067	4.546	4.546	2.330	2.330
UdA	10.2461	3.3238	1.6603	8.3014	5.2429	2.068	2.068	5.885	5.885	3.013	3.013
GmC2	6.9661	18.9394	9.4913	43.7471	20.8551	6.139	6.139	30.608	30.608	15.631	15.631
GkB	5.7008	3.2916	1.6567	7.5194	0.2782	1.077	1.077	5.241	5.241	6.835	6.835
AmA	4.8541	0.4854	0.4854	1.4562	0.9708	0.000	0.000	0.9708	0.9708	0.4854	0.4854
AuA	1.2779	0.4473	0.2556	1.2779	0.5751	0.128	0.128	0.895	0.895	0.447	0.447
Total	10136.1188	7820.1215	3919.2938	16189.6354	7784.6268	2632.3796	2632.4	11865.7	11865.7	6129.1	6129.1

Reduction when using wetlands is the same as Filter Strips

Analysis of Load Reductions
Riley Creek watershed - 12 digit watersheds

04 04 Middle Riley Creek

Ag. Land Use: 71.8% or 7175.8 acres

Sediment:

Base Sediment Delivery: 4064.8 tns./yr. / 9773.7141 ac. = .4159 tns./ac.

Sediment Reduction goal: 50%

Base Sediment Delivery from Ag.: .4159 tns./ac./yr. X 7175.8 ac. = 2984 tns./yr.

Sediment Reduction/year 50% goal: 2984 tns./yr. X .5 = 1492 tns./yr.

Sediment Reduction using Filter Strips/Riparian Buffers: 2531.5 tns./yr. / 9773.7141 ac. = .2590 tns./ac.

Acres of Filter Strips/Riparian Buffers needed to treat: 1492 tns./yr. / .2590 tns./ac. = 5761 acres

Phosphorus:

P-Associated with Sediment: 8662.8 lbs./yr. / 9773.7141 ac. = .8863 lbs./ac.

P loading from sediment Association: 7175.8 ac. X .8863 lbs./ac./yr. = 6360 lbs.

P-Associated goal: 57%

P Reduction/year 57%: 6360 lbs./yr. X .57 = 3625 lbs.

Phosphorus Reduction using:

Filter Strips/Riparian Buffers: 6538.2 lbs./ac./yr. / 9773.7141 ac = .6690 lbs./ac./yr.

Acres of Filter Strips/Riparian Buffers needed to treat: 3625 lbs./yr. / .6690 lbs./ac./yr. = 5417 ac.

Nitrogen:

N-Associated with Sediment: 18,720.8 lbs./yr. / 9773.7141 ac. = 1.915 lbs./ac.

N loading from sediment Association: 7175.8 ac. X 1.915 lbs./ac./yr. = 13,742 lbs.

N-Associated goal: 38.5%

N Reduction/year 38.5%: 13,742 lbs./yr. X .385 = 5291 lbs.

Nitrogen Reduction using:

Filter Strips/Riparian Buffers: 15456.1 lbs./ac./yr. / 9773.7141 ac. = 1.5814 lbs./ac./yr.

Acres of Filter Strips/Riparian Buffers needed to treat: 5291 lbs./yr. / 1.5814 lbs./ac./yr. = 3346 ac.

Middle Riley Creek

HUC 04100008 04 04

Soil Symbols	Area Acres	Base Sheet & rill erosion (tns/yr)	Base Sedi-ment Delivery (tns/yr)	N Associated w/sediment (tns/yr)	P Associated w/sediment (tns/yr)	Sediment Reduction w/BMPs Filter Strips	Sediment Reduction Riparian Buffer	Nitrogen Reduction w/BMPs Filter Strips	Nitrogen Reduction Riparian Buffer	Phosphorus Reduction w/BMPs Filter Strips	Phosphorus Reduction Riparian Buffer
BoA	2652.6630	951.1123	475.6225	2310.2042	1097.6719	309.035	309.035	4058.574	4058.574	823.121	823.121
BoB	2427.7300	2824.1783	1413.6672	5307.0178	2558.8274	917.682	917.682	3714.427	3714.427	1920.577	1920.577
PmA	2214.6140	521.9845	260.8815	1389.8917	663.6091	170.523	170.523	972.880	972.880	492.530	492.530
GnB	713.4120	811.8629	406.1455	1532.1236	739.0948	263.962	263.962	1072.544	1072.544	555.320	555.320
WeA	455.5827	104.7840	52.392	282.46127	38.3145	34.169	34.169	198.178	198.178	104.784	104.784
RhA	185.9845	47.9468	23.8804	131.6398	70.2277	15.548	15.548	92.193	92.193	46.496	46.496
SpA	175.0792	41.4062	20.8694	110.4400	52.1911	13.464	13.464	77.595	77.595	39.060	39.060
SeB	98.2042	82.6585	41.3243	166.1320	79.7909	27.006	27.006	116.176	116.176	59.738	59.738
HpB	96.6415	83.1600	41.5783	166.8709	80.2318	26.963	26.963	116.869	116.869	60.121	60.121
BpA	92.7193	46.6694	21.3440	98.1712	46.7862	13.871	13.871	68.705	68.705	35.085	35.085
UcD	82.0810	1452.8337	640.2318	3759.3098	1699.0767	344.740	344.740	2585.552	2585.552	1231.215	1231.215
HgA	68.1871	43.0940	12.3623	46.3127	22.3108	8.053	8.053	32.455	32.455	16.726	16.726
MbA	49.5737	20.93	10.4600	28.9709	14.5400	6.831	6.831	20.271	20.271	10.906	10.906
UdD	47.0251	832.3443	366.7958	2153.7496	973.4196	197.505	197.505	1481.291	1481.291	705.377	705.377
ThA	41.17545	14.7038	4.8546	39.0919	18.4507	4.760	4.760	27.378	27.378	13.851	13.851
FdA	40.1627	18.8122	9.3900	27.1379	13.2898	6.113	6.113	18.993	18.993	9.971	9.971
MnA	38.6603	14.4667	7.2333	34.9180	4.7398	4.7398	4.7398	24.444	24.444	12.797	12.797
UdA	32.4824	10.5373	5.2634	26.3172	16.6212	6.555	6.555	18.658	18.658	9.560	9.560
FoB	29.8843	3.7355	1.9096	15.5219	1.2462	1.246	1.246	10.875	10.875	0.995	0.995
GpC2	25.2353	68.6097	34.3831	158.4776	25.2353	22.240	22.240	110.788	110.788	56.623	56.623
SfB	25.0194	29.1051	13.1077	50.2239	24.1888	8.529	8.529	35.145	35.145	18.142	18.142
GrC2	21.6335	58.8172	29.4756	136.2094	64.7664	19.066	19.066	95.053	95.053	48.541	48.541
GaB	21.0736	22.0704	11.0405	42.3031	20.3740	7.184	7.184	29.602	29.602	15.280	15.280
BnA	19.9803	7.8123	3.9097	18.6416	8.9072	6.394	6.394	13.047	13.047	6.765	6.765
JeB	16.31361	6.5254	3.2627	13.0509	5.9822	2.175	2.175	9.082	9.082	4.350	4.350
LyE	10.9005	214.7399	106.8249	521.0439	247.4414	69.763	69.763	365.166	365.166	185.309	185.309
HaA	10.6484	2.4843	13.4990	6.6425	3.1434	0.811	0.811	4.665	4.665	2.332	2.332
GpB2	9.7882	9.1686	4.5682	24.4049	11.5178	2.969	2.969	17.061	17.061	8.643	8.643
MpD3	8.9921	2.6617	1.3398	6.7531	3.2090	0.863	0.863	4.725	4.725	2.486	2.486
Herb	8.5458	7.3537	3.6764	10.0214	7.0947	2.384	2.384	10.334	10.334	5.316	5.316
AkA	7.0311	1.8555	0.9695	4.2881	2.0432	0.603	0.603	3.002	3.002	1.533	1.533
LbA	6.8589	2.0110	1.0055	1.7476	0.8505	0.653	0.653	1.226	1.226	0.663	0.663
McA	6.1839	1.7667	0.8837	3.5440	1.7043	0.571	0.571	2.484	2.484	1.278	1.278

Middle Riley Creek

						Sediment Reduction		Nitrogen Reduction		Phosphorus Reduction	
HUC 04100008 04 04			Base Sediment	N Associated	P Associated	w/BMPs		w/BMPs		w/BMPs	
Soil	Area	Base Sheet & rill	Delivery	w/sediment	w/sediment	Filter	Riparian	Filter	Riparian	Filter	Riparian
Symbols	Acres	erosion (tns/yr)	(tns/yr)	(tns/yr)	(tns/yr)	Strips	Buffer	Strips	Buffer	Strips	Buffer
RcA	3.9953	1.4503	0.7251	3.4919	0.4734	0.473	0.473	2.442	2.442	0.355	0.355
HrA	3.6447	1.1823	0.5906	2.9529	1.8650	0.736	0.736	2.094	2.094	1.072	1.072
CyA	3.4707	1.1259	0.5624	2.8120	1.7760	0.700	0.700	1.994	1.994	1.021	1.021
WdA	3.2711	1.0611	0.5300	2.6502	1.6934	0.660	0.660	1.879	1.879	0.963	0.963
GmC2	2.7779	6.0525	3.7849	17.4452	8.3165	2.448	2.448	1.094	1.094	6.233	6.233
MgA	2.7427	0.6462	0.3228	1.7202	0.8129	0.210	0.210	1.205	1.205	0.064	0.064
GnC	2.5760	2.9287	1.4650	5.5245	2.6646	0.952	0.952	3.867	3.867	1.999	1.999
ReA	2.4208	0.3631	0.1210	0.8473	0.3631	0.121	0.121	0.065	0.065	0.242	0.242
HuC2	2.3114	6.2842	3.1493	14.5156	6.9199	2.037	2.037	0.910	0.910	5.186	5.186
GaC	1.7580	4.7797	2.3953	11.0402	5.2631	1.549	1.549	7.724	7.724	3.945	3.945
UcA	1.6891	0.5479	0.2737	1.3685	0.8643	0.341	0.341	0.970	0.970	0.497	0.497
LcD2	1.2816	12.5597	6.2798	30.6302	14.6012	4.101	4.101	21.402	21.402	10.894	10.894
MmA	1.1981	0.4483	0.2242	1.7892	0.1469	0.147	0.147	0.758	0.758	0.128	0.128
KnA	0.3510	0.1038	0.0519	0.2051	0.0976	0.034	0.034	0.144	0.144	0.074	0.074
BrA	0.1587	0.0714	0.1270	0.1587	0.0238	0.024	0.024	0.111	0.111	0.016	0.016
Total	9773.7141	8401.8	4064.8	18720.8	8662.8	2531.5	2531.5	15456.1	15456.1	6538.2	6538.2

Reduction when using wetlands is the same as Filter Strips

Analysis of Load Reductions
Riley Creek watershed - 12 digit watersheds

04 05 Lower Riley Creek

Ag. Land Use: 79.7% or 12,831.1 acres

Sediment:

Base Sediment Delivery: 4635.7 tns./yr. / 16154.8555 ac. = .2867 tns./ac.

Sediment Reduction goal: 50%

Base Sediment Delivery from Ag.: .2867 tns./ac./yr. X 12831.1 ac = 3679 tns./yr.

Sediment Reduction/year 50% goal: 6850 tns./yr. X .5 = 1839 tns./yr.

Sediment Reduction using Filter Strips/Riparian Buffers: 3850.9 tns./yr. / 12831.1 ac. = .3001 tns./ac.

Acres of Filter Strips/Riparian Buffers needed to treat: 1839 tns./yr. / .3001 tns./ac. = 6,128 acres

Phosphorus:

P-Associated with Sediment: 7984.8 lbs./yr. / 16154.8555 ac = .4943 lbs./ac.

P loading from sediment Association with Ag.: 12831.1 ac. X .4943 lbs./ac./yr. = 6342 lbs.

P-Associated goal: 57%

P Reduction/year 57%: 6342 lbs./yr. X .57 = 3615 lbs./yr.

Phosphorus Reduction using:

Filter Strips/Riparian Buffers: 5919.9 lbs./ac./yr. / 16154.8555 ac. = .3664 lbs./ac./yr.

Acres of Filter Strips/Riparian Buffers needed to treat: 3615 lbs./yr. / .3664 lbs./ac./yr. = 9866 ac.

Nitrogen:

N-Associated with Sediment: 18,720.8 lbs./yr. / 9773.7141 ac. = 1.915 lbs./ac.

N loading from sediment Association: 7175.8 ac. X 1.915 lbs./ac./yr. = 13,742 lbs.

N-Associated goal: 38.5%

N Reduction/year 38.5%: 13,742 lbs./yr. X .385 = 5291 lbs.

Nitrogen Reduction using:

Filter Strips/Riparian Buffers: 15456.1 lbs./ac./yr. / 9773.7141 ac. = 1.5814 lbs./ac./yr.

Acres of Filter Strips/Riparian Buffers needed to treat: 5291 lbs./yr. / 1.5814 lbs./ac./yr. = 3346 ac.

Lower Riley Creek
HUC 04100008 04 05

Soil Symbols	Area Acres	Base Sheet & rill erosion (tns/yr)	Base Sediment Delivery (tns/yr)	N Associated w/sediment (tns/yr)	P Associated w/sediment (tns/yr)	Sediment Reduction w/BMPs Filter Strips	Sediment Reduction w/BMPs Riparian Buffer	Nitrogen Reduction w/BMPs Filter Strips	Nitrogen Reduction w/BMPs Riparian Buffer	Phosphorus Reduction w/BMPs Filter Strips	Phosphorus Reduction w/BMPs Riparian Buffer
Ls	1897.7990	1199.4090	644.0710	1288.9851	620.9598	524.128	524.128	903.295	903.295	465.530	465.530
BoB	1714.7160	1994.7291	998.4791	3748.3692	1807.3107	745.280	745.280	2623.515	2623.515	1356.512	1356.512
PmA	1441.1380	339.6762	269.7661	904.4582	427.9742	220.968	220.968	633.092	633.092	320.509	320.509
BoA	1298.9400	465.7349	232.8999	1131.2468	537.5014	281.327	281.327	791.964	791.964	403.062	403.062
Pm	1114.6460	379.7599	289.9357	928.8345	441.6227	223.726	223.726	652.291	652.291	330.270	330.270
ReA	717.3806	107.6071	55.8690	251.0832	107.6071	35.869	35.869	179.345	179.345	71.738	71.738
CyA	697.8696	226.3889	113.0828	565.4139	357.0999	180.830	180.830	400.856	400.856	205.383	205.383
HnA	654.7511	276.4359	138.2180	382.6365	192.0385	90.225	90.225	267.728	267.728	144.045	144.045
So	487.8384	205.9654	102.9827	285.0928	143.0830	67.224	67.224	199.477	199.477	107.324	107.324
Md	381.8103	100.7597	69.2222	259.3256	124.9283	55.092	55.092	181.730	181.730	93.658	93.658
SfB	377.5164	395.3729	197.7808	757.8264	364.9829	178.695	178.695	530.297	530.297	273.737	273.737
Mf	370.7159	97.8319	49.0086	251.7902	107.7300	51.807	51.807	158.296	158.296	80.816	80.816
DlA	312.2646	92.3679	46.1839	182.4874	86.8408	30.009	30.009	127.810	127.810	65.513	65.513
MbA	296.5202	87.7107	43.8553	173.3864	82.4623	38.496	38.496	121.366	121.366	62.210	62.210
DnA	295.8380	95.9698	47.9376	239.6879	151.3803	59.700	59.700	169.929	169.929	87.065	87.065
GnB	271.2398	308.3725	154.2541	573.5626	280.5704	140.277	140.277	407.131	407.131	210.455	210.455
Aka	253.2445	66.8312	33.4789	154.4462	73.5929	31.728	31.728	108.135	108.135	55.207	55.207
AmA	249.0701	124.9070	64.9070	74.7210	49.8140	24.907	24.907	49.814	49.814	24.907	24.907
Ho	228.2429	144.2495	41.3804	155.0226	74.6811	36.955	36.955	108.637	108.637	55.988	55.988
RhA	200.2816	51.6326	25.7162	141.7593	115.6827	36.744	36.744	99.280	99.280	50.070	50.070
BmB	196.7793	174.0906	86.9961	379.1544	141.8779	56.554	56.554	265.613	265.613	107.205	107.205
FuA	159.3254	42.0460	21.0628	97.1678	46.3000	13.670	13.670	68.032	68.032	34.733	34.733
Mg	156.9788	99.2106	28.4603	106.6200	51.3635	13.469	13.469	74.717	74.717	38.507	38.507
Me	152.9867	96.6876	27.7365	103.9086	50.0572	18.068	18.068	72.817	72.817	37.528	37.528
PnA	148.0945	34.9059	17.97867	94.14367	11.7026	11.703	11.703	65.591	65.591	65.591	65.591
W	146.3647	33.6639	16.8319	90.7461	42.4458	10.977	10.977	63.669	63.669	33.664	33.664
Sh	144.7056	34.0926	16.9917	95.1005	42.8907	11.070	11.070	63.555	63.555	3.386	3.386
RmB	120.5910	117.9139	58.95694	229.5691	38.4082	68.469	68.469	160.748	160.748	29.907	29.907
ArB	115.3089	25.9445	14.73647	87.5656	9.6167	83.472	83.472	83.922	83.922	7.680	7.680
TkA	95.34035	19.0681	9.5340	57.2042	28.6021	9.5340	9.5340	38.136	38.136	19.0681	19.0681
To	86.10604	54.4190	15.6110	58.4832	28.1739	10.169	10.169	40.984	40.984	21.122	21.122
Sk	82.44084	52.1026	14.9465	55.9938	26.9746	9.736	9.736	39.239	39.239	20.223	20.223
HdB	80.08548	50.2777	29.1831	96.8874	54.5542	21.287	21.287	75.841	75.841	42.285	42.285

Lower Riley Creek
HUC 04100008 04 05

Soil Symbols	Area Acres	Base Sheet & rill erosion (tns/yr)	Base Sediment Delivery (tns/yr)	N Associated w/sediment (tns/yr)	P Associated w/sediment (tns/yr)	Sediment Reduction w/BMPs Filter Strips	Sediment Reduction w/BMPs Riparian Buffer	Nitrogen Reduction w/BMPs Filter Strips	Nitrogen Reduction w/BMPs Riparian Buffer	Phosphorus Reduction w/BMPs Filter Strips	Phosphorus Reduction w/BMPs Riparian Buffer
GrB2	78.75837	69.6775	34.8191	624.3018	56.7848	22.635	22.635	106.308	106.308	42.908	42.908
SrA	68.70979	19.2731	9.6056	36.3031	17.4866	6.259	6.259	25.416	25.416	13.130	13.130
SdB	68.18402	46.0242	22.1598	81.8208	15.3414	15.341	15.341	56.252	56.252	35.797	35.797
SfC2	67.97562	184.8121	92.6168	426.8869	203.5054	59.907	59.907	298.671	298.671	152.524	152.524
DgA	67.12168	21.7743	11.0148	54.3820	34.3462	13.545	13.545	38.555	38.555	19.754	19.754
Gn	65.5415	15.4416	7.7142	43.0739	19.4265	5.014	5.014	28.786	28.786	1.234	1.234
Hrb	56.7690	48.8497	24.4220	98.0230	47.1296	21.459	21.459	86.857	86.857	44.910	44.910
HxA	55.0178	17.8478	8.9151	44.5754	28.1526	11.103	11.103	31.602	31.602	16.192	16.192
TnA	53.2629	17.2785	8.6307	43.1536	27.2546	10.748	10.748	30.594	30.594	16.675	16.675
OkB	45.9100	5.7388	2.9336	23.8457	1.9144	1.9144	1.9144	16.707	16.707	1.529	1.529
GrC2	44.9179	122.1228	61.2006	282.0844	134.4752	39.586	39.586	197.360	197.360	100.787	100.787
AuA	42.2662	14.7932	8.4532	42.2662	19.0198	29.586	29.586	29.586	29.586	14.793	14.793
HrA	35.0414	11.3674	5.6781	28.3905	17.9307	7.071	7.071	20.128	20.128	10.313	10.313
HdA	31.9610	10.3681	5.1790	25.8948	16.3544	6.450	6.450	18.358	18.358	9.406	9.406
HgA	31.6710	20.0161	5.7420	21.5109	10.3628	3.740	3.740	15.074	15.074	7.769	7.769
DoA	30.19686	9.7959	4.8931	24.4655	15.4517	6.094	6.094	17.345	17.345	8.887	8.887
GkB	27.6851	15.9854	8.0453	36.5166	1.3510	5.235	5.235	25.451	25.451	33.194	33.194
MrB	25.7130	26.9292	13.4710	51.6163	24.8593	8.766	8.766	36.119	36.119	18.644	18.644
HnB	25.6833	22.7220	11.3546	49.4866	18.5177	7.381	7.381	34.667	34.667	13.992	13.992
BmA	25.5718	8.2955	4.1437	20.7183	13.0851	5.160	5.160	14.688	14.688	7.526	7.526
BnA	22.8195	8.9224	4.4653	21.2906	10.1273	7.302	7.302	14.901	14.901	7.727	7.727
TdA	20.0315	2.5039	1.2800	10.4040	0.8353	0.8353	0.8353	7.289	7.289	0.667	0.667
HpB	17.4600	15.0243	7.5113	30.1482	14.4953	4.871	4.871	21.111	21.111	10.862	10.862
RnA	16.3690	2.0461	1.0459	8.5021	0.6826	0.683	0.683	5.957	5.957	0.545	0.545
HsA	15.1768	3.9460	1.9730	10.4720	5.0083	1.366	1.366	7.285	7.285	16.543	16.543
LwC2	13.9772	38.0012	19.0439	87.7768	41.8449	12.318	12.318	61.413	5.504	31.356	31.356
RmC2	13.6597	37.1380	69.2119	85.7829	40.8944	12.038	12.038	60.018	60.018	30.640	30.640
KnA	11.9278	3.5282	1.7641	6.9706	3.3171	1.146	1.146	4.882	4.882	2.502	2.502
DIB	11.7932	32.0634	16.0682	74.0613	35.3065	10.393	10.393	51.817	51.817	26.462	26.462
LcD2	11.7718	115.3636	57.6818	281.3460	134.1985	37.667	37.667	196.589	196.589	100.060	100.060
DnB	11.3380	10.0307	5.0125	21.8461	8.1747	3.259	3.259	15.304	15.304	6.177	6.177
Tt	11.1071	4.6894	2.3447	6.4910	3.2577	1.531	1.531	4.542	4.542	2.444	2.444

Lower Riley Creek
HUC 04100008 04 05

Soil Symbols	Area Acres	Base Sheet & rill erosion (tns/yr)	Base Sediment Delivery (tns/yr)	N Associated w/sediment (tns/yr)	P Associated w/sediment (tns/yr)	Sediment Reduction w/BMPs Filter Strips	Sediment Reduction w/BMPs Riparian Buffer	Nitrogen Reduction w/BMPs Filter Strips	Nitrogen Reduction w/BMPs Riparian Buffer	Phosphorus Reductio w/BMPs Filter Strips	Phosphorus Reductio w/BMPs Riparian Buffer
FdA	8.6667	4.0595	2.02627	5.85608	2.8679	1.319	1.319	4.106	4.106	2.154	2.154
BmC	8.0218	17.4779	10.9297	50.3769	24.01566	7.110	7.110	35.246	35.246	17.953	17.953
HkA	6.8233	10.2350	5.4586	19.1052	9.5526	3.412	3.412	13.647	13.647	9.486	9.486
SeB	6.6375	5.5868	2.7931	11.2287	5.3930	1.825	1.825	7.852	7.852	4.038	4.038
HuC2	6.4215	13.9912	8.7493	40.3270	19.2247	5.691	5.691	28.215	28.215	14.409	14.409
LbF	6.4018	132.5173	69.1394	312.4078	151.7227	47.373	47.373	220.862	220.862	115.232	115.232
GnC	5.6332	6.4044	3.2036	12.0810	5.8270	2.083	2.083	8.455	8.455	4.371	4.371
BlB	5.2401	3.2897	1.9095	6.3395	3.5696	1.393	1.393	4.962	4.962	2.767	2.767
GkA	3.1047	1.0072	0.5031	2.5154	1.5887	0.627	0.627	1.783	1.783	0.914	0.914
NpA	2.9839	0.8826	0.4413	1.7438	0.8298	0.287	0.287	1.221	1.221	0.626	0.626
GaB	2.9144	2.5784	1.2885	5.6154	2.1013	0.838	0.838	3.934	3.934	1.588	1.588
RnB	2.8336	2.7707	1.3853	5.3943	0.9025	0.904	0.904	3.777	3.777	0.703	0.703
GaC	2.5785	5.6180	3.5132	16.1930	1.8591	0.741	0.741	3.480	3.480	5.786	5.786
VaB	2.5550	2.2604	1.1296	4.9230	1.8422	0.734	0.734	3.449	3.449	1.392	1.392
HsB	2.4803	1.9292	0.9646	4.2716	2.1497	0.634	0.634	3.306	3.306	0.615	0.615
GmC2	2.2138	6.0189	3.0163	13.9027	6.6277	1.951	1.951	9.727	9.727	4.967	4.967
BrA	1.8982	0.8542	1.5186	1.8982	0.2847	0.285	0.285	1.329	1.329	0.190	0.190
GdA	1.7299	0.5612	0.2809	1.4016	0.8852	0.349	0.349	0.994	0.994	0.509	0.509
HxB	1.3802	1.2211	0.6102	2.6594	0.9951	0.397	0.397	1.863	1.863	0.751	0.751
BvA	0.9040	0.2131	0.1337	0.0549	0.2514	0.087	0.087	0.370	0.370	0.190	0.190
CzA	0.8630	0.2800	0.1398	0.6992	0.4416	0.194	0.194	0.496	0.496	0.283	0.283
BpB	0.2496	0.2208	0.1103	0.4809	0.1800	0.072	0.072	0.337	0.337	0.136	0.136
Total	16154.8555	8798.5	4635.7	17226.6	7984.8	3850.9	3850.9	11765.9	11710.0	5919.9	5919.9

Reduction when using wetlands is the same as Filter Strips

Appendix C

Biological Resources

Fish

During the 2005 OEPA TMDL study, a comprehensive fish tissue study was conducted by the Ohio Department of Natural Resources - Division of Wildlife. Eight sites on Riley Creek; one site on Cranberry Run; three sites on Little Riley Creek (lower); one site on Marsh Run; and two sites on Little Riley Creek (upper) were sampled within the Riley Creek watershed. The detailed summary of the results for each of these samplings can be seen on pages C-10 through C-24. For a more detailed report use the following web site: http://www.epa.ohio.gov/portals/35/documents/BlanchardRiverTSD2005_appendices.pdf

Mammals

A list of mammals found in Hancock County was supplied by the Hancock Park District. This list would apply to the other counties in the Riley Creek watershed. The list included:

Badger
Coyote
Eastern Chipmunk
Eastern Mole
Evening Bat
Fox Squirrel
Gray Squirrel
House Mouse
Keens Bat
Least Weasel
Masked Shrew
Mink
Norway Rat
Raccoon
Red Fox
Short-tailed Shrew
Striped Skunk
White-footed mouse
Woodchuck.

Big Brown Bat
Deer Mouse
Eastern Cottontail
Eastern Pipistrelle
Flying Squirrel
Gray Fox
Hoary Bat
Indiana Bat*
Least Shrew
Little Brown Bat
Meadow Vole
Muskrat
Opossum
Red Bat
Red Squirrel
Silver-haired Bat
Thirteen-lined Ground Squirrel
White-tailed Deer

*listed on U.S. Endangered Species list.

For the purpose of this WAP, we will assume these mammals are spread throughout the entire Blanchard River Watershed.

Birds of the Blanchard River Watershed

This is a listing of 294 species of birds that have been recorded in the Blanchard River watershed. It is possible (actually probable) that other species have gone unrecorded, but these would be accidentals or vagrants and only have occurred in the area once or twice.

Species are listed in the currently accepted taxonomic order set forth by the American Ornithological Union. Species listed in **bold** are known to have bred in the sub-watersheds at least once in the past ten years.

After each species is listed a letter (A, M, S, W, Y) which tells generally when this species is most often seen.

- A - Accidental, vagrant or wanderer. Generally only a few records; in many cases a couple at most.
- M - Migrant. Seen in spring or fall as it travels to or from its breeding grounds further north.
- S - Summer. A species, typically arriving in spring, that stays to breed.
- W - Winter. Seen mostly as a winter resident.
- Y - Year-round. Seen at all times of year.

All species except for the year-round birds should be considered also as migrants.

The Riley Creek watershed provides contains two wildlife areas where birds can concentrate, the Motter Metro Park near Bluffton and the ODNR Wildlife Production Area in Orange township. The only large body of water in the watershed is Cobb Lake in Bluffton.

Species:

Greater White-fronted Goose	M	**Wood Duck**	S
Snow Goose	M	Gadwall	M
Ross's Goose	A	Eurasian Wigeon	A
Brant	A	American Wigeon	M
Cackling Goose	W	American Black Duck	M
Canada Goose	Y	**Mallard**	Y
Trumpeter Swan	M	**Blue-winged Teal**	S
Tundra Swan	M	Northern Shoveler	M
Mute Swan	M	Northern Pintail	M

Species cont.

Green-winged Teal	M	American White Pelican	A
Canvasback	M	Brown Pelican	A
Redhead	M	Double-crested Cormorant	M
Ring-necked Duck	M	**American Bittern**	M
Greater Scaup	M	**Least Bittern**	Y
Lesser Scaup	M	**Great Blue Heron**	M
Harlequin Duck	A	Great Egret	A
Surf Scoter	M	Snowy Egret	A
Black Scoter	A	Cattle Egret	S
White-winged Scoter	M	**Green Heron**	M
Long-tailed Duck	M	**Black-crowned Night-Heron**	A
Bufflehead	M	Yellow-crowned Night-Heron	S
Common Goldeneye	M	**Turkey Vulture**	M
Hooded Merganser	M	Osprey	Y
Common Merganser	M	**Bald Eagle**	A
Red-breasted Merganser	M	Peregrine Falcon	A
Ruddy Duck	M	Merlin	W
Ring-necked Pheasant	Y	**American Kestrel**	Y
Wild Turkey	Y	Northern Harrier	W
Northern Bobwhite	A	Sharp-shinned Hawk	M
Red-throated Loon	A	**Cooper's Hawk**	Y
Common Loon	M	Northern Goshawk	W
Pied-billed Grebe	Y	**Red-shouldered Hawk**	Y
Horned Grebe	M	Broad-winged Hawk	M
Red-necked Grebe	A	**Red-tailed Hawk**	Y
Eared Grebe	M	Rough-legged Hawk	W
Western Grebe	A		
	A		
	M		
	A		

Species cont.

King Rail	M
Virginia Rail	M
Sora	M
Common Moorhen	M
American Coot	M
Sandhill Crane	M
Black-bellied Plover	M
American Golden-Plover	M
Semipalmated Plover	M
Killdeer	S
Whimbrel	A
Black-necked Stilt	A
American Avocet	M
Spotted Sandpiper	S
Upland Sandpiper	A
Solitary Sandpiper	M
Greater Yellowlegs	M
Willet	M
Lesser Yellowlegs	M
Hudsonian Godwit	A
Marbled Godwit	A
Red Knot	A
Ruddy Turnstone	M
Sanderling	M
Baird's Sandpiper	M
White-rumped Sandpiper	M
Semipalmated Sandpiper	M
Western Sandpiper	M
Least Sandpiper	M
Pectoral Sandpiper	M
Dunlin	M
Buff-breasted Sandpiper	M
Short-billed Dowitcher	M
Long-billed Dowitcher	M
Wilson's Snipe	M
American Woodcock	S
Wilson's Phalarope	M
Red-necked Phalarope	A
Red Phalarope	A
Great Black-backed Gull	M
Laughing Gull	A
Franklin's Gull	M
Bonaparte's Gull	M
Ring-billed Gull	Y
Herring Gull	Y
Iceland Gull	A
Lesser Black-backed Gull	M
Glaucous Gull	M
Forster's Tern	M
Black-legged Kittiwake	A
Least Tern	A
Caspian Tern	M
Black Tern	M
Common Tern	M
Mourning Dove	Y
Eurasian Collared-Dove	A
Rock Pigeon	Y

Species cont.

Black-billed Cuckoo	S
Yellow-billed Cuckoo	S
Northern Saw-whet Owl	M
Barn Owl	A
Eastern Screech-Owl	Y
Great Horned Owl	Y
Snowy Owl	W
Barred Owl	Y
Long-eared Owl	W
Short-eared Owl	M
Belted Kingfisher	Y
Chimney Swift	S
Common Nighthawk	S
Whip-poor-will	M
Ruby-throated Hummingbird	Y
Pileated Woodpecker	S
Hairy Woodpecker	Y
Downy Woodpecker	Y
Yellow-bellied Sapsucker	M
Red-bellied Woodpecker	Y
Red-headed Woodpecker	S
Northern Flicker	Y

Eastern Wood-Pewee	S
Yellow-bellied Flycatcher	M
Acadian Flycatcher	S
Alder Flycatcher	S
Willow Flycatcher	S
Least Flycatcher	M
Eastern Phoebe	S
Great Crested Flycatcher	S
Eastern Kingbird	S
Scissor-tailed Flycatcher	A
Olive-sided Flycatcher	M
Northern Shrike	W
Blue Jay	Y
White-eyed Vireo	S
Yellow-throated Vireo	S
Blue-headed Vireo	M
Warbling Vireo	S
Philadelphia Vireo	M
Red-eyed Vireo	S
American Crow	Y
Horned Lark	S
Barn Swallow	S
Cliff Swallow	M
Bank Swallow	S
Northern Rough-winged Swallow	S
Purple Martin	S
Tree Swallow	S

Species cont.

Black-capped Chickadee	Y
Carolina Chickadee	Y
Tufted Titmouse	Y
White-breasted Nuthatch	Y
Red-breasted Nuthatch	M
Brown Creeper	M
Marsh Wren	S
Sedge Wren	M
Winter Wren	M
Carolina Wren	Y
House Wren	S
Brown Thrasher	S
Northern Mockingbird	Y
Gray Catbird	S
Blue-gray Gnatcatcher	S
Golden-crowned Kinglet	W
Ruby-crowned Kinglet	M
American Robin	Y
Veery	M
Eastern Bluebird	Y
Varied Thrush	A
Gray-cheeked Thrush	M
Swainson's Thrush	M
Hermit Thrush	M
Wood Thrush	S

European Starling	Y
American Pipit	M
Cedar Waxwing	M
Bohemian Waxwing	A
American Redstart	S
Back-and-white Warbler	M
Prothonotary Warbler	S
Blue-winged Warbler	M
Golden-winged Warbler	M
Tennessee Warbler	M
Orange-crowned Warbler	M
Nashville Warbler	M
Northern Parula	M
Yellow Warbler	S
Chestnut-sided Warbler	M
Magnolia Warbler	M
Cape May Warbler	M
Black-throated Blue Warbler	M
Yellow-rumped Warbler	M
Black-throated Green Warbler	M
Blackburnian Warbler	M
Yellow-throated Warbler	S
Pine Warbler	M
Prairie Warbler	A
Palm Wabler	M
Bay-breasted Warbler	M
Blackpoll Warbler	M
Cerulean Warbler	M

Species cont.

Worm-eating Warbler	M	White-throated Sparrow	W
Ovenbird	M	White-crowned Sparrow	M
Northern Waterthrush	M	Dark-eyed Junco	W
Louisiana Waterthrush	M	Lapland Longspur	W
Kentucky Warbler	M	Snow Bunting	W
Connecticut Warbler	M	**Dickcissel**	S
Mourning Warbler	M	Summer Tanager	A
Common Yellowthroat	S	**Scarlet Tanager**	S
Hooded Warbler	M	**Northern Cardinal**	Y
Wilson's Warbler	M	**Rose-breasted Grosbeak**	S
Canada Warbler	M	Blue Grosbeak	A
Yellow-breasted Chat	S	**Indigo Bunting**	S
Eastern Towhee	S	Painted Bunting	A
Spotted Towhee	A	Purple Finch	W
Swamp Sparrow	Y	**House Finch**	Y
American Tree Sparrow	W	**Bobolink**	S
Clay-colored Sparrow	A	**Red-winged Blackbird**	S
Chipping Sparrow	S	**Eastern Meadowlark**	S
Field Sparrow	Y	Western Meadowlark	A
Vesper Sparrow	S	Yellow-headed Blackbird	M
Lark Sparrow	A	Rusty Blackbird	M
Lark Bunting	A	Brewer's Blackbird	A
Savannah Sparrow	S	**Common Grackle**	S
Grasshopper Sparrow	S	**Brown-headed Cowbird**	Y
Henslow's Sparrow	A	**Orchard Oriole**	S
LeConte's Sparrow	A	**Baltimore Oriole**	S
Nelson's Sparrow	A	Red Crossbill	W
Fox Sparrow	M	Pine Grosbeak	A
Song Sparrow	Y		
Lincoln's Sparrow	M		

Species cont.

White-winged Crossbill	W
Common Redpoll	W
Pine Siskin	W
American Goldfinch	Y
Evening Grosbeak	W
House Sparrow	Y

Species List

River Code: **04-168**	Stream: **Riley Creek**	Sample Date: **2005**
River Mile: **24.90**	Location:	Date Range: 09/08/2005
Time Fished: 1800 sec	Drainage:	
Dist Fished: 0.10 km	Basin: Maumee River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm Weight
White Sucker	W	O	S	T	51	153.00	17.96			
Common Carp	G	O	M	T	2	6.00	0.70			
Golden Shiner	N	I	M	T	23	69.00	8.10			
Creek Chub	N	G	N	T	16	48.00	5.63			
Fathead Minnow	N	O	C	T	144	432.00	50.70			
Bluntnose Minnow	N	O	C	T	2	6.00	0.70			
Central Stoneroller	N	H	N		36	108.00	12.68			
Green Sunfish	S	I	C	T	7	21.00	2.46			
Johnny Darter	D	I	C		3	9.00	1.06			
Mile Total					284	852.00				
Number of Species					9					
Number of Hybrids					0					

Species List

River Code: **04-168**	Stream: **Riley Creek**	Sample Date: **2005**
River Mile: **22.60**	Location:	Date Range: 09/09/2005
Time Fished: 1800 sec	Drainage:	
Dist Fished: 0.15 km	Basin: Maumee River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	143	286.00	41.09			
Common Carp	G	O	M	T	3	6.00	0.86			
Golden Shiner	N	I	M	T	18	36.00	5.17			
Creek Chub	N	G	N	T	85	170.00	24.43			
Redfin Shiner	N	I	N		9	18.00	2.59			
Striped Shiner	N	I	S		1	2.00	0.29			
Spotfin Shiner	N	I	M		2	4.00	0.57			
Fathead Minnow	N	O	C	T	19	38.00	5.46			
Bluntnose Minnow	N	O	C	T	7	14.00	2.01			
Central Stoneroller	N	H	N		6	12.00	1.72			
Yellow Bullhead		I	C	T	4	8.00	1.15			
Black Bullhead		I	C	P	1	2.00	0.29			
Green Sunfish	S	I	C	T	41	82.00	11.78			
Orangespotted Sunfish	S	I	C		9	18.00	2.59			
	Mile Total				348	696.00				
	Number of Species				14					
	Number of Hybrids				0					

Species List

River Code: **04-168**	Stream: **Riley Creek**	Sample Date: **2005**
River Mile: **19.40**	Location:	Date Range: 09/09/2005
Time Fished: 1800 sec	Drainage: 29.4 sq mi	
Dist Fished: 0.19 km	Basin: Maumee River No of Passes: 1	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	64	101.05	9.05	5.71	30.47	56.45
Common Carp	G	O	M	T	6	9.47	0.85	3.36	17.95	354.80
Golden Shiner	N	I	M	T	2	3.16	0.28	0.02	0.09	5.00
Creek Chub	N	G	N	T	27	42.63	3.82	0.62	3.32	14.58
Suckermouth Minnow	N	I	S		1	1.58	0.14	0.01	0.03	3.00
Redfin Shiner	N	I	N		23	36.32	3.25	0.04	0.19	1.00
Striped Shiner	N	I	S		13	20.53	1.84	0.09	0.46	4.17
Spotfin Shiner	N	I	M		7	11.05	0.99	0.03	0.18	3.00
Fathead Minnow	N	O	C	T	15	23.68	2.12	0.02	0.10	0.79
Bluntnose Minnow	N	O	C	T	343	541.58	48.51	1.20	6.42	2.22
Central Stoneroller	N	H	N		17	26.84	2.40	0.23	1.22	8.53
Yellow Bullhead		I	C	T	24	37.90	3.39	2.37	12.65	62.50
Blackstripe Topminnow		I	M		2	3.16	0.28	0.01	0.03	1.50
Smallmouth Bass	F	C	C	M	3	4.74	0.42	0.04	0.23	9.00
Largemouth Bass	F	C	C		4	6.32	0.57	0.80	4.26	126.25
Green Sunfish	S	I	C	T	86	135.79	12.16	2.59	13.81	19.04
Bluegill Sunfish	S	I	C	P	19	30.00	2.69	0.51	2.71	16.94
Longear Sunfish	S	I	C	M	41	64.74	5.80	0.85	4.51	13.05
Hybrid X Sunfish					2	3.16	0.28	0.21	1.13	67.00
Blackside Darter	D	I	S		5	7.90	0.71	0.04	0.20	4.80
Logperch	D	I	S	M	2	3.16	0.28	0.01	0.04	2.50
Rainbow Darter	D	I	S	M	1	1.58	0.14	0.00	0.01	1.00
Mile Total					707	1,116.32		18.72		
Number of Species					21					
Number of Hybrids					1					

Species List

River Code: **04-168**	Stream: **Riley Creek**	Sample Date: **2005**
River Mile: **15.50**	Location:	Date Range: 10/06/2005
Time Fished: 2700 sec	Drainage: 44.4 sq mi	
Dist Fished: 0.20 km	Basin: Maumee River No of Passes: 1	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	12	18.00	0.67	0.15	2.13	8.33
Common Carp	G	O	M	T	2	3.00	0.11	0.05	0.77	18.00
Creek Chub	N	G	N	T	3	4.50	0.17	0.05	0.64	10.00
Suckermouth Minnow	N	I	S		14	21.00	0.78	0.08	1.06	3.57
Redfin Shiner	N	I	N		41	61.50	2.29	0.06	0.89	1.03
Spotfin Shiner	N	I	M		21	31.50	1.17	0.08	1.06	2.38
Fathead Minnow	N	O	C	T	15	22.50	0.84	0.03	0.43	1.33
Bluntnose Minnow	N	O	C	T	1,001	1,501.50	55.89	3.28	46.51	2.18
Central Stoneroller	N	H	N		292	438.00	16.30	2.09	29.59	4.76
Tadpole Madtom		I	C		2	3.00	0.11	0.01	0.11	2.50
Blackstripe Topminnow		I	M		3	4.50	0.17	0.00	0.03	0.33
Rock Bass	S	C	C		22	33.00	1.23	0.10	1.39	2.95
Smallmouth Bass	F	C	C	M	5	7.50	0.28	0.10	1.36	12.80
Green Sunfish	S	I	C	T	5	7.50	0.28	0.02	0.28	2.60
Bluegill Sunfish	S	I	C	P	1	1.50	0.06	0.00	0.03	1.00
Longear Sunfish	S	I	C	M	74	111.00	4.13	0.33	4.72	3.00
Hybrid X Sunfish					6	9.00	0.34	0.11	1.56	12.17
Logperch	D	I	S	M	2	3.00	0.11	0.03	0.41	9.50
Johnny Darter	D	I	C		99	148.50	5.53	0.13	1.80	0.85
Greenside Darter	D	I	S	M	89	133.50	4.97	0.24	3.40	1.80
Orangethroat Darter	D	I	S		5	7.50	0.28	0.01	0.13	1.20
Fantail Darter	D	I	C		77	115.50	4.30	0.13	1.77	1.08
	Mile Total				1,791	2,686.50		7.05		
	Number of Species				21					
	Number of Hybrids				1					

Species List

River Code: **04-168**	Stream: **Riley Creek**	Sample Date: **2005**
River Mile: **11.50**	Location:	Date Range: 09/09/2005
Time Fished: 2700 sec	Drainage:	
Dist Fished: 0.20 km	Basin: Maumee River No of Passes: 1	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	5	7.50	0.27	0.03	0.32	4.00
Creek Chub	N	G	N	T	13	19.50	0.71	0.11	1.17	5.54
Redfin Shiner	N	I	N		11	16.50	0.60	0.02	0.22	1.18
Striped Shiner	N	I	S		1	1.50	0.05	0.00	0.03	2.00
Fathead Minnow	N	O	C	T	42	63.00	2.29	0.14	1.52	2.23
Bluntnose Minnow	N	O	C	T	1,562	2,343.00	85.17	7.54	81.39	3.22
Central Stoneroller	N	H	N		55	82.50	3.00	0.43	4.62	5.19
Yellow Bullhead		I	C	T	9	13.50	0.49	0.10	1.09	7.50
Smallmouth Bass	F	C	C	M	9	13.50	0.49	0.22	2.33	16.00
Green Sunfish	S	I	C	T	94	141.00	5.13	0.57	6.19	4.07
Longear Sunfish	S	I	C	M	6	9.00	0.33	0.04	0.44	4.60
Johnny Darter	D	I	C		2	3.00	0.11	0.01	0.05	1.50
Greenside Darter	D	I	S	M	25	37.50	1.36	0.06	0.65	1.60
	Mile Total				1,834	2,751.00		9.27		
	Number of Species				13					
	Number of Hybrids				0					

Species List

River Code: **04-168**	Stream: **Riley Creek**	Sample Date: **2005**
River Mile: **7.60**	Location:	Date Range: 10/06/2005
Time Fished: 1800 sec	Drainage: 68.0 sq mi	
Dist Fished: 0.20 km	Basin: Maumee River No of Passes: 1	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Golden Redhorse	R	I	S	M	5	7.50	0.85	3.00	18.23	400.00
White Sucker	W	O	S	T	24	36.00	4.07	5.34	32.44	148.25
Spotted Sucker	R	I	S		5	7.50	0.85	2.03	12.31	270.00
Common Carp	G	O	M	T	3	4.50	0.51	0.48	2.94	107.33
Redfin Shiner	N	I	N		14	21.00	2.38	0.02	0.15	1.15
Striped Shiner	N	I	S		19	28.50	3.23	0.32	1.93	11.17
Spotfin Shiner	N	I	M		12	18.00	2.04	0.04	0.22	2.00
Bluntnose Minnow	N	O	C	T	276	414.00	46.86	0.95	5.80	2.30
Yellow Bullhead		I	C	T	3	4.50	0.51	0.28	1.67	61.00
Blackstripe Topminnow		I	M		3	4.50	0.51	0.05	0.30	11.00
Rock Bass	S	C	C		41	61.50	6.96	1.58	9.57	25.61
Smallmouth Bass	F	C	C	M	12	18.00	2.04	0.36	2.16	19.75
Green Sunfish	S	I	C	T	16	24.00	2.72	0.63	3.83	26.25
Bluegill Sunfish	S	I	C	P	64	96.00	10.87	0.48	2.94	5.03
Longear Sunfish	S	I	C	M	42	63.00	7.13	0.56	3.41	8.90
Hybrid X Sunfish					19	28.50	3.23	0.27	1.63	9.42
Johnny Darter	D	I	C		17	25.50	2.89	0.03	0.18	1.12
Greenside Darter	D	I	S	M	9	13.50	1.53	0.03	0.18	2.11
Orangethroat Darter	D	I	S		5	7.50	0.85	0.02	0.14	3.00
	Mile Total				589	883.50		16.45		
	Number of Species				18					
	Number of Hybrids				1					

Species List

River Code: **04-168**	Stream: **Riley Creek**	Sample Date: **2005**
River Mile: **4.30**	Location:	Date Range: 10/06/2005
Time Fished: 2700 sec	Drainage:	
Dist Fished: 0.20 km	Basin: Maumee River No of Passes: 1	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		52	78.00	4.91	1.30	5.77	16.70
Golden Redhorse	R	I	S	M	11	16.50	1.04	4.35	19.26	263.64
White Sucker	W	O	S	T	2	3.00	0.19	0.35	1.56	117.50
Spotted Sucker	R	I	S		10	15.00	0.94	3.01	13.34	200.80
Common Carp	G	O	M	T	2	3.00	0.19	0.68	2.99	225.00
Golden Shiner	N	I	M	T	2	3.00	0.19	0.01	0.06	4.50
Creek Chub	N	G	N	T	4	6.00	0.38	0.21	0.93	35.00
Redfin Shiner	N	I	N		9	13.50	0.85	0.02	0.10	1.67
Striped Shiner	N	I	S		61	91.50	5.75	1.65	7.31	18.03
Spotfin Shiner	N	I	M		3	4.50	0.28	0.01	0.06	3.00
Bluntnose Minnow	N	O	C	T	393	589.50	37.08	1.33	5.88	2.25
Yellow Bullhead		I	C	T	7	10.50	0.66	0.54	2.40	51.57
Tadpole Madtom		I	C		7	10.50	0.66	0.06	0.27	5.83
Blackstripe Topminnow		I	M		4	6.00	0.38	0.02	0.09	3.33
Rock Bass	S	C	C		100	150.00	9.43	4.96	21.94	33.04
Smallmouth Bass	F	C	C	M	17	25.50	1.60	0.64	2.82	25.00
Largemouth Bass	F	C	C		1	1.50	0.09	0.04	0.19	29.00
Green Sunfish	S	I	C	T	26	39.00	2.45	0.45	1.99	11.54
Bluegill Sunfish	S	I	C	P	68	102.00	6.42	0.10	0.44	0.98
Orangespotted Sunfish	S	I	C		10	15.00	0.94	0.08	0.33	5.00
Longear Sunfish	S	I	C	M	227	340.50	21.42	2.52	11.17	7.41
Hybrid X Sunfish					5	7.50	0.47	0.05	0.21	6.40
Logperch	D	I	S	M	4	6.00	0.38	0.11	0.50	18.75
Johnny Darter	D	I	C		11	16.50	1.04	0.02	0.08	1.00
Greenside Darter	D	I	S	M	24	36.00	2.26	0.08	0.33	2.08
Mile Total					1,060	1,590.00		22.59		
Number of Species					24					
Number of Hybrids					1					

Species List

River Code: **04-168**	Stream: **Riley Creek**	Sample Date: **2005**
River Mile: **1.20**	Location:	Date Range: 08/30/2005
Time Fished: 5333 sec	Drainage: 85.0 sq mi	
Dist Fished: 0.24 km	Basin: Maumee River No of Passes: 1	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		281	351.25	12.27	3.26	3.13	9.29
Golden Redhorse	R	I	S	M	2	2.50	0.09	1.00	0.96	400.00
White Sucker	W	O	S	T	4	5.00	0.17	0.19	0.18	37.50
Spotted Sucker	R	I	S		5	6.25	0.22	1.38	1.32	220.80
Common Carp	G	O	M	T	1	1.25	0.04	0.13	0.12	100.00
Creek Chub	N	G	N	T	45	56.25	1.97	0.47	0.45	8.41
Scarlet Shiner	N	I	S	M	35	43.75	1.53	0.08	0.07	1.77
Striped Shiner	N	I	S		101	126.25	4.41	0.52	0.50	4.10
Spotfin Shiner	N	I	M		7	8.75	0.31	0.03	0.03	3.57
Fathead Minnow	N	O	C	T	1	1.25	0.04	0.00	0.00	1.00
Bluntnose Minnow	N	O	C	T	382	477.50	16.68	1.00	0.96	2.10
Central Stoneroller	N	H	N		41	51.25	1.79	0.28	0.26	5.38
Striped Sh X Rosefin Sh		I			7	8.75	0.31	0.06	0.06	7.14
Channel Catfish	F		C		27	33.75	1.18	39.75	38.12	1,177.78
Yellow Bullhead		I	C	T	98	122.50	4.28	1.51	1.45	12.31
Stonecat Madtom		I	C	I	1	1.25	0.04	0.13	0.12	100.00
Tadpole Madtom		I	C		2	2.50	0.09	0.03	0.02	10.00
Blackstripe Topminnow		I	M		9	11.25	0.39	0.08	0.07	6.67
Brook Silverside		I	M	M	2	2.50	0.09	0.01	0.01	2.50
White Crappie	S	I	C		11	13.75	0.48	2.98	2.86	216.67
Rock Bass	S	C	C		122	152.50	5.33	24.15	23.15	158.33
Smallmouth Bass	F	C	C	M	79	98.75	3.45	8.70	8.35	88.13
Largemouth Bass	F	C	C		5	6.25	0.22	0.66	0.64	106.00
Green Sunfish	S	I	C	T	11	13.75	0.48	0.23	0.22	16.36
Bluegill Sunfish	S	I	C	P	389	486.25	16.99	2.94	2.81	6.04
Orangespotted Sunfish	S	I	C		5	6.25	0.22	0.03	0.03	5.40
Longear Sunfish	S	I	C	M	62	77.50	2.71	1.25	1.20	16.10
Redear Sunfish	E	I	C		173	216.25	7.55	1.08	1.03	4.97
Pumpkinseed Sunfish	S	I	C	P	8	10.00	0.35	0.25	0.24	25.00
Longear X Orangespot					2	2.50	0.09	0.10	0.10	40.00
Hybrid X Sunfish					75	93.75	3.28	0.51	0.49	5.46
Blackside Darter	D	I	S		10	12.50	0.44	0.10	0.10	8.00
Logperch	D	I	S	M	23	28.75	1.00	0.20	0.19	7.05
Johnny Darter	D	I	C		63	78.75	2.75	0.09	0.09	1.13
Greenside Darter	D	I	S	M	153	191.25	6.68	0.36	0.35	1.89
Rainbow Darter	D	I	S	M	30	37.50	1.31	0.07	0.07	1.83
Fantail Darter	D	I	C		2	2.50	0.09	0.02	0.02	7.50
Freshwater Drum			M	P	16	20.00	0.70	10.69	10.25	534.38
Mile Total					2,290	2,862.50		104.28		
Number of Species					35					
Number of Hybrids					3					

Species List

River Code: **04-169**	Stream: **Cranberry Run**	Sample Date: **2005**
River Mile: **6.70**	Location:	Date Range: 08/29/2005
Time Fished: 1460 sec	Drainage:	
Dist Fished: 0.10 km	Basin: Maumee River — No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	28	84.00	1.64	0.34	1.58	4.00
Common Carp	G	O	M	T	24	72.00	1.41	0.96	4.52	13.33
Creek Chub	N	G	N	T	519	1,557.00	30.42	10.91	51.44	7.01
Scarlet Shiner	N	I	S	M	15	45.00	0.88	0.12	0.57	2.67
Fathead Minnow	N	O	C	T	267	801.00	15.65	1.61	7.58	2.01
Bluntnose Minnow	N	O	C	T	500	1,500.00	29.31	3.18	14.98	2.12
Central Stoneroller	N	H	N		230	690.00	13.48	2.60	12.25	3.77
Yellow Bullhead		I	C	T	9	27.00	0.53	0.63	2.97	23.33
Blackstripe Topminnow		I	M		47	141.00	2.75	0.15	0.71	1.06
Green Sunfish	S	I	C	T	6	18.00	0.35	0.33	1.56	18.33
Johnny Darter	D	I	C		50	150.00	2.93	0.33	1.54	2.17
Orangethroat Darter	D	I	S		7	21.00	0.41	0.05	0.25	2.50
Least Darter [S]	D	I	N		4	12.00	0.23	0.01	0.06	1.00
	Mile Total				1,706	5,118.00		21.22		
	Number of Species				13					
	Number of Hybrids				0					

Species List

River Code: **04-170**	Stream: **Little Riley Creek (lower)**	Sample Date: **2005**
River Mile: **5.50**	Location:	Date Range: 09/19/2005
Time Fished: 1680 sec	Drainage: 5.5 sq mi	
Dist Fished: 0.20 km	Basin: Maumee River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	289	433.50	20.50			
Golden Shiner	N	I	M	T	3	4.50	0.21			
Creek Chub	N	G	N	T	302	453.00	21.42			
Redfin Shiner	N	I	N		1	1.50	0.07			
Striped Shiner	N	I	S		1	1.50	0.07			
Spotfin Shiner	N	I	M		2	3.00	0.14			
Fathead Minnow	N	O	C	T	398	597.00	28.23			
Bluntnose Minnow	N	O	C	T	193	289.50	13.69			
Central Stoneroller	N	H	N		160	240.00	11.35			
Yellow Bullhead		I	C	T	4	6.00	0.28			
Rock Bass	S	C	C		1	1.50	0.07			
Green Sunfish	S	I	C	T	39	58.50	2.77			
Bluegill Sunfish	S	I	C	P	1	1.50	0.07			
Longear Sunfish	S	I	C	M	1	1.50	0.07			
Johnny Darter	D	I	C		15	22.50	1.06			
	Mile Total				1,410	2,115.00				
	Number of Species				15					
	Number of Hybrids				0					

Species List

River Code: **04-170**	Stream: **Little Riley Creek (lower)**	Sample Date: **2005**
River Mile: **4.30**	Location:	Date Range: 10/06/2005
Time Fished: 1800 sec	Drainage: 12.3 sq mi	
Dist Fished: 0.15 km	Basin: Maumee River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	114	228.00	29.84			
Creek Chub	N	G	N	T	68	136.00	17.80			
Suckermouth Minnow	N	I	S		5	10.00	1.31			
Redfin Shiner	N	I	N		2	4.00	0.52			
Striped Shiner	N	I	S		2	4.00	0.52			
Fathead Minnow	N	O	C	T	58	116.00	15.18			
Bluntnose Minnow	N	O	C	T	73	146.00	19.11			
Central Stoneroller	N	H	N		27	54.00	7.07			
Yellow Bullhead		I	C	T	1	2.00	0.26			
Smallmouth Bass	F	C	C	M	1	2.00	0.26			
Green Sunfish	S	I	C	T	23	46.00	6.02			
Bluegill Sunfish	S	I	C	P	1	2.00	0.26			
Longear Sunfish	S	I	C	M	3	6.00	0.79			
Blackside Darter	D	I	S		1	2.00	0.26			
Johnny Darter	D	I	C		3	6.00	0.79			
	Mile Total				382	764.00				
	Number of Species				15					
	Number of Hybrids				0					

Species List

River Code: **04-170**	Stream: **Little Riley Creek (lower)**	Sample Date: **2005**
River Mile: **0.10**	Location:	Date Range: 10/06/2005
Time Fished: 1800 sec	Drainage: 16.0 sq mi	
Dist Fished: 0.15 km	Basin: Maumee River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	7	14.00	2.11			
Creek Chub	N	G	N	T	82	164.00	24.70			
Suckermouth Minnow	N	I	S		10	20.00	3.01			
Fathead Minnow	N	O	C	T	28	56.00	8.43			
Bluntnose Minnow	N	O	C	T	110	220.00	33.13			
Central Stoneroller	N	H	N		56	112.00	16.87			
Yellow Bullhead		I	C	T	4	8.00	1.20			
Rock Bass	S	C	C		1	2.00	0.30			
Green Sunfish	S	I	C	T	9	18.00	2.71			
Longear Sunfish	S	I	C	M	1	2.00	0.30			
Green Sf X Hybrid					3	6.00	0.90			
Hybrid X Sunfish					6	12.00	1.81			
Johnny Darter	D	I	C		7	14.00	2.11			
Greenside Darter	D	I	S	M	1	2.00	0.30			
Orangethroat Darter	D	I	S		7	14.00	2.11			
Mile Total					332	664.00				
Number of Species					13					
Number of Hybrids					2					

OEPA Division of Surface Water Ecological Assessment Unit 06/21/2007

Species List

River Code: **04-173**	Stream: **Marsh Run**	Sample Date: **2005**
River Mile: **1.80**	Location:	Date Range: 09/08/2005
Time Fished: 1800 sec	Drainage:	
Dist Fished: 0.10 km	Basin: Maumee River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	30	90.00	12.35			
Common Carp	G	O	M	T	9	27.00	3.70			
Creek Chub	N	G	N	T	19	57.00	7.82			
Spotfin Shiner	N	I	M		12	36.00	4.94			
Fathead Minnow	N	O	C	T	20	60.00	8.23			
Bluntnose Minnow	N	O	C	T	105	315.00	43.21			
Central Stoneroller	N	H	N		18	54.00	7.41			
Yellow Bullhead		I	C	T	1	3.00	0.41			
Blackstripe Topminnow		I	M		16	48.00	6.58			
Longear Sunfish	S	I	C	M	1	3.00	0.41			
Johnny Darter	D	I	C		9	27.00	3.70			
Orangethroat Darter	D	I	S		3	9.00	1.23			
Mile Total					243	729.00				
Number of Species					12					
Number of Hybrids					0					

Species List

River Code: **04-174**	Stream: **Little Riley Creek (upper)**	Sample Date: **2005**
River Mile: **2.70**	Location:	Date Range: 09/09/2005
Time Fished: 1800 sec	Drainage:	
Dist Fished: 0.10 km	Basin: Maumee River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	42	126.00	12.92			
Golden Shiner	N	I	M	T	9	27.00	2.77			
Creek Chub	N	G	N	T	187	561.00	57.54			
Suckermouth Minnow	N	I	S		1	3.00	0.31			
Redfin Shiner	N	I	N		11	33.00	3.38			
Striped Shiner	N	I	S		5	15.00	1.54			
Fathead Minnow	N	O	C	T	21	63.00	6.46			
Bluntnose Minnow	N	O	C	T	27	81.00	8.31			
Central Stoneroller	N	H	N		9	27.00	2.77			
Blackstripe Topminnow		I	M		2	6.00	0.62			
Green Sunfish	S	I	C	T	2	6.00	0.62			
Longear Sunfish	S	I	C	M	3	9.00	0.92			
Blackside Darter	D	I	S		1	3.00	0.31			
Johnny Darter	D	I	C		4	12.00	1.23			
Rainbow Darter	D	I	S	M	1	3.00	0.31			
	Mile Total				325	975.00				
	Number of Species				15					
	Number of Hybrids				0					

Species List

River Code: **04-174**	Stream: **Little Riley Creek (upper)**	Sample Date: **2005**
River Mile: **1.00**	Location:	Date Range: 09/09/2005
Time Fished: 1800 sec	Drainage: 14.1 sq mi	
Dist Fished: 0.15 km	Basin: Maumee River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	25	50.00	16.56			
Common Carp	G	O	M	T	11	22.00	7.28			
Creek Chub	N	G	N	T	29	58.00	19.21			
Redfin Shiner	N	I	N		8	16.00	5.30			
Striped Shiner	N	I	S		1	2.00	0.66			
Spotfin Shiner	N	I	M		3	6.00	1.99			
Bluntnose Minnow	N	O	C	T	23	46.00	15.23			
Central Stoneroller	N	H	N		2	4.00	1.32			
Yellow Bullhead		I	C	T	6	12.00	3.97			
Blackstripe Topminnow		I	M		1	2.00	0.66			
Green Sunfish	S	I	C	T	25	50.00	16.56			
Bluegill Sunfish	S	I	C	P	4	8.00	2.65			
Longear Sunfish	S	I	C	M	4	8.00	2.65			
Blackside Darter	D	I	S		7	14.00	4.64			
Johnny Darter	D	I	C		1	2.00	0.66			
Rainbow Darter	D	I	S	M	1	2.00	0.66			
	Mile Total				151	302.00				
	Number of Species				16					
	Number of Hybrids				0					

Report on the mussels of the Blanchard River in the vicinity of Findlay, Ohio

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Summary

A study of the mussels of the Blanchard River and Eagle Creek in and within the vicinity of the City of Findlay, Ohio was performed on 19-22 September, 26-29 September, and 3-6 October. Water clarity during this time period was excellent and water depth was within acceptable limits throughout the study period. Mussels were collected by hand employing sight and tactile methods involving both general collecting (including some timed sampling methods) and line transect and quadrat sampling. A total of 29 species of mussels were found during the current study. Twenty of these species were found to be extant in the Blanchard River in the study area and seven species were found to be extant in Eagle Creek. Eagle Creek within its lower reaches suffers from water quality and habitat quality problems that limit this stream's ability to serve as habitat for a wider diversity of mussels. Furthermore, habitat constrains the community of mussels within the impounded section of the Blanchard River in the City of Findlay. Only eight species of mussels were found in this reach, none of these species was found alive, and one of these species (*Uniomerous tetralasmus*, an Ohio threatened species) was found only as a weathered dead specimen (indicating that the species is not extant in the reach).

All other reaches examined supported a fairly diverse community of mussels. The second reach upstream from the downstream end of the project area supported the greatest diversity of mussels with 18 species found to be extant in this reach and three others extirpated from the reach. This reach supports Ohio listed species (all Ohio species of concern) and high mussel density (3.8-4.4 mussels/m^2). Another reach (Area 4) produced a living specimen of the Ohio threatened species (*Ligumia recta* – black sandshell) as well as 12 extant species and one extirpated species. Area 1 (furthest downstream section) supported 12 extant species also with five species found to be extirpated from this reach, and Area 6 (upstream of the city) supported seven extant species with three species found to be extirpated from this reach.

No living or freshly dead specimens of Ohio endangered or US endangered (or candidate species) were found during the study. The clubshell, *Pleurobema clava* (Ohio and US endangered species), was found as weathered and subfossil shells in the lowermost two areas sampled, the rayed bean, *Villosa fabalis* (Ohio endangered and in prelisting as a US endangered species) was found as subfossil shells in the lowermost reach, and the purple lilliput, *Toxolasma lividus* (Ohio endangered and candidate for listing as a US endangered species) was found as a weathered shell in the lowermost reach. Similarly, *U. tetralasmus* (described above) and the wavy-rayed lampmussel, *Lampsilis fasciola* (Ohio species of concern) were found to be extirpated from the river. All other listed species (*L. recta*, black sandshell – Ohio threatened, *Alasmidonta marginata*, elktoe, *Lasmigona compressa*, creek heelsplitter, *Simpsonaias ambigua*, salamander mussel, *Ptychobranchus fasciolaris*, kidneyshell, and *Truncilla truncata*, deertoe – all Ohio species of concern) were found alive and/or as freshly dead shells indicating extant populations of these species occur in the project area. Given the

presence of these species, the relatively high diversity of mussels in Area 2 and the large number of extant versus extirpated species (20 of 29 species found extant), the unimpounded reaches of the Blanchard River support a locally significant mussel community.

Introduction

Prior to 1990 little data existed concerning the mussels of the Blanchard River (Watters *et al*., 2009). The Museum of Zoology at The Ohio State University (OSUM) had 56 lots of specimens representing 21 species of mussels. No Ohio or US endangered or threatened species were known from the river and the river had only been sampled at five locations for mussels. In 1994 a survey of the mussels of the upper portion of the river was required during environmental assessment of the US Route 30 construction project. The authors of that report listed 15 species of mussels for this reach (upstream of Mt. Blanchard) including five species listed as endangered by Ohio. Upon review of the list included in this report, it was found to list species not known to occur in the Lake Erie drainage system and so later that summer a new study of the mussels of this reach was conducted. That study was continued through the summer of 1996 (Hoggarth *et al*.,2000) and ultimately resulted in the discovery of 21 species of mussels from this reach including one US and Ohio endangered species (*P. clava* – clubshell) and two species listed by Ohio as endangered and candidates for listing as endangered by the USFWS (*T.lividus* – purple lilliput, and *V. fabalis* – rayed bean). Hoggarth *et al*. (2000) documented the fact that *V. fabalis* was more abundant in this reach of the Blanchard River than any other stream in Ohio and perhaps in the Midwest.

Mussels are the most endangered of all aquatic organisms (Neves, 1993) with 14 of 80 Ohio species listed as endangered by the U.S. Fish and Wildlife Service, and another 21 species listed as endangered by the Ohio Department of Natural Resources, Division of Wildlife. In addition, ten species are listed as threatened or of special concern in the state. Sixteen Ohio species of mussels are either extirpated or extinct (ODNR, 2009).

Many factors have contributed to the decline in population number and community structure of these animals (reviewed by Havlik and Marking, 1987 and Marking and Bills, 1980). Chief among these factors are water pollution, sedimentation, habitat destruction, the construction of impoundments, instream construction including dredging and filling operations, and more recently competition with zebra mussels (Starrett, 1971; Fuller, 1974; Neves, 1987). Each of these affects mussels differently; instream construction might increase sedimentation which clogs mussel gills, while water pollution and the formation of impoundments affects the chemical constituency of the water and the physical nature of a stream's habitats. Taken together these threats to stream ecosystems have resulted in the rarity of many species and populations of mussels.

The current study was performed to determine the mussel resources in the Blanchard River and Eagle Creek in Findlay, Ohio, immediately upstream of the city for both streams and immediately downstream of the city for the Blanchard River (Figures 1 & 2). In recent years the city has suffered significant flooding events which the city, working with state and federal agencies, would like to resolve for the health and welfare of the people of Findlay. This report provides the information needed to determine the impact of any proposed solution to the flooding problem on the mussel communities within the project area as shown in Figures 1, 2 and 3 on pages C-25 through C-27.

Materials and Methods

A study of the community structure and distribution of the mussels of the Blanchard River and Eagle Creek in Findlay (see Figures 1, 2 and 3 on pages C-25 through C-27 for the limits of this study) was performed on the following dates: 19-22 September, 26-29 September, and 3-6 October. Both streams were fairly low during the entire length of this study (Figure 4 on page C-27) with excellent water clarity (extremely important for sight dependent survey methods). Water chemistry parameters were examined late in the study (3-6 October 2009) due to rain events between 29 September 2009 and 3 October 2009 that may have changed water clarity and dropping temperatures (especially nighttime temperatures) that may have decreased water temperature below recommended for extracting mussels from the substrate (50 $_{o}$F, 10 $_{o}$C). The following water quality parameters were assessed: water temperature and conductivity (HACH SensIon 5 Conductivity meter), Turbidity (HACH 2100P Turbidimeter) and pH and oxygen concentration (HACH HQ40d mulitprobe meter).

During the current study mussels were collected by employing transect and quadrat sampling and general collecting methods, as well as limited timed collecting techniques. Glass bottom viewers were used to increase the effectiveness of these fairly sight intensive methods. In addition, dead shells were collected from the banks and bottom of the river and creek and live mussels were collected by noodling (employing tactile methods rather than sight methods). The entire reach of the Blanchard River shown in Figures 1, 2 and 3, on pages C-25 through C-27, and Eagle Creek were sampled for mussels during this study. Where possible, the river and creek were walked and where the river was too deep (between dams in the City of Findlay), the river was sampled from a canoe. That is, access to sampling locations was reached by canoe. The Blanchard River was subdivided into five reaches for better communication of the data and Eagle Creek was subdivided into two reaches. The following reaches were assigned for the Blanchard River: Reach 1(furthest downstream) extended from CR 128 to TR 139; Reach 2 extended from TR 139 to CR 140; Reach 3 was from CR 140 to IR 75; Reach 4 was from IR 75 to the first dam upstream of the IR 75 Bridge; Reach 5 was between dams in Findlay; and Reach 6 was immediately downstream of the SR 568 Bridge (in the unimpounded section of the river upstream of the City of Findlay). Eagle Creek was subdivided into two reaches: one upstream of a city park dominated by a natural stream corridor, and one downstream of this reach dominated by an urban stream corridor. A sewer break, which was emptying untreated sewage into Eagle Creek within the upstream reach further distinguished the upstream from the downstream sections (that sewer line break was at 41$_{o}$00”12.59”N by 83$_{o}$38’37.32”W and entered Eagle Creek at 41$_{o}$00”11.10”N by 83$_{o}$38’39.78”W). This outfall significantly impacted the water quality of Eagle Creek and in the water quality data described below.

All live mussels collected in quadrats were measured (length, height, width), aged (annular ring method), and sexed when possible (only one subfamily of mussels shows sexually dimorphism in shells). Live mussels collected during general collecting or during timed sampling were identified and either left *in situ* or extracted from the bottom, identified, tallied, and quickly returned to the substrate. Shells were collected whenever found and determined to be freshly dead (dead less than one year with an intact periostracum and lustrous nacre), weathered dead (dead between one and twenty years with a mostly intact periostracum but lacking luster to the nacre) or subfossil shells (dead longer than twenty years with an abraded periostracum and chalky nacre). Only live and freshly dead shells were used to indicate the existence of an extant population of mussels within the project area.

Results

Twenty-three species of mussels had been recorded from the Blanchard River prior to this study (Table 1). Included in this total were one species (*P. clava* – the clubshell) listed as an Ohio and US endangered species, one species (*V. fabalis* – rayed bean) listed as an Ohio endangered species and in prelisting as a US endangered species, one other species listed as endangered in Ohio (*T. lividus* – purple lilliput), and five species listed in Ohio as species of concern (*A. marginata* – elktoe, *L. compressa* – creek heelsplitter, *P.sintoxia* – round pigtoe, *P. fasciolaris* – kidneyshell, and *L. fasciola* – wavy-rayed lampmussel). All but *P. clava* were found to be extant in the upper reaches of the river (Hoggarth *et al*., 2000). *Pleurobema clava* (clubshell) is believed to be extirpated from the river today (USFWS, 1993). The current study resulted in the discovery of 29 species of mussels from the Blanchard River (with fewer coming from Eagle Creek) including eight species never before reported for the river (Table 2). In addition, two species previously recorded for the river were not found during this study (as live specimens or dead shells). This gives a total of 31 species of mussels for the river. A total of seven species of mussels were found to occur in Eagle Creek (Table 3). Of these species, all were found extant within the upstream section and only two were found extant in the downstream section.

The current study yielded only weathered and subfossil specimens of *P. clava*, *T. lividus*, and *V. fabalis* (Table 4). No other Ohio or US endangered species were found. However, one live specimen of *L. recta* was found in Area 4, an Ohio threatened species, as well as live and/or freshly dead specimens of the following Ohio species of concern: *A. marginata, L. compressa, S. ambigua, P. fasciolaris,* and *T. truncata. Lampsilis fasciola,* an Ohio species of concern, was only found as a weathered shell. This is a first record for *L. recta, S. ambigua* and *T. truncate* for the river. In addition, one weathered dead specimen of *U. tetralasmus* (pondhorn) was collected from this river, which also represents the first time this Ohio threatened species has been collected from the Blanchard River. Given that the shell had been dead for some time and was collected from an impounded section of the river, it probably is not extant in the river today.

All sections of the river and both sections of Eagle Creek (see above for this discussion) produced mussels. Section 5 (between dams in the City of Findlay) produced the fewest extant species (seven), no live mussels, and only 24 freshly dead shells (Table 4). The species found in this reach were slack water or generalist species commonly found in

Ohio rivers and lakes (particularly impoundments). Freshly dead shells of one Ohio species of concern (*T. truncata*) were found in this reach (indicating an extant population of this species in this reach), but that species is more abundant and more widely distributed than its status in Ohio and nearby states indicates (see discussion below). Sections 2 and 4 produced the most mussels (Table 4). Section 2 produced 18 extant species and three species as weathered or subfossil shells. The three dominant species in this reach were *Lasmigona complanata* (white heelsplitter), *Leptodea fragilis* (fragile papershell) and *T. truncata* (deertoe). Quadrat sampling produced estimates of 0.8 mussels/m^2 in a run habitat within this reach and 3.8-4.4 mussels/m^2 in faster water habitats (either in riffles or just downstream of a riffle in a fast run habitat) near Liberty Landing canoe launch area (see Appendix 1 for these data). These same areas produced estimates of the Asiatic clam (*Corbicula fluminea* – an invasive species) in excess of 1000 clams/m^2.

Area 1 (furthest downstream section) produced the second most number of species (17) and specimens of *P. clava, T. lividus* and *V. fabalis*, but these, and other species, were represented here only by weathered or subfossil specimens. This reach only produced 35 live mussels, even though it was the longest natural reach of stream (not impounded) sampled during this study. Section 3 only produced six live mussels and seven extant species, but it was the shortest reach sampled during this study. It was separated here as it represents the reach of the river immediately downstream of the outfall of the wastewater treatment facility for the City of Findlay. We do not believe the relative absence of mussels here is due to that facility but the absence of habitat for mussels in this reach. The water chemistry for this reach was not all that different from reaches immediately upstream or downstream of the outfall (Table 5) and all parameters were within acceptable limits for mussels.

The same cannot be said for Eagle Creek. The site where water was sampled from Eagle Creek was downstream of the sewage line break discussed above and shown in Figure 13. It is probable that the water being helped upriver by the lower water levels experienced on 19-22 September, and 26-29 September (Figure 4) was released downstream by the precipitation event that occurred prior to the 3-6 October collecting period.
This water increased the Biological Oxygen Demand (not quantified) and reduced the oxygen concentration of the creek below 5 mg/l, which is generally thought of as the minimum level necessary to support aquatic life. A combination of water quality and habitat quality problems has eliminated all but the most tolerant of mussels from the lower reaches of Eagle Creek.

Discussion

This report documents the most complete survey for mussels in the vicinity of Findlay, Ohio that has been done. A total of 29 species of mussels were documented for the Blanchard River within this area and seven species were found in Eagle Creek. Prior to this study, Hoggarth *et al*. (2000) documented 21 species for the river and OSUM (Watters *et al*., 2009) document two additional species for the river. During the current study 20 of the 29 species found were found to have extant populations in the reach (mostly upstream and downstream of the impounded section in downtown Findlay).

None of the Ohio endangered species were found to be extant in the study area (including one federal endangered species, *P. clava*, one species in prelisting as an endangered species, *V. fabalis*, and one species a candidate for prelisting, *T. lividus*).

Eight species were reported here for the river for the first time. Six of these maintain extant populations in this reach (including the Ohio threatened species, *L. recta*, and two species listed by Ohio as species of concern, *S. ambigua* and *T. truncata*). The latter species, *T. truncata* is of interest as it, along with *L. fragilis* and *Potamilus alatus* are on the increase in the state as the species' host fish is becoming more abundant and widely distributed statewide and in adjacent states (Hoggarth, 1986, 1990, 1999, 2000, 2008, 2009; Hoggarth and Yankie, 2008). The freshwater drum (*Aplodinotus grunniens*) is the host of the parasitic larval stages of these three aforementioned species. As the drum's abundance and distribution has increased so too have these species. Freshwater drum were observed in the study area particularly downstream of the dams in the Blanchard River.

The mussel community that occurs in the Blanchard River upstream of the impounded sections and downstream of the dams in the river represent locally significant populations of mussels. Although the downstream community is dominated by a relatively silt tolerant and habitat generalist mussel (*L. complanata* accounted for 75-90% of the mussels in this reach), there are sufficient other species in this reach to suggest the mussel community here is of local significance. The presence of numerous state listed species here (including one Ohio threatened species and other species of concern) supports this conclusion. The number of creek heelsplitters (*L. compressa*) in Section 2 of the Blanchard River and kidneyshells (*P. fasciolaris*) in the section immediately upstream of the city is impressive. Both species were found upstream by Hoggarth et al. (2000), but only in similar numbers at the best site in the upper river. The density of mussels in a portion of this area (in the faster water within Section 2) also confirms the significance of the mussel community here (3.8-4.4 mussels/m^2).

Endangered Species

Only weathered and/or subfossil shells of *P. clava* were found in the study area (Sections 1 & 2). No live or freshly dead specimens were found. These data agree with the Recovery Plan for this species (USFWS, 1993) that this species is extirpated from the river. Additionally, only two subfossil shells of *V. fabalis* and one weathered shell of *T. lividus* were found at Station 1 (the only station that yielded these species). Again, these data suggest both species have been extirpated from this reach of the river. Similarly, *U.tetralasmus* (Ohio threatened) and *L. fasciola* (Ohio species of concern) were only found as a weathered shell indicating they too are extirpated from the river today. All other listed species, *L. recta* (Ohio threatened), and *A. marginata, L. compressa, S. ambigua, P.fasciolaris,* and *T. truncata* (all Ohio species of concern) were found to be extant. This is the first record of *L. recta* and *S. ambigua* for the Blanchard River. No Ohio or federally listed species were found to occur in Eagle Creek. This stream lacked suitable habitat in its lower reaches and was suffering from water quality problems upstream.

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Table 1. Species of mussels collected from the Blanchard River by Hoggarth *et al*. (2000) and/or deposited in the collection of the Ohio State University Museum of Zoology.

Species	Common name	Extant
1. *Pyganodon grandis*	giant floater	Yes
2. *Anodontoides ferussacianus*	cylindrical papershell	Yes
3. *Strophitus undulatus*	creeper	Yes
4. *Alasmidonta viridis*	slippershell	Yes
5. *Alasmidonta marginata*[e]	elktoe	Yes
6. *Lasmigona costata*	fluted-shell	Yes
7. *Lasmigona complanata*	white heelsplitter	Yes
8. *Lasmigona compressa*[e]	creek heelsplitter	Yes
9. *Amblema plicata*	threeridge	Yes
10. *Quadrula quadrula*	mapleleaf	Yes
11. *Quadrula pustulosa*	pimpleback	Yes
12. *Pleurobema clava*[a]	clubshell	No
13. *Pleurobema sintoxia*[e]	round pigtoe	Yes
14. *Fusconaia flava*	Wabash pigtoe	Yes
15. *Elliptio dilatata*	spike	Yes
16. *Ptychobranchus fasciolaris*[e]	kidneyshell	Yes
17. *Toxolasma lividus*[c]	lilliput	Yes
18. *Toxolasma parvum*	purple lilliput	Yes
19. *Villosa iris*	rainbow	Yes
20. *Villosa fabalis*[b]	rayed bean	Yes
21. *Lampsilis radiata luteola*	fat mucket	Yes
22. *Lampsilis cardium*	pocketbook	Yes
23. *Lampsilis fasciola*[e]	wavy-rayed lampmussel	Yes

a – Ohio and US endangered, b – Ohio endangered and US prelisting, c – Ohio endangered, d – Ohio threatened, e – Ohio species of concern

Table 2. Species of mussels collected from the Blanchard River and Eagle Creek during the current study in the vicinity of Findlay, Ohio.

Species	Common name	Extant
1. *Utterbackia imbecillis*	paper pondshell	Yes
2. *Pyganodon grandis*	giant floater	Yes
3. *Anodontoides ferussacianus*	cylindrical papershell	Yes
4. *Strophitus undulatus*	creeper	Yes
5. *Alasmidonta marginata*[e]	elktoe	Yes
6. *Lasmigona costata*	fluted-shell	Yes
7. *Lasmigona complanata*	white heelsplitter	Yes
8. *Lasmigona compressa*[e]	creek heelsplitter	Yes
9. *Simpsonaias ambigua*[e]	salamander mussel	Yes
10. *Amblema plicata*	threeridge	Yes
11. *Quadrula quadrula*	mapleleaf	Yes
12. *Quadrula pustulosa*	pimpleback	Yes
13. *Pleurobema clava*[a]	clubshell	No
14. *Fusconaia flava*	Wabash pigtoe	Yes
15. *Elliptio dilatata*	spike	Yes
16. *Uniomerus tetralasmus*[d]	pondhorn	No
17. *Ptychobranchus fasciolaris*[e]	kidneyshell	Yes
18. *Leptodea fragilis*	fragile papershell	Yes
19. *Potamilus alatus*	pink heelsplitter	Yes
20. *Truncilla truncata*[e]	deertoe	Yes
21. *Toxolasma lividus*[c]	lilliput	No
22. *Toxolasma parvum*	purple lilliput	No
23. *Obovaria subrotunda*	hickorynut	No
24. *Ligumia recta*[d]	black sandshell	Yes
25. *Villosa iris*	rainbow	No
26. *Villosa fabalis*[b]	rayed bean	No
27. *Lampsilis radiata luteola*	fat mucket	Yes
28. *Lampsilis cardium*	pocketbook	No
29. *Lampsilis fasciola*[e]	wavy-rayed lampmussel	No

a – Ohio and US endangered, b – Ohio endangered and US prelisting, c – Ohio endangered, d – Ohio threatened, e – Ohio species of concern

Table 3. Distribution of mussels collected from Eagle Creek during the current study in the vicinity of Findlay, Ohio. Numbers based on total mussels collected – all methods.

Species	Upstream			Downstream.		
	L	D	S	L	D	S
1. *A. ferussacianus*	0	3	--	0	2	--
2. *S. undulatus*	0	3	--	--	--	--
3. *L. complanata*	9	5	--	--	--	--
4. *A. plicata*	2	8	--	--	--	--
5. *F. flava*	0	2	--	--	--	--
6. L. fragilis	1	0	--	--	--	--
7. *L. r. luteola*	7	11	--	4	1	--
Total live mussels	19			4		

a – Ohio and US endangered, b – Ohio endangered and US prelisting, c – Ohio endangered, d – Ohio threatened, e – Ohio species of concern. Upstream and down-stream refer to a sewer line break emptying into Eagle Creek. The break is at 41$_o$00’12.54”N 83$_o$38’37.32”W and it enters the stream at 41$_o$00’11.10”N 83$_o$38’39.78”W. L – live, D – freshly dead shells (L+D = extant); S – weathered + subfossil shells = extirpated.

Table 4. Distribution of mussels from the Blanchard River during the current study in the vicinity of Findlay, Ohio.

	Species	1			2			3			4			5			6		
		L	D	S	L	D	S	L	D	S	L	D	S	L	D	S	L	D	S
1.	*U. imbecillis*	0	2	--	1	5	--	0	2	--	0	3	--	0	2	--	--	--	--
2.	*P. grandis*	1	3	--	3	4	--	--	--	--	8	17	--	0	9	--	1	1	--
3.	*A. ferussacianus*	0	3	--	2	2	--	--	--	--	--	--	--	--	--	--	--	--	--
4.	*S. undulatus*	--	--	--	0	2	--	--	--	--	0	1	--	0	1	--	0	0	1
5.	*A. marginata*[e]	0	1	--	3	2	--	--	--	--	0	2	--	--	--	--	--	--	--
6.	*L. costata*	--	--	--	1	0	--	--	--	--	--	--	--	--	--	--	10	1	--
7.	*L. complanata*	13	6	--	117	23	--	4	2	--	90	4	--	0	4	--	5	0	--
8.	*L. compressa*[e]	--	--	--	15	6	--	--	--	--	1	0	--	--	--	--	--	--	--
9.	*S. ambigua*[e]	0	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10.	*A. plicata*	0	1	--	1	0	--	--	--	--	--	--	--	--	--	--	--	--	--
11.	*Q. quadrula*	2	1	--	3	2	--	0	5	--	1	66	--	--	--	--	--	--	--
12.	*Q. pustulosa*	--	--	--	0	1	--	0	1	--	0	2	--	--	--	--	--	--	--
13.	*P. clava*[a]	0	0	6	0	0	1	--	--	--	--	--	--	--	--	--	--	--	--
14.	*F. flava*	--	--	--	1	0	--	--	--	--	--	--	--	--	--	--	--	--	--
15.	*E. dilatata*	--	--	--	1	0	--	--	--	--	--	--	--	--	--	--	3	8	--
16.	*U. tetralasmus*[d]	--	--	--	--	--	--	--	--	--	--	--	--	0	0	1	--	--	--
17.	*P. fasciolaris*[e]	--	--	--	0	1	--	0	1	--	--	--	--	--	--	--	13	3	--
18.	*L. fragilis*	0	5	--	52	38	--	--	--	--	0	4	--	0	1	--	21	6	--
19.	*P. alatus*	4	1	--	6	2	--	--	--	--	0	1	--	--	--	--	--	--	--
20.	*T. truncata*[e]	6	15	--	25	15	--	1	10	--	0	86	--	0	5	--	--	--	--
21.	*T. lividus*[c]	0	0	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
22.	*T. parvum*	--	--	--	--	--	--	--	--	--	0	0	2	--	--	--	--	--	--
23.	*O. subrotunda*	0	0	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24.	*L. recta*[d]	--	--	--	--	--	--	--	--	--	1	0	--	--	--	--	--	--	--
25.	*V. iris*	0	0	1	0	0	1	--	--	--	--	--	--	--	--	--	0	0	1
26.	*V. fabalis*[b]	0	0	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
27.	*L. r. luteola*	9	1	--	17	3	--	1	1	--	--	--	--	0	2	--	19	9	--
28.	*L. cardium*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	0	1
29.	*L. fasciola*[e]	--	--	--	0	0	1	--	--	--	--	--	--	--	--	--	--	--	--
Total live mussels		35			248			6			101			0			72		

a – Ohio and US endangered, b – Ohio endangered and US prelisting, c – Ohio endangered, d – Ohio threatened, e – Ohio species of concern. 1 – CR 128 to TR 139; 2 – TR 139 to CR 140; 3 – CR 140 to IR 75; 4 – IR 75 to first dam; 5 – between dams in Findlay; 6 – immediately downstream of SR 568. L – live, D – freshly dead shells (L+D = extant); S – weathered + subfossil shells = extirpated.

Table 5. Water chemistry of the Blanchard River and Eagle Creek during the time of this study; 3 & 5 October 2009.

Parameter	Blanchard River 1	2 & 3	4	5	6	Eagle Creek U/D	Units
3 October 2009							
Water Temperature	14.0	14.7	15.6	14.1	12.8	13.4	°C
Conductivity	636	671	720	638	698	862	µS/cm
Turbidity	16.1	11.5	11.3	13.2	13.4	8.4	NTU
Oxygen	7.29	7.58	7.93	7.26	8.17	5.67	mg/l
PH	7.90	7.83	7.84	7.93	8.00	7.87	
5 October 2009							
Water Temperature	11.7	12.7	13.1	12.2	11.7	11.9	°C
Conductivity	768	688	506	773	874	1080	µS/cm
Turbidity	4.8	11.2	13.8	15.2	12.6	7.1	NTU
Oxygen	7.95	7.53	7.53	7.50	8.72	4.69	mg/l
PH	7.79	7.81	7.99	7.96	8.16	7.85	

1 – CR 128 to TR 139; 2 – TR 139 to CR 140; 3 – CR 140 to IR 75; 4 – IR 75 to first dam; 5 – between dams in Findlay; 6 – immediately downstream of SR 568; U/D at the point that separated upstream from downstream.

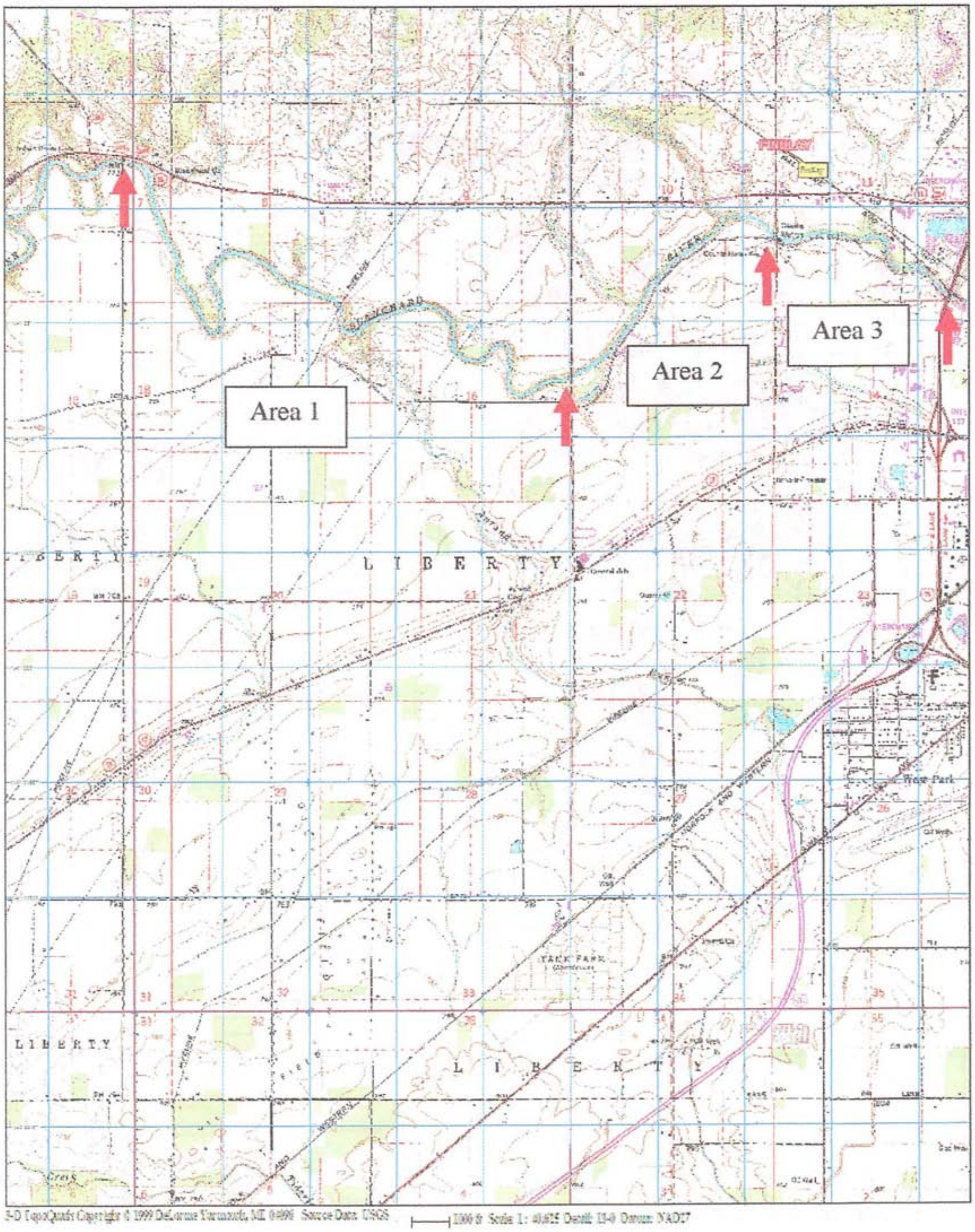

Figure 1. Map of the western half of the study area showing three reaches sampled from the Blanchard River: Areas 1 - 3.

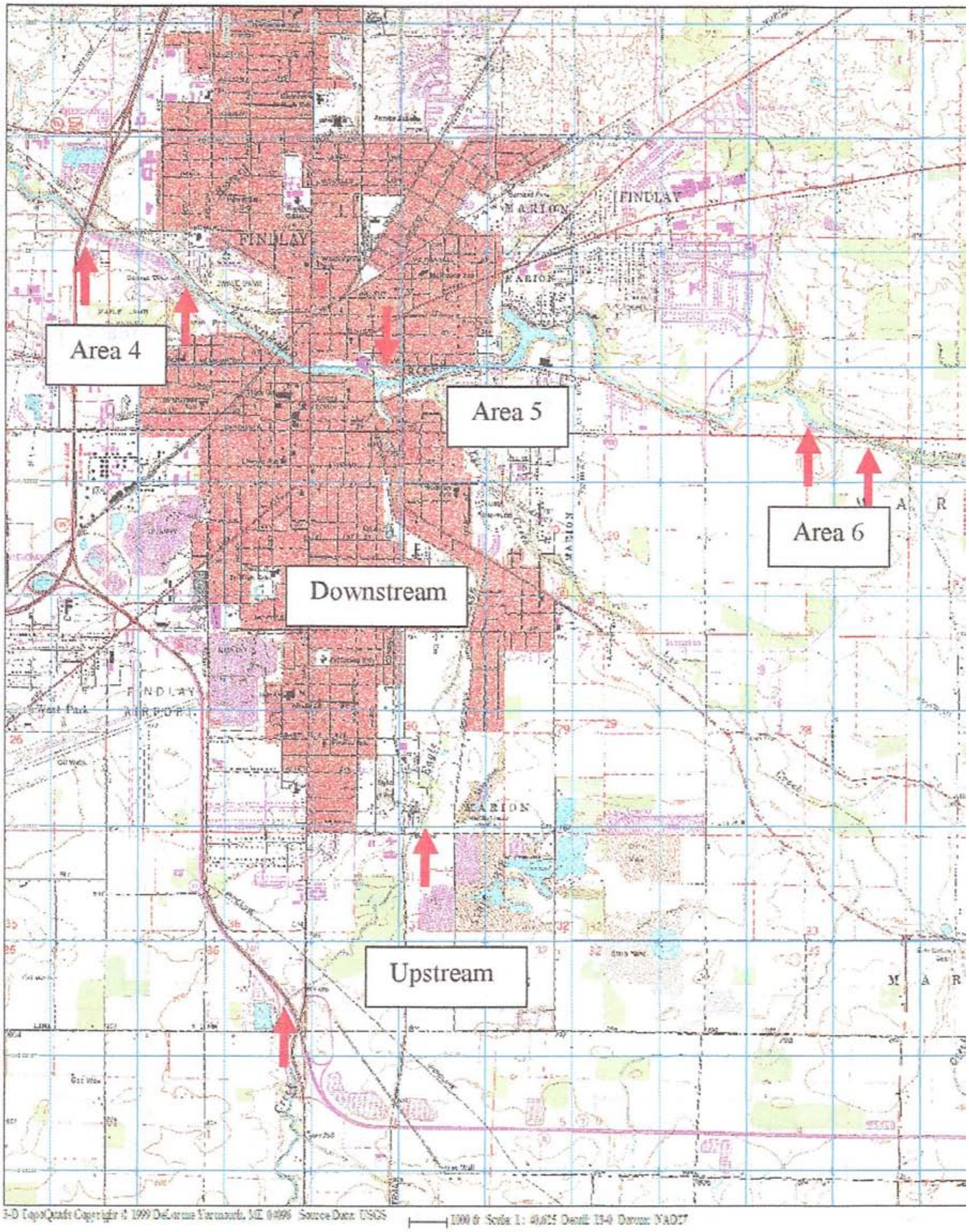

Figure 2. Map of the eastern half of the study area showing four reaches sampled from the Blanchard River (Areas 3 – 6) and the two reaches sampled from Eagle Creek.

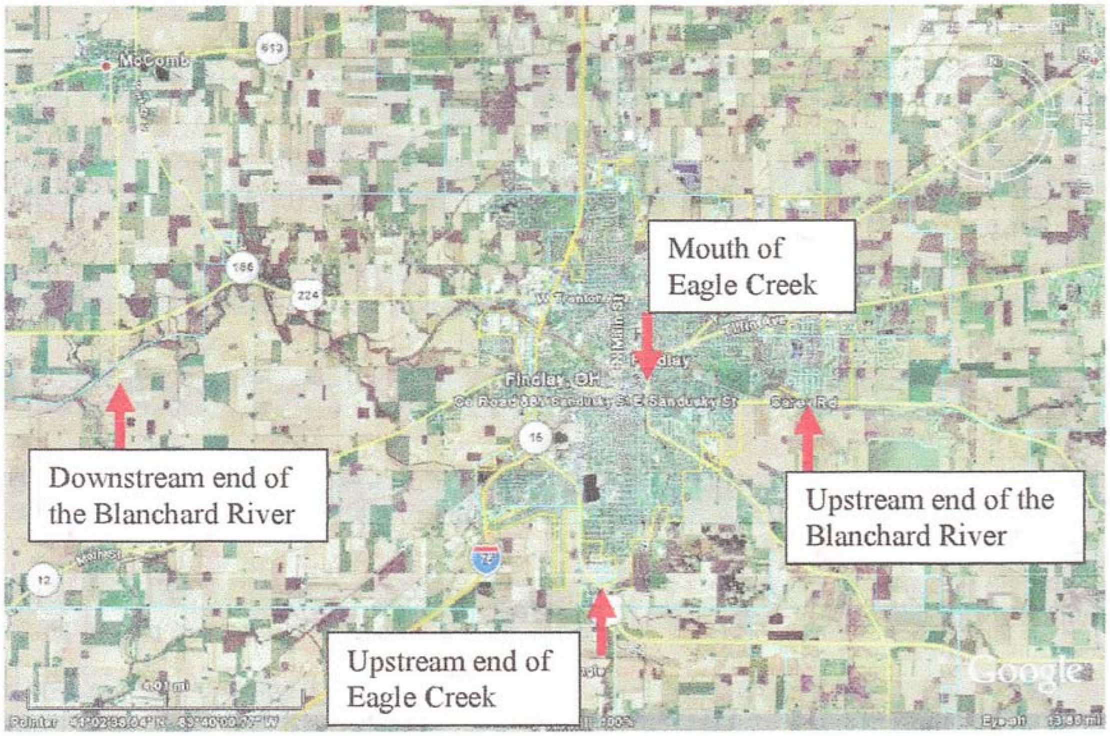

Figure 3. Aerial photograph of the Blanchard River and Eagle Creek in Findlay showing the reaches sampled during this study.

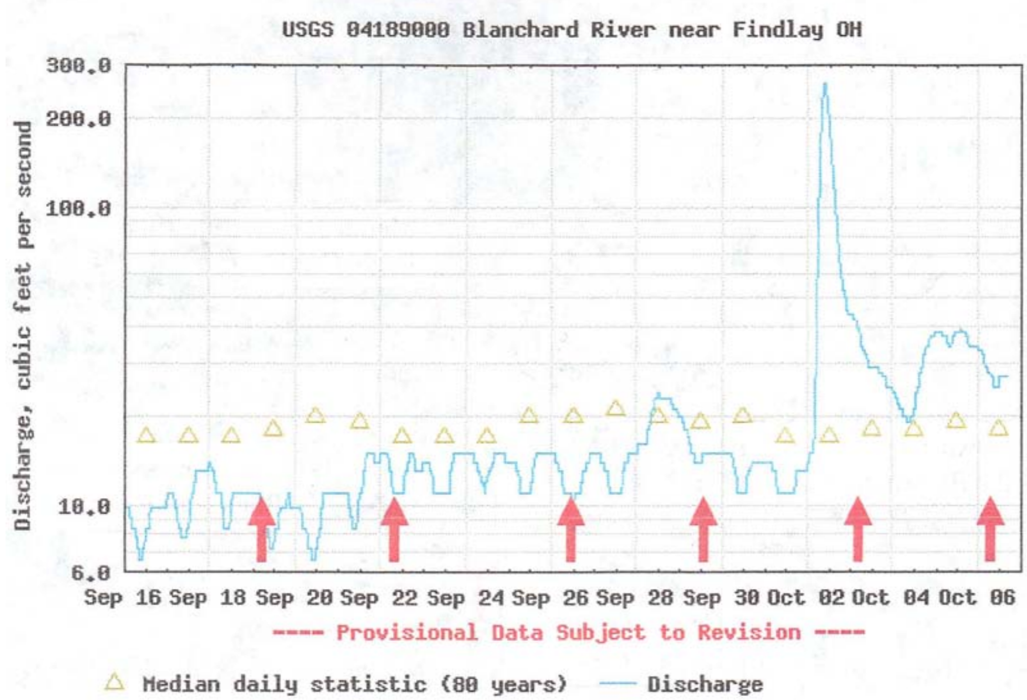

Figure 4. Stream gage data for the Blanchard River in Findlay during the time of this study; 19-22 September, 26-29 September, & 3-6 October.

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Appendix D
2010 Ohio Integrated Water Quality Assessment Report for the Riley Creek Watershed

Division of Surface Water Watershed Assessment Unit Summary

Overview Information

Click to view a glossary of terms

Assessment Unit Name: Binkley Ditch-Little Riley Creek
Hydrologic Unit Code: 04100008 04 01
Assessment Unit Size: 14.4 square miles
Priority Points: 0
Monitoring Scheduled: 2020
TMDL Scheduled: 2023

Land Use Statistics:

Developed	Forest	Grass/Pasture	Row Crops	Other
7.1%	7.4%	2.7%	82.7%	0.0%

Aquatic Life Use Assessment

Reporting Category: 4A
Aquatic Life Uses: WWH
Sampling Years: 2005
Watershed Score: 0.0

Assessment Details:

Headwater Sites <20 sq. mi.	Wading Sites >20 & <50 sq. mi.	Principal Sites >50 & <500 sq. mi.
Sites Assessed: 2	Sites Assessed: 0	Sites Assessed: 0
Sites Attaining: 0	Sites Attaining: 0	Sites Attaining: 0

Most Recent Data:

Year Assessed	Station Name	River Mile	Drainage Area	Aquatic Life Use	Attainment Status
2005	L RILEY CK (UPPER) @ ORANGE TR 27	2.64	8.5	WWH	Non
2005	L RILEY CK (UPPER) @ ORANGE TR 51	1.00	14.1	WWH	Non

Causes of Impairment:

- direct habitat alterations
- low flow alterations
- sedimentation/siltation

Web site: http://wwwapp.epa.ohio.gov/dsw/ir2010/wau.php?hu=041000080401 2/11/2011

Sources of Impairment:

- channelization
- crop production with subsurface drainage
- streambank modifications/destabilization

Comments: TMDLs for pollutants impairing designated aquatic life uses in the Blanchard River basin were approved by the U.S. EPA on July 2, 2009.

Recreation Use Assessment

Reporting Category: 4A
Assessment Unit Score: Not calculated

Public Drinking Water Supply Assessment

Reporting Category: Not applicable
Cause of Impairment: None
Nitrate Watch List: No
Pesticide Watch List: No

Fish Tissue Assessment

Reporting Category: 3
Causes of Impairment: None

Relevant TMDL Report

- Blanchard River

Division of Surface Water Watershed Assessment Unit Summary

Overview Information

Click to view a glossary of terms

Assessment Unit Name: Upper Riley Creek
Hydrologic Unit Code: 04100008 04 02
Assessment Unit Size: 14.4 square miles
Priority Points: 0
Monitoring Scheduled: 2020
TMDL Scheduled: 2023

Land Use Statistics:

Developed	Forest	Grass/Pasture	Row Crops	Other
6.2%	10.3%	2.4%	81.0%	0.0%

Aquatic Life Use Assessment

Reporting Category: 4A
Aquatic Life Uses: MWH-C
Sampling Years: 2005
Watershed Score: 0.0

Assessment Details:

Headwater Sites <20 sq. mi.	Wading Sites >20 & <50 sq. mi.	Principal Sites >50 & <500 sq. mi.
Sites Assessed: 2 Sites Attaining: 0	Sites Assessed: 0 Sites Attaining: 0	Sites Assessed: 0 Sites Attaining: 0

Most Recent Data:

Year Assessed	Station Name	River Mile	Drainage Area	Aquatic Life Use	Attainment Status
2005	RILEY CK @ HANCOCK CR 12	24.94	5.8	MWH-C	Non
2005	RILEY CK @ HANCOCK CR 28	22.62	12.1	MWH-C	Non

Causes of Impairment:

- direct habitat alterations
- organic enrichment (sewage) biological indicators
- oxygen, dissolved
- phosphorus (total)
- sedimentation/siltation

Web site: http://wwwapp.epa.ohio.gov/dsw/ir2010/wau.php?hu=041000080401 2/11/2011

Sources of Impairment:

- channelization
- crop production with subsurface drainage

Comments: TMDLs for pollutants impairing designated aquatic life uses in the Blanchard River basin were approved by the U.S. EPA on July 2, 2009.

Recreation Use Assessment

Reporting Category: 4A
Assessment Unit Score: Not calculated

Public Drinking Water Supply Assessment

Reporting Category: Not applicable
Cause of Impairment: None
Nitrate Watch List: No
Pesticide Watch List: No

Fish Tissue Assessment

Reporting Category: 3
Causes of Impairment: None

Relevant TMDL Report

- Blanchard River

Division of Surface Water Watershed Assessment Unit Summary

Overview Information

Click to view a glossary of terms

Assessment Unit Name: Marsh Run-Little Riley Creek
Hydrologic Unit Code: 04100008 04 03
Assessment Unit Size: 16.3 square miles
Priority Points: 0
Monitoring Scheduled: 2020
TMDL Scheduled: 2023

Land Use Statistics:

Developed	Forest	Grass/Pasture	Row Crops	Other
16.4%	6.7%	3.9%	72.8%	0.2%

Aquatic Life Use Assessment

Reporting Category: 4A
Aquatic Life Uses: WWH,MWH-C
Sampling Years: 2005
Watershed Score: 0.0

Assessment Details:

Headwater Sites <20 sq. mi.	Wading Sites >20 & <50 sq. mi.	Principal Sites >50 & <500 sq. mi.
Sites Assessed: 3	Sites Assessed: 0	Sites Assessed: 0
Sites Attaining: 0	Sites Attaining: 0	Sites Attaining: 0

Most Recent Data:

Year Assessed	Station Name	River Mile	Drainage Area	Aquatic Life Use	Attainment Status
2005	L RILEY CK (LOWER) @ SWANEY RD	5.50	5.5	MWH-C	Partial
2005	L RILEY CK (LOWER) @ HILLVILE RD	4.30	12.3	WWH	Non
2005	L RILEY CK (LOWER) @ RILEY ST AT BLUFFTON	0.03	16.0	WWH	Non

Causes of Impairment:

- direct habitat alterations
- low flow alterations
- organic enrichment (sewage) biological indicators

Web site: http://wwwapp.epa.ohio.gov/dsw/ir2010/wau.php?hu=041000080401 2/11/2011

- phosphorus (total)
- sedimentation/siltation

Sources of Impairment:

- channelization
- crop production with subsurface drainage
- urban runoff/storm sewers

Comments: TMDLs for pollutants impairing designated aquatic life uses in the Blanchard River basin were approved by the U.S. EPA on July 2, 2009.

Recreation Use Assessment

Reporting Category: 4A
Assessment Unit Score: Not calculated

Public Drinking Water Supply Assessment

Reporting Category: Not applicable
Cause of Impairment: None
Nitrate Watch List: No
Pesticide Watch List: No

Fish Tissue Assessment

Reporting Category: 3
Causes of Impairment: None

Relevant TMDL Report

- Blanchard River

Division of Surface Water Watershed Assessment Unit Summary

Overview Information

Click to view a glossary of terms

Assessment Unit Name: Middle Riley Creek
Hydrologic Unit Code: 04100008 04 04
Assessment Unit Size: 15.6 square miles
Priority Points: 0
Monitoring Scheduled: 2020
TMDL Scheduled: 2023

Land Use Statistics:

Developed	Forest	Grass/Pasture	Row Crops	Other
17.9%	5.3%	1.9%	74.7%	0.1%

Aquatic Life Use Assessment

Reporting Category: 4A
Aquatic Life Uses: WWH,MWH-C
Sampling Years: 2005
Watershed Score: 0.0

Assessment Details:

Headwater Sites <20 sq. mi.	Wading Sites >20 & <50 sq. mi.	Principal Sites >50 & <500 sq. mi.
Sites Assessed: 1	Sites Assessed: 2	Sites Assessed: 0
Sites Attaining: 0	Sites Attaining: 0	Sites Attaining: 0

Most Recent Data:

Year Assessed	Station Name	River Mile	Drainage Area	Aquatic Life Use	Attainment Status
2005	RILEY CK @ ORANGE TR 51	19.40	29.4	WWH	Non
2005	RILEY CK JUST UPSTREAM BLUFFTON WWTP	15.41	44.4	WWH	Partial
2005	MARSH RUN @ UNION TR 51	1.74	6.2	MWH-C	Partial

Causes of Impairment:

- direct habitat alterations
- nitrate/nitrite (nitrite + nitrate as N)
- nitrates
- nutrient/eutrophication biological indicators

- organic enrichment (sewage) biological indicators
- oxygen, dissolved
- sedimentation/siltation
- temperature, water

Sources of Impairment:

- channelization
- combined sewer overflows
- crop production with subsurface drainage

Comments: TMDLs for pollutants impairing designated aquatic life uses in the Blanchard River basin were approved by the U.S. EPA on July 2, 2009.

Recreation Use Assessment

Reporting Category: 4A
Assessment Unit Score: Not calculated

Public Drinking Water Supply Assessment

Reporting Category: Not applicable
Cause of Impairment: None
Nitrate Watch List: No
Pesticide Watch List: No

Fish Tissue Assessment

Reporting Category: 3
Causes of Impairment: None

Relevant TMDL Report

- Blanchard River

Division of Surface Water Watershed Assessment Unit Summary

Overview Information

Click to view a glossary of terms

Assessment Unit Name: Lower Riley Creek
Hydrologic Unit Code: 04100008 04 05
Assessment Unit Size: 25.1 square miles
Priority Points: 0
Monitoring Scheduled: 2020
TMDL Scheduled: 2023

Land Use Statistics:

Developed	Forest	Grass/Pasture	Row Crops	Other
8.9%	4.9%	2.5%	82.8%	1.0%

Aquatic Life Use Assessment

Reporting Category: 4A
Aquatic Life Uses: WWH,MWH-C
Sampling Years: 2005
Watershed Score: 20.0

Assessment Details:

Headwater Sites <20 sq. mi.	Wading Sites >20 & <50 sq. mi.	Principal Sites >50 & <500 sq. mi.
Sites Assessed: 1	Sites Assessed: 0	Sites Assessed: 5
Sites Attaining: 0	Sites Attaining: 0	Sites Attaining: 2

Most Recent Data:

Year Assessed	Station Name	River Mile	Drainage Area	Aquatic Life Use	Attainment Status
2005	RILEY CK @ BENTLEY RD DST BLUFFTON WWTP	14.40	62.0	WWH	Full
2005	RILEY CK @ PHILLIPS RD DST BLUFFTON	11.53	64.0	WWH	Non
2005	RILEY CK @ RILEY TR Q (MADISON AVE) AT PANDORA	7.52	68.0	WWH	Partial
2005	RILEY CK @ CR 6 NR PANDORA	4.36	70.0	WWH	Partial
2005	RILEY CK @ OTTAWA TR K-6	1.20	85.0	WWH	Full
2005	CRANBERRY RUN @ COOL RD (S CROSSING)	6.67	6.2	MWH-C	Partial

Web site: http://wwwapp.epa.ohio.gov/dsw/ir2010/wau.php?hu=041000080401 2/11/2011

Causes of Impairment:

- direct habitat alterations
- nitrate/nitrite (nitrite + nitrate as N)
- nutrient/eutrophication biological indicators
- organic enrichment (sewage) biological indicators
- phosphorus (total)
- sedimentation/siltation
- temperature, water

Sources of Impairment:

- channelization
- combined sewer overflows
- crop production with subsurface drainage
- dam or impoundment
- municipal point source discharges
- urban runoff/storm sewers

Comments: TMDLs for pollutants impairing designated aquatic life uses in the Blanchard River basin were approved by the U.S. EPA on July 2, 2009.

Recreation Use Assessment

Reporting Category: 4A
Assessment Unit Score: Not calculated

Public Drinking Water Supply Assessment

Reporting Category: Not applicable
Cause of Impairment: None
Nitrate Watch List: No
Pesticide Watch List: No

Fish Tissue Assessment

Reporting Category: 3
Causes of Impairment: None

Relevant TMDL Report

- Blanchard River

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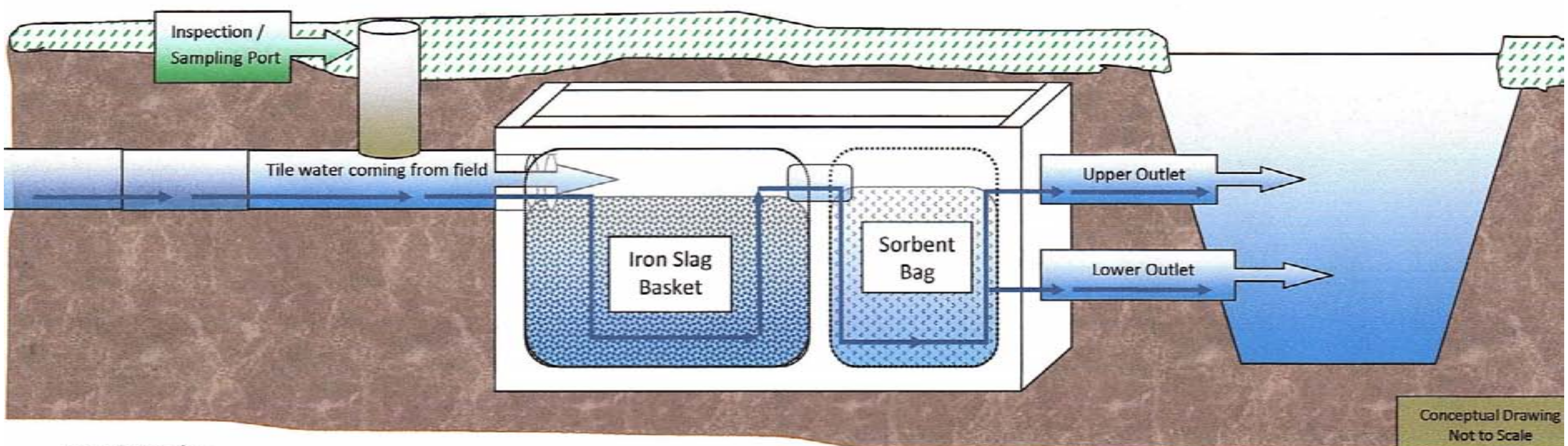
Appendix E
Tile Discharge Filter
For Phosphorus
Removal

USDA NRCS
Natural Resources Conservation Service
Helping People Help the Land

Tile Discharge Filter

Design:

The tank consists of a two stage 1500-2000 gallon precast concrete septic tank with baffle and removable lid. One side of the tank is filled with iron slag or some other type of coarse material that ties up phosphorus (and/or nitrogen). The iron slag could be contained in a galvanized wire mesh basket to facilitate replacement when exhausted. The other side of the tank contains a geo-textile bag filled with alum, charcoal, or some other sorbent. The sorbent could be easily replaced by lifting out and replacing the geo-textile bag containing the sorbent. Testing would need to determine if the Lower Outlet is necessary or could be eliminated from the design.



How it Works:

Tile drainage water empties into the tank which drains through the coarse slag material and then through the bag of sorbent. The tile water exits the Lower Outlet on the opposite side of the tank. During high flow, water can exit the tank using both outlet ports if needed or could be designed to exit the top of the tank. Sorbent material would be replaced when the effluent coming out of the tank is no longer filtering as intended. This could be determined by comparing water sampled from the inspection port to water exiting the tank.

Advantages:

The materials are readily available and relatively inexpensive. The system is management free once installed (except for sorbent replacement when exhausted). The system should handle full flow water from tile vs. having a separate by-pass system. The filter is not limited by hydraulic elevation as a drainage control structure is limited. The system will take little to no land out of production nor does it restrict or back up water in the tile. Therefore it should be much more accepted by producers.

1/27/12

Appendix F

Drinking Water Assessment for the Village of Ottawa

Drinking Water Source Assessment for the Village of Ottawa

Protecting Ohio's Drinking Water Sources

Ohio EPA

SUMMARY

Source Water Assessment and Protection. The following report for the Village of Ottawa was compiled as part of the Source Water Assessment and Protection Program for Ohio. This program is intended to identify drinking water protection areas and provide information on how to reduce the risk of contamination of the waters within those areas. The goal of the program is to ensure the long term availability of abundant and safe drinking water for the present and future citizens of Ohio.

The Safe Drinking Water Act Amendments of 1996 established the national Source Water Assessment and Protection Program, targeting drinking water sources for all public water systems in the United States. A public water system is a facility that provides drinking water to 15 or more service connections or that regularly serves at least 25 people a day for at least 60 days a year, whether from an underground well or spring, or from an above ground stream, lake, or reservoir. The requirement does not address residential wells or cisterns. In Ohio there are approximately 5,800 public water systems.

Background. The Village of Ottawa operates a community public water system that serves a population of approximately 4,200 people. The source is surface water taken from the Blanchard River. The system's treatment capacity is approximately 3.05 million gallons per day, but current average production is about 1.433 million gallons per day.

Protection Areas. The drinking water source protection area for the surface water source is shown in the following figure. This report includes the results of an inventory of all known or identified potential contaminant sources within the drinking water protection area. The inventory was conducted by Ohio EPA with the assistance of Michael Meyer, Superintendent of the Village of Ottawa Water Treatment Plant. Possible threats to the surface water source include agricultural runoff, industrial and commercial sources, home construction, feed lot runoff, unsewered areas, wastewater treatment discharges, combined sewer overflows, pesticide and fertilizer tank farms, transportation related spills, and gas line rupture.

Protective Strategies. The ultimate goal of source water assessment is implementation of protective strategies that will better protect the drinking water source. Strategies for protecting the Blanchard River should include controlling runoff from agricultural areas, establishment of an early warning and emergency response plan for spills, controlling home and commercial septic system discharges from failing systems, and coordination with local emergency response agencies.

The Village of Ottawa and other jurisdictions comprising the protection areas are encouraged to develop a local protection plan to protect the source of drinking water or to update current emergency management plans as applicable. Local watershed planning efforts may already be underway to guide stream restoration and protection activities. These efforts can also serve to benefit the protection of drinking water sources. Guidance on how to form a Drinking Water Protection Team and protection plan is available from Ohio EPA by calling (614) 644-2752.

For More Information. Additional information on protective strategies and how this assessment was completed is included in the detailed Drinking Water Source Assessment Report for the Village of Ottawa.

For information on how to obtain a copy of this report, please visit Ohio EPA's Source Water Assessment and Protection Program Web page at http://www.epa.state.oh.us/ddagw/pdu/swap.html or contact the Village of Ottawa for a copy.

Current information on the quality of the treated water supplied by the Village of Ottawa is available in the Consumer Confidence Report (CCR) for the Village of Ottawa Public Water System. The CCR is distributed annually and reports the most current detected contaminants and any associated health risks from data collected during the past five years. Consumer Confidence Reports are available from the Village of Ottawa.

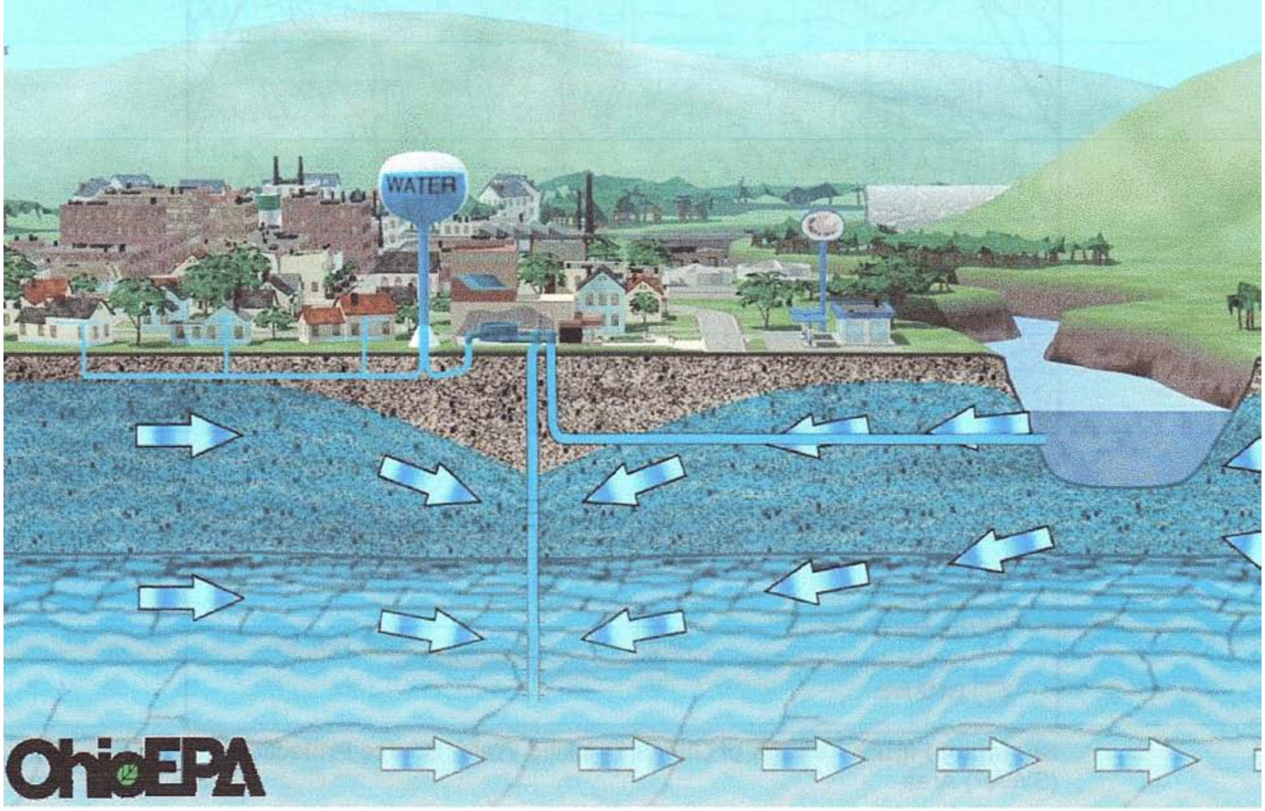
Drinking Water Source Assessment for the Village of Ottawa

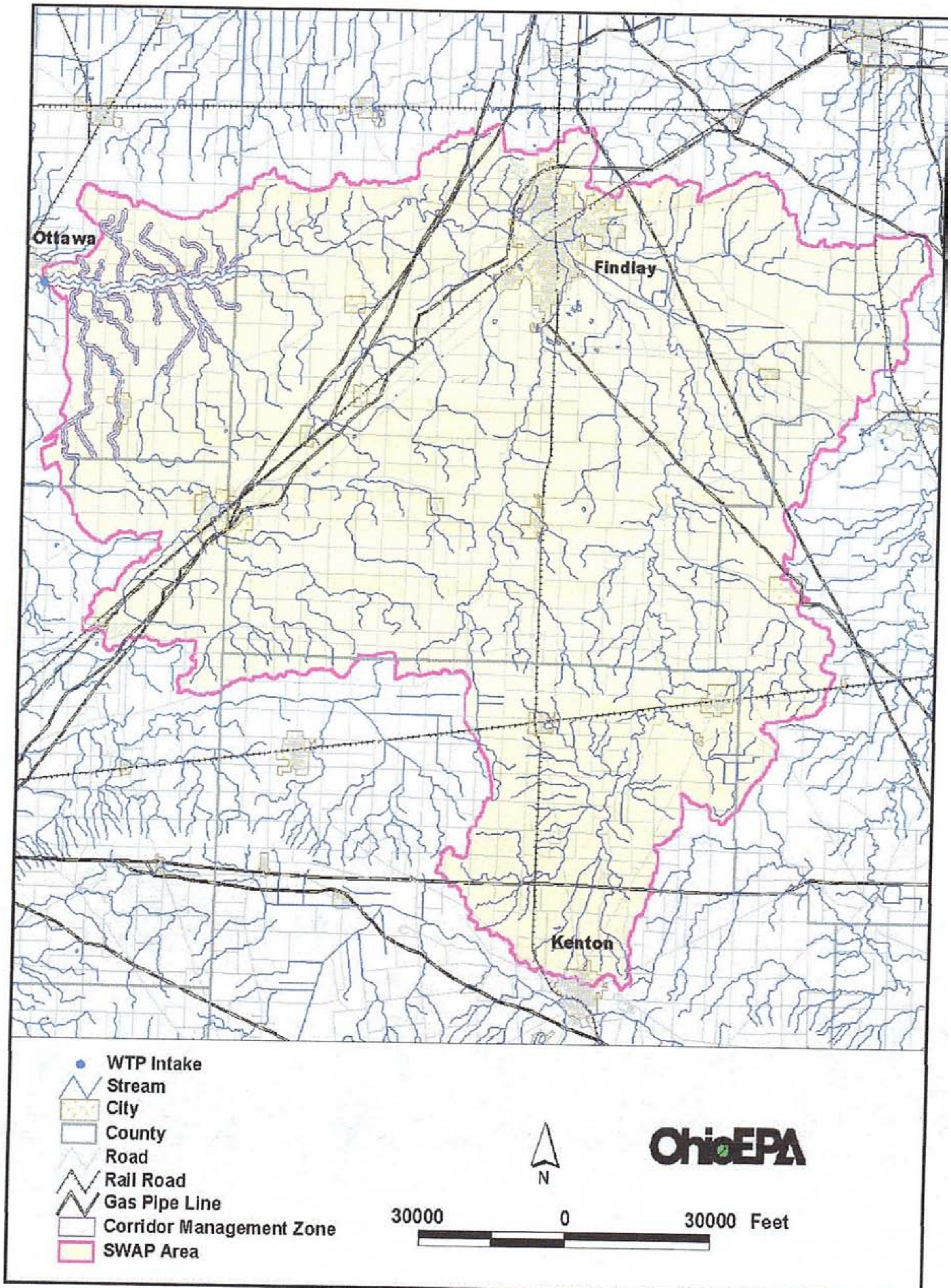
Public Water System # 6900711

Putnam County

Prepared by:
Ohio Environmental Protection Agency
Division of Surface Water
Division of Drinking and Ground Waters
Northwest District Office

November, 2003





Summary Figure - Village of Ottawa Drinking Water Source Protection (SWAP) Area

How to Use this Assessment

Clean and safe drinking water is essential to everyone. Protecting the source of drinking water is a wise and cost effective investment. The purpose of this drinking water source assessment is to provide information your community can use to develop a local Drinking Water Protection Program. The Drinking Water Source Assessment benefits your community by providing the following:

A basis for focusing limited resources within the community to protect the drinking water source(s).

The assessment provides your community with information regarding activities within the Drinking Water Source Protection Area that directly affect your water supply source area. It is within this area that a release of contaminants, from a spill or improper usage may travel through the watershed and reach the surface water intake. By examining where the source waters are most sensitive to contaminants, and where potential contaminants are located, the assessment identifies the potential risks that should be addressed first.

A basis for informed decision-making regarding land use within the community.

The assessment provides your community with a significant amount of information regarding where your drinking water comes from (the source) and what the risks are to the quality of that source. This information allows your community planning authorities to make informed decisions regarding proposed land uses within the protection area that are compatible with both your drinking water resource and the vision of growth embraced by your community.

A start to a comprehensive plan for the watershed and source water area.

This assessment can be the beginning of a comprehensive plan for the water resource, one that addresses all of the uses the water resource provides. An ecologically healthy lake, stream and watershed will provide a stable, high quality resource for drinking water.

For information about developing a local Drinking Water Source Protection Program, please contact the Ohio EPA Division of Drinking and Ground Waters at (614) 644-2752 or visit the Division's web site at http://www.epa.state.oh.us/ddagw/pdu/swap.html.

1.0 INTRODUCTION

The 1996 Amendments to the Safe Drinking Water Act established a program for states to assess the drinking water source for all public water systems. The Source Water Assessment and Protection (SWAP) Program is designed to help Ohio's public water systems protect their sources of drinking water from becoming contaminated.

The purpose of this assessment is to identify where and how the Village of Ottawa's source waters are at risk of contamination. The report

- identifies the drinking water source protection area,
- examines the characteristics of the watershed and the water quality,
- inventories the potential contaminant sources within that area, and discusses the susceptibility of the system to contamination.

Finally, the report suggests actions that the public water supplier and local community may take to reduce the risk of contaminating their source of drinking water and ensure the long term availability of abundant and safe drinking water resources.

Results and recommendations presented in this report are based on the information available at the time of publication. Ohio EPA recognizes that additional information may become available in the future that could be used to more accurately determine the drinking water source protection area. Also, changes in land use may occur after Ohio EPA completes the potential contaminant source inventory. This report should be used as a starting point to develop a plan to protect drinking water resources.

This report was prepared by Dana Martin-Hayden and Janet Hageman, Ohio EPA, Division of Surface Water, Northwest District Office, and Amy Klei, Ohio EPA, Division of Drinking and Ground Waters, Central Office.

2.0 PUBLIC WATER SYSTEM DESCRIPTION

The Village of Ottawa operates a community public water system that serves a population of approximately 4,200 people through 1,695 service connections. A community public water system is a system that regularly supplies drinking water from its own sources to at least 15 service connections used by year-round residents of the area or regularly serves 25 or more people throughout the entire year. The water treatment system obtains its water from the Blanchard River. The system's treatment capacity is approximately 3.05 million gallons per day, but current average production is 1.433 million gallons per day. Water is pumped from the river into an above ground reservoir for storage prior to treatment. The Village of Ottawa's water treatment system consists of coagulation, flocculation, stabilization, fluoridation, lime softening, sedimentation, filtration, and disinfection.

3.0 DRINKING WATER SOURCE PROTECTION AREA

The **Drinking Water Source Protection Area** (protection area) for an inland stream is defined as the drainage area upstream of the point where the water is withdrawn from a surface source such as a stream, lake or reservoir. The protection area is subdivided into corridor and emergency management zones. An illustration of the protection area for the Village of Ottawa Public Water System is shown in Figure 1. Figures 2 and 3 show the corridor management zone and emergency management zone, respectively.

The **Corridor Management Zone, (CMZ)**, is an area along streams and tributaries within the source water assessment area that warrants delineation, inventory, and management. Typically, this zone runs a total of ten miles upstream from the intake, and includes the tributaries that drain into it. The zone is 1,000 feet wide on each side of the Blanchard River mainstem and 500 feet wide on each side of any tributaries.

The **Emergency Management Zone, (EMZ)**, is defined as an area in the immediate vicinity of the surface water intake in which the public water system operator has little or no time to respond to a spill. The boundary of the emergency management zone is delineated in cooperation with the water supplier. Figure 3 shows the boundary of the emergency management zone for the Village of Ottawa Public Water System. The Village of Ottawa's Emergency Management Zone (EMZ) is an area in the immediate vicinity of the Blanchard Riv intake structure and the upland reservoir. This zone is defined as a semi-circle that extends 5C feet upstream and 100 feet downstream of the intake.

The corridor and emergency management zones were the focus of field and windshield survey to inventory potential contaminant sources. Information was also collected during interviews with water treatment plant personnel.

4.0 HYDROLOGIC SETTING

The Blanchard River serves as the surface water source for the Village of Ottawa. The Blanchard River is approximately 91 miles in length with a drainage area of 771 square miles, and flows into the Auglaize River. The water system intake is located slightly more than 28.5 miles from the mouth. The protection area comprises approximately 625 square miles. The average fall of the Blanchard River is 0.9 feet per mile. Annual average precipitation in the protection area is approximately 34 to 35 inches, of which 10 inches become surface runoff.

Figure 4 shows the land use for the protection area. The predominant land use is row crops (76.1%), pasture/hay (14.2%) and deciduous forest (6.0%). The percentage cover for other land uses include: 1.8% residential, 0.7% commercial/industrial/transportation, 0.5% woody wetlands, 0.4% open water, and 0.2% urban/recreational grasses.

Drinking Water Quality Monitoring Summary

Available chemical and biological water quality data collected from the streams in the protectic area, and sampling results from finished water reported to Ohio EPA by the public water supplier were evaluated to characterize water quality. A review of the Village of Ottawa compliance monitoring data (for treated drinking water) from 1991-2002 revealed that the system had no health based or maximum contaminant level (MCL) violations. Table 1 lists contaminants where at least one result was above the level of detection, and does not include all contaminants tested for by the public water system. The table also includes data from the Village of Ottawa's participation in Ohio EPA Pesticide Special Study (1995-1999). Several pesticides (alachlor, atrazine, metolachlor, metribuzin, simazine, cyanazine, and acetochlor) and nitrate have been detected, indicating an impact from local land use activities. Atrazine was detected at levels above the MCL of 3.0 mg/l, but the drinking water standard is based on running annual average of the quarterly sampling and historically the Village of Ottawa has no exceeded the MCL for this contaminant.

It should be recognized that sampling results presented in this report can only provide information on the quality of the water at the time the sample was collected. Water quality ma change over time due to a number of reasons. Therefore, it is recommended that the reader also consult the most recent Consumer Confidence Report (CCR) for the Village of Ottawa public water system. All public water systems are required to annually prepare and distribute the CCR to their customers. The report is a good source of information on health effects associated with detected contaminants and contains information on the community's drinking water, including the source of the water, contaminants detected, the likely sources of detected contaminants, and the potential health effects of contaminants at levels above the drinking water standards.

Biological and Chemical Monitoring in the Blanchard River and its Tributaries
Biological and water quality surveys were conducted on the Blanchard River in 1983, 1989, and 1991, and in Riley Creek in 1983 and 1991. Several of the sites sampled as part of these surveys are within the Ottawa corridor management zone (CMZ). Results of these samples can be obtained from the Ohio EPA, Division of Surface Water.

The two Blanchard River sites, at CR 8 (RM 28.8) and at CR 5-F (RM 35.2), were both in full attainment of the Warmwater Habitat (WWH) aquatic life use designation. On Riley Creek, the most downstream site at CR M (RM 1.8), was also in full attainment of the WWH use. However, Riley Creek at Madison Ave. (RM 7.5) was only partially attaining the WWH use. It should be noted that, although the sites within the CMZ appear to have recovered substantially, the sites on Riley Creek that are upstream of the CMZ (and therefore not included above) were all in non-attainment of the WWH use, and found to be impacted primarily by the discharge from combined sewer overflows (CSOs) and the Bluffton WWTP discharge. Also, the Blanchard River sites upstream of RM 45, that are also outside the CMZ, were only partially attaining the WWH use. The primary impact was the Findlay WWTP discharge. However, water quality should be continuing to improve at these upstream Blanchard River sites due to continued improvements to the Findlay WWTP.

Overall, water quality within the Ottawa CMZ is good, with only sporadic exceedences for the Ohio EPA Water Quality Criteria (OAC 3745-1).

5.0 POTENTIAL CONTAMINANT SOURCES

A review of available regulated facility data bases and a field survey of the corridor management zone indicate that 60 potential contaminant sources are present in the drinking water source protection area. Thirty-five of these sources are within the corridor management zone and none are within the emergency management zone. Table 2 provides a list of the identified potential contaminant sources in the drinking water source protection area. The locations of potential contaminant sources in the protection area are shown in Figure 5. Figures 6 and 7 show the northern and southern sections of the corridor management zone with potential source locations related to the information in Table 2.

It is important to note that this inventory represents *potential* contaminant sources, and includes any source that has the *potential* to release a contaminant to surface or ground waters in the protection area. It is beyond the scope of this study to determine whether any specific potential source is actually releasing a contaminant, or to what extent any potential source(s) may be contributing to the overall pollutant load.

The transportation network is a potential source of contamination through vehicular accidents that release hazardous materials. Approximately 162 miles of roads and 75 miles of rail lines traverse the protection area, creating a total of 1,066 road and 48 rail crossings of the Blanchard River or its tributaries. Approximately 3.6 miles of roads are within 100 feet of a stream. Approximately 102 of the road crossings occur within the corridor management zone.

Figure 8 shows the locations where road and rail lines cross the Blanchard River or tributaries

Extensive petroleum and natural gas production within the protection area and the corridor management zone is also considered a potential source of contamination to surface and grou waters. A total of 5,693 oil/gas wells are located in the Village of Ottawa protection area, of which one is found within the corridor management zone. Figure 8 shows locations where the gas lines cross the Blanchard River and Figure 9 shows the distribution of oil and gas wells in the protection area.

6.0 SUSCEPTIBILITY ANALYSIS

For the purposes of source water assessments, all surface waters are considered to be susceptible to contamination. By their nature surface waters are accessible and can be readil contaminated by chemicals and pathogens, with relatively short travel times from the source t the intake. Based on the information compiled for this assessment, the Village of Ottawa drinking water source protection area is susceptible to agricultural runoff, industrial and commercial sources, home construction, feed lot runoff, unsewered areas, wastewater treatment discharges, combined sewer overflows, junk yard runofff, transportation related spill pesticide and fertilizer tank farms and gas line rupture.

It is important to note that this assessment is based on available data, and therefore may not reflect current conditions in all cases. Water quality, land uses and other activities that are potential sources of contamination may change with time. While the source water for the Villa of Ottawa Public Water System is considered susceptible to contamination, historically, the Village of Ottawa Public Water System has effectively treated this source water to meet drinki water quality standards.

7.0 PROTECTIVE STRATEGIES

Source water protection efforts for Village of Ottawa should focus on controlling agricultural runoff and runoff from cattle grazing pastures; with particular attention to sources of pesticides nitrates, phosphorus, and microorganisms such as fecal coliform bacteria. This can be accomplished via educational efforts. County extension agents are an excellent resource for assisting the agricultural community with controlling agricultural runoff, and staff from local an county health offices can instruct homeowners in proper maintenance of their septic systems.

Other source water protection efforts may include:

Education and Outreach: Informing people who live, work, or own property within the protection area about the benefits of drinking water protection is very important. Although son communities develop their own educational outreach resources, assistance is available at no cost from various agencies. For example, staff from Ohio EPA's Office of Pollution Preventior can visit businesses (free of charge) and provide recommendations on how they can modify their processes, materials and practices to generate less pollution in a cost-effective and technically feasible manner. An effort should be made to educate homeowners and business of the potential threat their activities can pose to the water supply. Education could also focus on increasing public awareness of illegal dumping and drinking water protection.

Coordination with Existing Activities: Many local groups are engaged in programs that complement a public water system's drinking water source protection efforts. Working with groups such as the Natural Resources Conservation Service, the Soil and Water Conservatio

District, the Ohio Farm Bureau, or a local watershed planning organization ensures coordination of their respective programs.

Oil and Gas Production: Provide education (material/meetings) to owners and land owners on proper operation and maintenance. Develop an early warning system for accidental spills and releases.

Agricultural Activities: Provide education to local farmers on the use of best management practices to reduce agricultural and animal feedlot runoff, use of proper manure handling facilities, proper handling and road safety with agricultural chemicals, and other methods to control or reduce impacts to surface waters.

Transportation Routes: There is a potential for spills along roads within the protection area. The Village of Ottawa may want to consider contacting the local fire department and local emergency planning agency about the location of the drinking water source protection area, so that strategies can be developed to prevent spilled materials from impacting the Blanchard River.

Emergency Response Planning: The Village of Ottawa should prepare a plan that includes early warning of spills and coordination of response and remediation activities for spills that may enter the Blanchard River. This plan should include emergency response actions for the Blanchard River, such as the placement of absorbent booms to control oil spills, or the ability to mechanically add oxygen to oxidize chemicals with a high oxygen demand. Different response plans could be developed for different types of contamination. The emergency response plan may also contain strategies for dealing with unexpected levels of runoff containing chemicals such as fertilizers and pesticides from adjacent land uses. Though it may be less catastrophic than a major spill, this kind of contamination is more prevalent and is harder to detect and contain.

Water Quality Monitoring: Monitoring does not directly prevent contamination, but the protection plan will be more effective if the Village of Ottawa conducts periodic monitoring of raw water quality and quantity from the Blanchard River. For example, monitoring data can be used to (1) determine optimal conditions or seasons for pumping water to the reservoir; (2) estimate time-of-travel for a chemical to reach the water treatment intake from various locations in the Blanchard River; (3) track water quality trends; and (4) evaluate the effectiveness of selected protective strategies. Sampling locations and schedules could be modified on an emergency basis to monitor spills or the runoff of contaminants that may enter the reservoir.

Zoning Ordinances: A water protection zoning ordinance is a regulatory control that typically places some restrictions or standards on activities conducted within a specified zone (such as the corridor management zone and/or the emergency management zone). Such ordinances enable the municipality to require people who live or work in this area to avoid contaminating the source of the municipality's drinking water. Ordinances can help ensure best management practices are being employed at local businesses and can help reduce the volume of contaminants stored within the protection area. The Village of Ottawa may want to consider working with the counties, townships, and municipalities in the protection area to develop zoning overlays that require specific standards for chemical storage, handling of waste materials, and other source control strategies. Several communities in Ohio have enacted very successful drinking water source protection ordinances. Copies can be obtained by contacting Craig Smith at (614) 644-2752.

Regulatory Compliance: Where possible, the Village of Ottawa can monitor the compliance of potential contaminant sources with existing regulations through inspections and/or contact with regulatory agencies. If routine inspections are a regulatory requirement, they provide an excellent opportunity to educate an important segment of the community about the importance of drinking water source protection. Inspections also provide an opportunity to encourage improved materials handling procedures, hazardous materials training, waste and disposal assessments, facility spill/contingency planning, and pollution prevention initiatives.

Ohio EPA encourages the Village of Ottawa to incorporate the types of protective strategies listed above into a written drinking water source protection plan. It is also highly recommended that the City form a "Protection Team" to develop the plan. Two guidance documents are available from Ohio EPA to assist with development of a Drinking Water Source Protection Plan *A Guide to Developing Local Watershed Action Plans in Ohio* is available on the internet at www.epa.state.oh.us/dsw/hps/wsguide.pdf and *Developing Local Drinking Water Source Protection Plans in Ohio* is available at www.epa.state.oh.us/ddagw/pdu/swap_psdoc.pdf. For more information on drinking water source protection, please contact the Drinking Water Protection staff at (614) 644-2752.

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Ohio EPA. 1990. 1989 Biological and Water Quality Study of the Blanchard River near Findlay, Ohio and Comparison of Results: 1983 to 1989.

Ohio EPA. 1983. NWDO Division of Surface Water Monitoring Data.

Table 1. Water Quality Monitoring Summary of Treated Water Village of Ottawa Public Water System

Ohio EPA Public Water System Compliance Monitoring Database (1991- 2002) Ohio EPA Pesticide Special Study (May 1995 - March 1999)

Contaminant (units)	Levels Found	Primary MCL	MCL Violation[1]	Typical Source
Inorganic Contaminants				
Barium (mg/l)	0.013 - 0.033	2	No	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
Fluoride (mg/l)	0.93 - 1.67	4	No	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories
Nitrate (mg/l)	0.65 - 6.76	10	No	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
Phosphorus (mg/l)	0.03 - 0.25	none	NA	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits; Discharge of industrial waste
Sulfate (mg/l)	99.0 - 127.0	none	NA[2]	Erosion of natural deposits; decomposition product of organic matter; discharge from mining and industrial waters; detergents in sewage; component of precipitation in metropolitan areas
Radioactive Contaminants				
Beta/photon emitters (pCi/L)	4.0 - 8.0	AL=50	No	Decay of natural and man-made deposits
Synthetic Organic Contaminants including Pesticides and Herbicides				
Alachlor [3] (µg/l)	0.07 - 0.63	2	No	Herbicide runoff
Atrazine [3] (µg/l)	0.25 - 3.57	3	No	Herbicide runoff
Metolachlor [3] (µg/l)	0.19 - 2.47	none	NA	Pesticide runoff
Metribuzin [3] (µg/l)	0.05 - 0.15	none	NA	Pesticide runoff
Simazine [3] (µg/l)	0.07 - 3.52	4	No	Herbicide runoff
Cyanazine [3] (µg/l)	0.07 - 1.46	none	NA	Pesticide runoff
Acetochlor [3] (µg/l)	0.22 - 0.39	none	NA	Herbicide runoff
Volatile Organic Contaminants				
Xylenes (mg/l)	0.9 - 2.3	10	No	Discharge from petroleum factories; Discharge from chemical factories
TTHMs [Total Trihalomethanes] (µg/l)	31.3 - 111.0	80	No[4]	By-product of drinking water chlorination
Bromodichloromethane (µg/l)	7.2 -32.8	none	NA[4]	By-product of drinking water chlorination
Chloroform (µg/l)	14.7 - 99.7	none	NA[4]	By-product of drinking water chlorination
Bromoform (µg/l)	0.7 - 19.7	none	NA[4]	By-product of drinking water chlorination
Dibromochloromethane (µg/l)	3.0 - 15.2	none	NA[4]	By-product of drinking water chlorination
Dibromoacetic Acid (µg/l)	1.2 - 1.4	none	NA[4]	By-product of drinking water chlorination

Table 1. Water Quality Monitoring Summary of Treated Water
Village of Ottawa Public Water System

Ohio EPA Public Water System Compliance Monitoring Database (1991- 2002)
Ohio EPA Pesticide Special Study (May 1995 - March 1999)

Contaminant (units)	Levels Found	Primary MCL	MCL Violation[1]	Typical Source
Dichloroacetic Acid (µg/l)	8.6 - 16.8	none	NA[4]	By-product of drinking water chlorination
Trichloroacetic Acid (µg/l)	3.0 - 6.0	none	NA[4]	By-product of drinking water chlorination
Monochloroacetic Acid (µg/l)	3.3 - 4.4	none	NA[4]	By-product of drinking water chlorination

MCL = Maximum Contaminant Level (AL = Action Level).

[1] MCL set by federal or state drinking water standards. **A sampling result that exceeds the MCL value does not necessarily indicate a violation by the public water system.** MCL violations for many contaminants are based on a running annual average.

[2] Secondary Maximum Contaminant Level (SMCL) for this parameter. SMCLs are non-health-related limits.

[3] Data includes Ohio EPA Pesticide Special Study results (1995-1999). For the study, samples were analyzed using an immunoassay (IA) method and by USEPA Method 507, a gas chromatograph (GC) method. The immunoassay results are only estimations of the actual concentration values. The IA test kits tend to overestimate concentrations, due to cross reactivity of chemically similar pesticides (e.g. atrazine and simazine).

[4] Total Trihalomethanes (TTHMs): (MCL = 80 µg/l) calculated as the sum of the concentrations of Bromodichloromethane, Dibromochloromethane, Bromoform, and Chloroform. Five Haloacetic Acids (HAA5): (MCL = 60 µg/l) calculated as the sum of the concentrations of Monochloroacetic acid, Dichloroacetic acid, Trichloroacetic acid, Monobromoacetic acid, and Dibromoacetic acid.

Table 2. Potential Contaminant Source Inventory for the Village of Ottawa Drinking Water Source Protection Area
(Map ID corresponds to Figures 6 and 7)

Map ID	Unique ID	Type	Source
2 3	LUST692078600 OHD986977403	Automotive Body Shop	BUSTR: LUST Database (geocoded) US EPA Envirofacts (RCRIS)
4	LUST693039500	Commercial (Trucking)	BUSTR: LUST Database (geocoded)
5	OHD987044807	Industrial	US EPA Envirofacts (RCRIS)
6	CEM0740	Cemetery	USGS Geonames
7	CEM0896	Cemetery	USGS Geonames
8	LAN0455	Inactive/Closed Landfill	OEPA Landfill GIS Layer
9	CEM1797	Cemetery	USGS Geonames
10	CEM1955	Cemetery	USGS Geonames
11	ADD690091223	Commercial (?)	field survey
14 19	369-1388 OHD005054366	Industrial	Ohio EPA-DERR MSL GIS layer US EPA Envirofacts (TRIS/RCRIS/SSTS)
20	OHD987040060	Commercial (Agricultural)	US EPA Envirofacts (SSTS)
21	LUST691098401	Dry Cleaner	BUSTR: LUST Database (geocoded)
23 32	SIM2307 000008040908	Municipal Wastewater Treatment Plant (NPDES Discharge)	OEPA-DSW Surface Impoundment GIS Layer, US EPA Envirofacts (PCS)
24	CEM3265	Cemetery	USGS Geonames
27 28	LUST696012200 LUST696012201	Industrial	BUSTR: LUST Database (geocoded)
29	CEM3596	Cemetery	USGS Geonames
33	OHD986970309	Stone Quarry	US EPA Envirofacts (AFS)
39	ADD690091226	Auto Repair Shops/Body Shops	field survey
40	ADD690091225	Auto Repair Shops/Body Shops	field survey
41	ADD690091224	Mobile Home Park	field survey
49	D6900711049	Agricultural (Pesticide/fertilizer/petroleum storage)	field survey
49	D6900711049	Agricultural (Farm chemical distributor)	field survey
53	D6900711053	Wastewater treatment plant (Mobile Home Park)	field survey
64	D6900711064	Junk yards (scrap and auto)	field survey
65	D6900711065	Residence w/Above Ground Storage Tanks	field survey
66	D6900711066	Residence w/Above Ground Storage Tanks	field survey
67	D6900711067	Residence w/Above Ground Storage Tanks	field survey
68	D6900711068	Residence w/Above Ground Storage Tanks	field survey
71	D6900711071	Stone Quarry (NPDES Discharge)	field survey
72	D6900711072	Farm (Pesticide/fertilizer/petroleum storage)	field survey

Table 2. Potential Contaminant Source Inventory for the Village of Ottawa Drinking Water Source Protection Area
(Map ID corresponds to Figures 6 and 7)

Map ID	Unique ID	Type	Source
76	D6900711076	Farm (Above Ground Storage Tanks)	field survey
78	D6900711078	Junk yards (scrap and auto)	field survey
79	D6900711079	Residence w/Above Ground Storage Tanks	field survey
80	D6900711080	Farm w/Above Ground Storage Tanks and Animal feedlots	field survey
84	D6900711084	Farm w/Junk yards (scrap and auto)	field survey
85	D6900711085	Migrant Labor Camp w/Above Ground Storage Tanks	field survey
86	D6900711086	Junk yards (scrap and auto)	field survey
87	D6900711087	Farm w/Animal feedlots and Above Ground Storage Tanks	field survey
91 92 93	ADD690091228 ADD690091227 ADD690091231	Commercial (Agricultural/Farm Chemical Distributor w/Above Ground Storage Tanks)	field survey
94	D6900711094	Combined Sewer overflows	field survey
95	D6900711095	Combined Sewer overflows	field survey
96	D6900711096	Combined Sewer overflows	field survey
97	D6900711097	Combined Sewer overflows	field survey
98	D6900711098	Combined Sewer overflows	field survey
99	D6900711099	Combined Sewer overflows	field survey
100	D69007110100	Combined Sewer overflows	field survey
101	ADD690091216 ADD690091217	Industrial (Machine/metalworking shops and metal finishing/plating)	field survey
102	ADD690091229	Medical/dental offices/clinics	field survey
103	ADD690091233	Funeral Home	field survey
104	ADD690091222	Food Processor	field survey
105	ADD690091218	Auto Dealer	field survey
106	ADD690091230	Hardware/lumber/parts stores	field survey
107	ADD690091221 ADD690091220	Industrial (Petroleum product production and storage)	field survey
108	ADD690091232	Barber and beauty shops	field survey
109	ADD690091215	Gas station	field survey

Database Explanation

AFS — Airborne Emissions (AIRS) Facilities report releases of pollutants into the air. Airborne pollutants can be deposited in surface waters.

PCS — Facilities that hold a National Pollutant Discharge Elimination System (NPDES) permit. The NPDES permit program controls water pollution by regulating point sources such as pipes or man-made ditches that discharge pollutants into waters of the United States.

RCRIS — Facilities regulated by U.S. EPA under the Resource Conservation and Recovery Act (RCRA) as hazardous waste generators or handlers. These types of facilities may be associated with potential releases of hazardous materials.

Table 2 - Continued

SSTS	Facilities that produce pesticide, active ingredients, and devices. These types of facilities may be associated with potential releases of pesticides or other hazardous materials.
TRIS	Toxics Release Inventory (TRI) facilities are industrial facilities that manufacture, process, or import any of over 300 listed toxic chemicals that are released directly into the air, water, or land, or are transported off-site.
MSL	Sites that have been investigated by or are under investigation by Ohio EPA's Division of Emergency and Remedial Response. These types of facilities may be associated with soil, ground water, and surface water contamination from releases of hazardous materials.
LUST	Facilities that have reported a leaking underground storage tank (LUSTs) to Ohio's Bureau of Underground Storage Tank Regulations (BUSTR). Leaking underground storage tanks have been associated with soil and water contamination related to leaks and spills of gasoline and other petroleum products. Unused underground storage tanks may be used for the improper disposal of wastes.

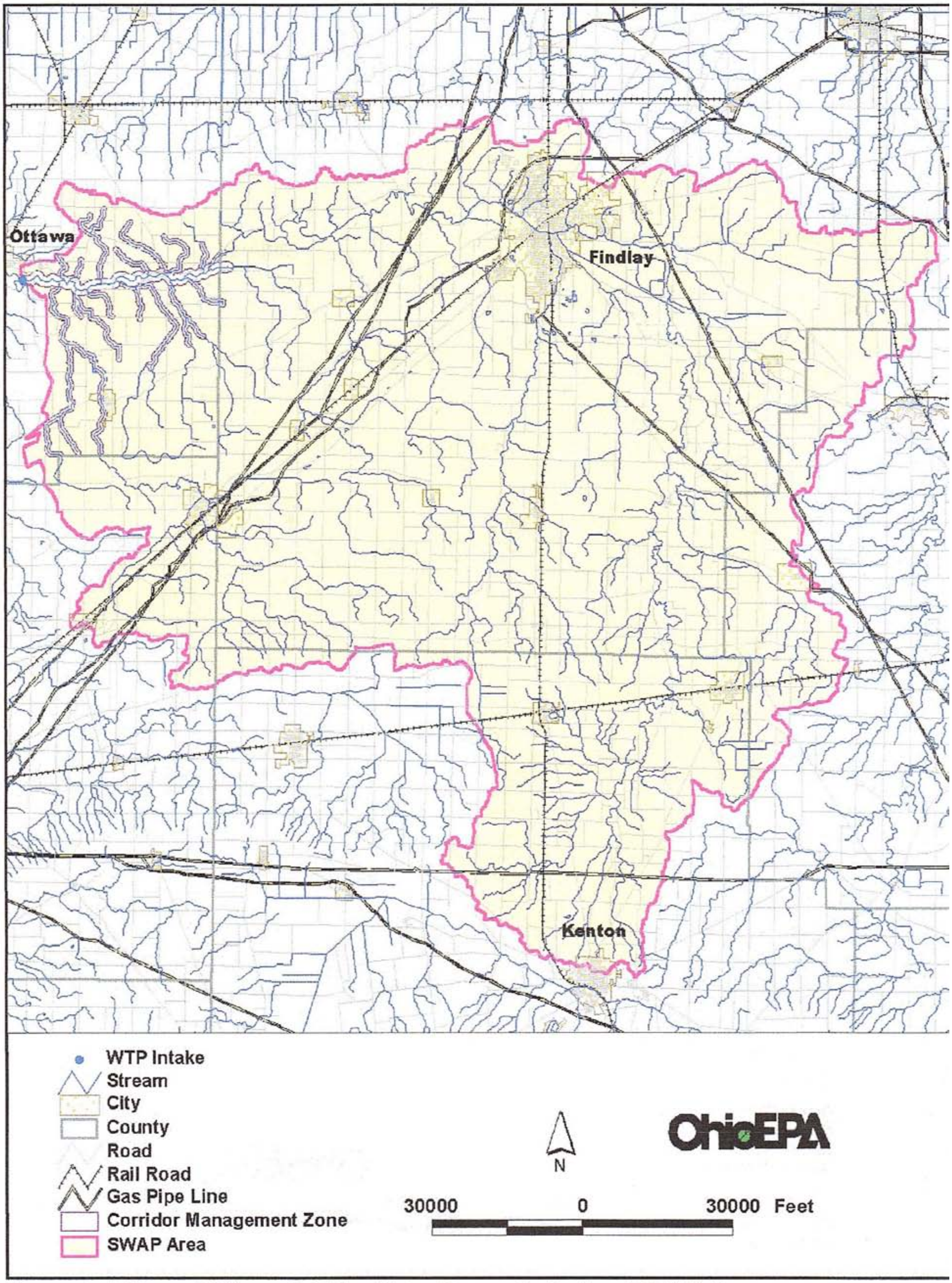

Figure 1 - Village of Ottawa Drinking Water Source Protection (SWAP) Area

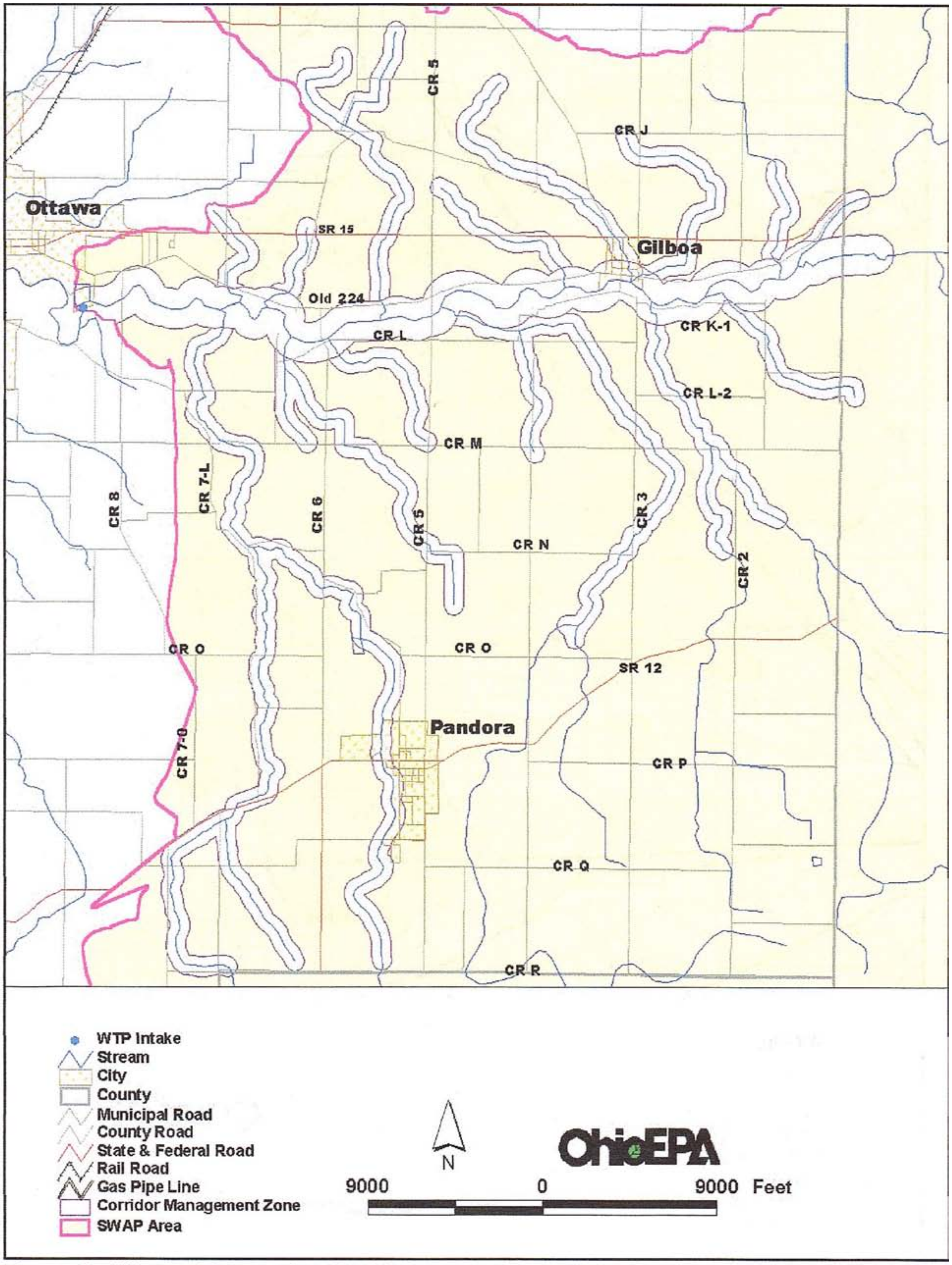

Figure 2 - Village of Ottawa Corridor Management Zone (CMZ)

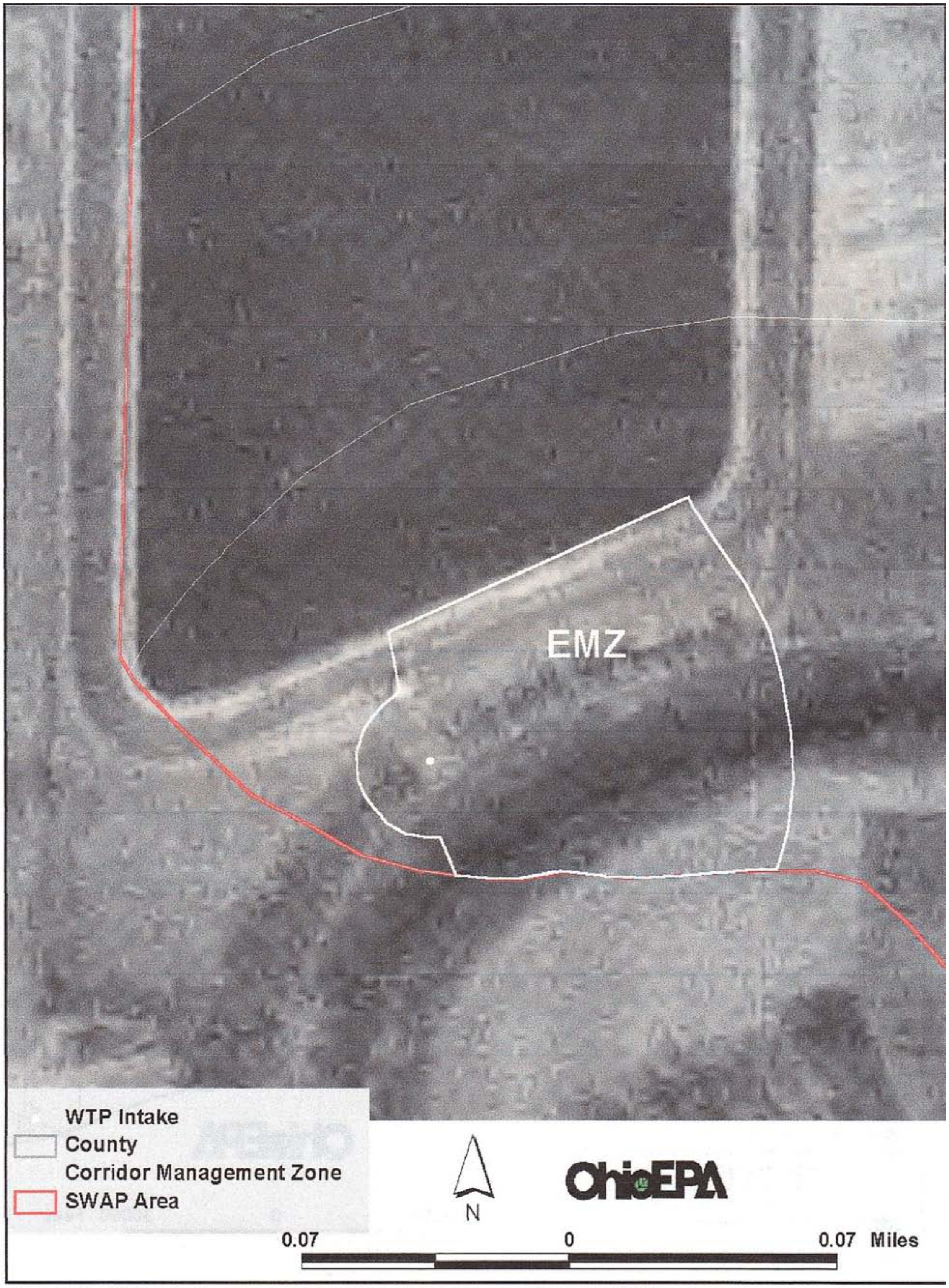

Figure 3 - Village of Ottawa Emergency Management Zone (EMZ)

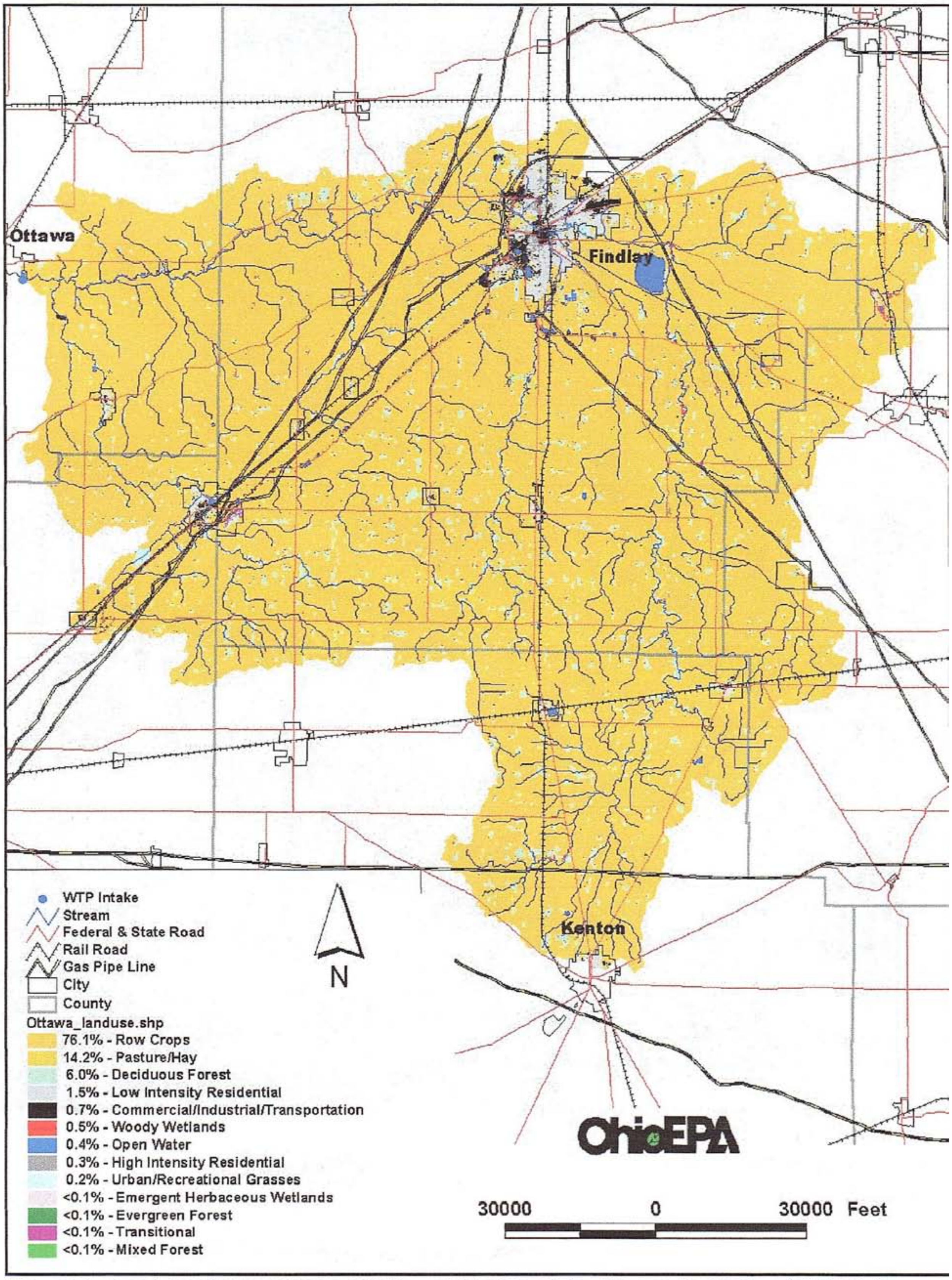

Figure 4 - Land Use in the Village of Ottawa Drinking Water Source Protection (SWAP) Area

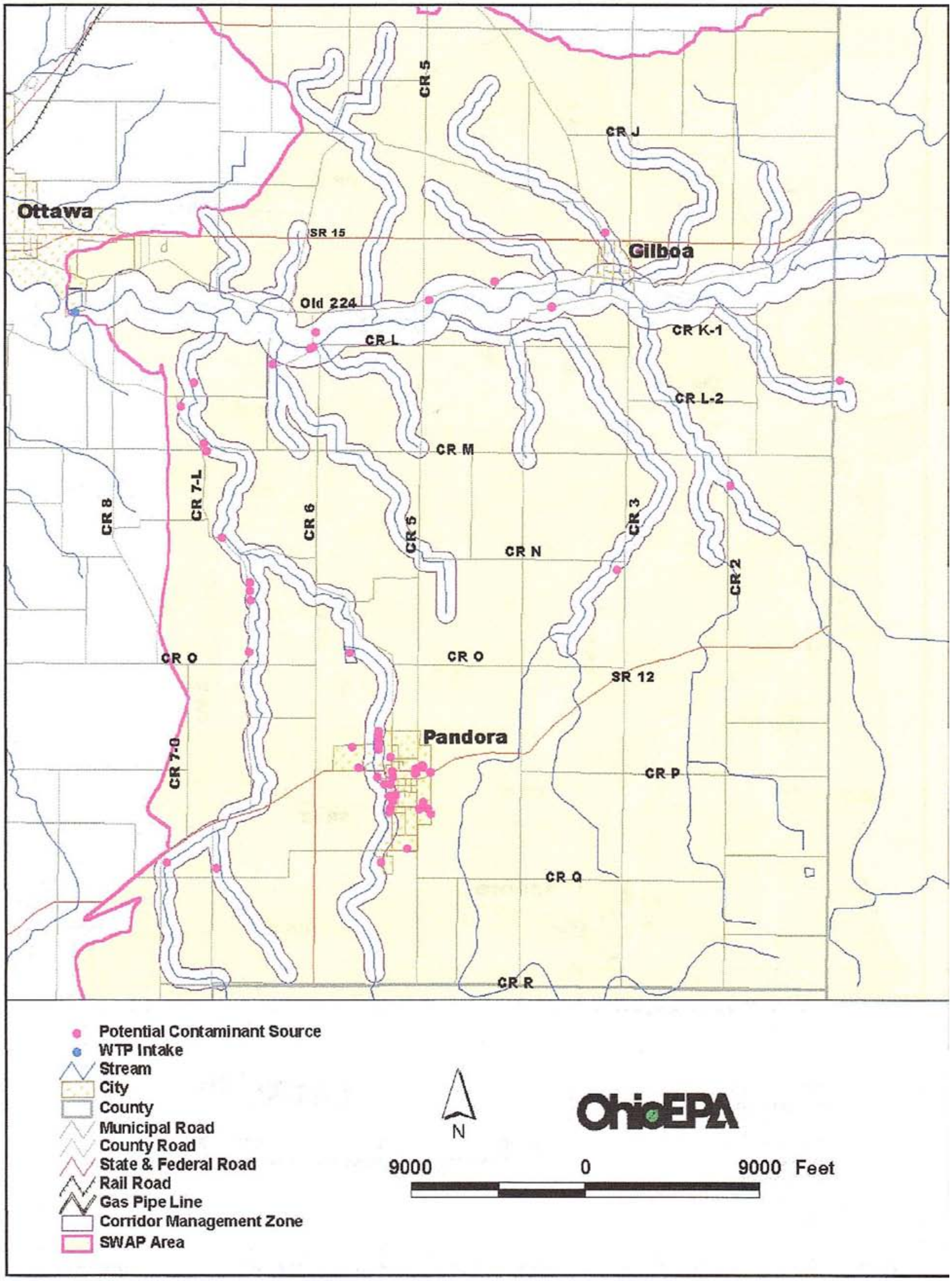

Figure 5 - Potential Contaminant Sources in the Village of Ottawa Corridor Management Zone

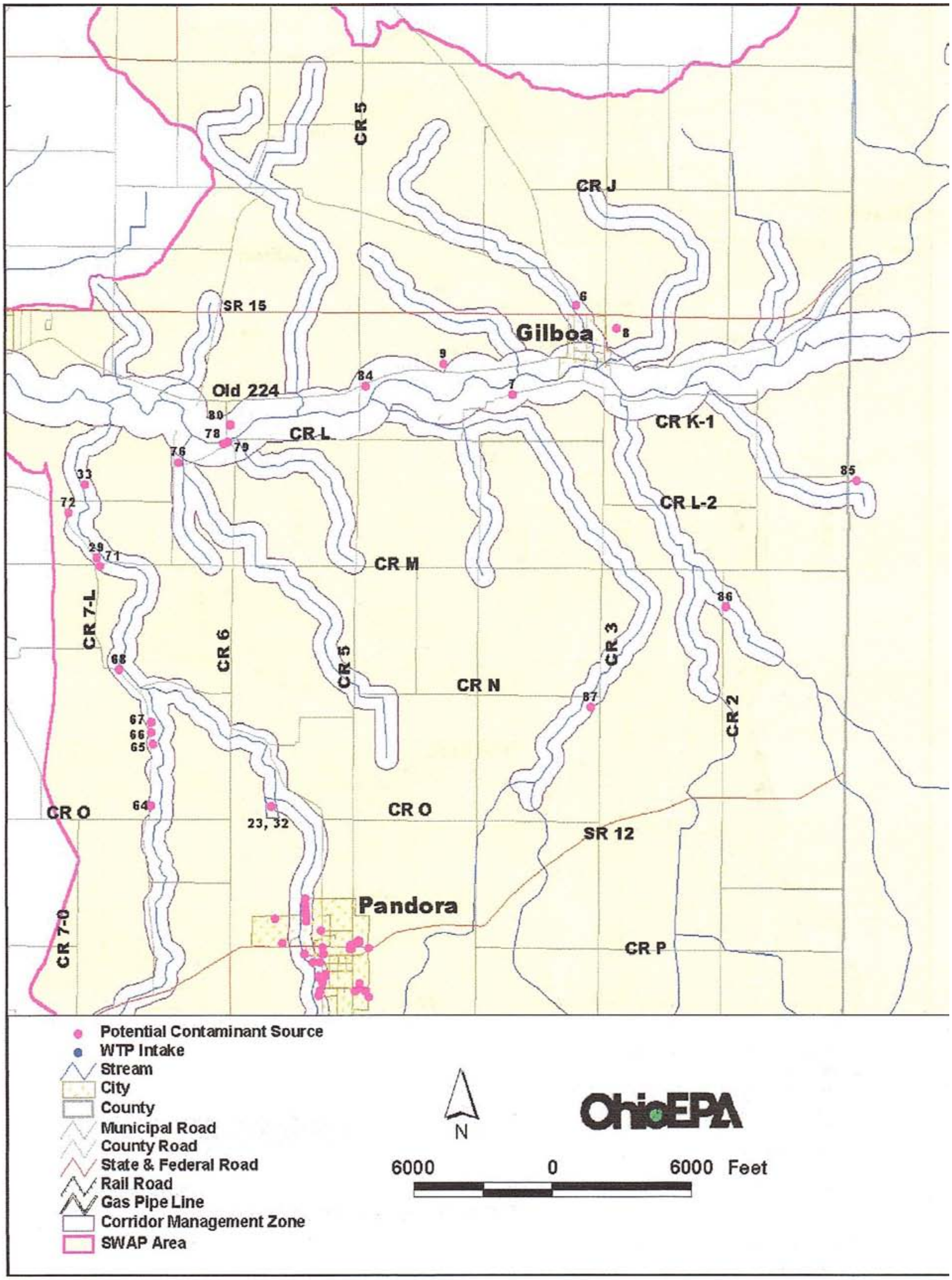

Figure 6 - Potential Contaminant Sources in the Village of Ottawa Corridor Management Zone (Detailed Northern Section)

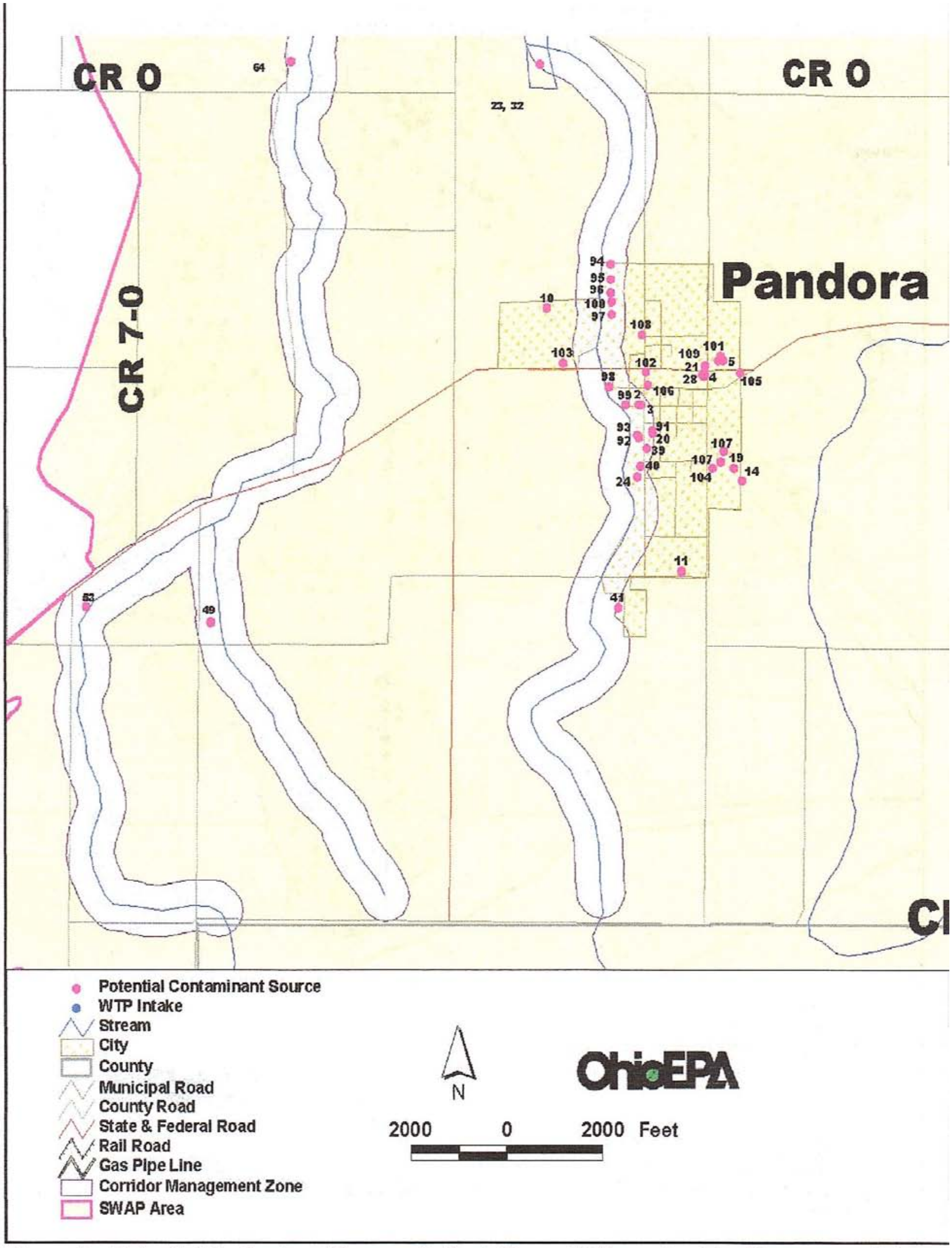

Figure 7 - Potential Contaminant Sources in the Village of Ottawa Corridor Management Zone (Detailed Southern Section)

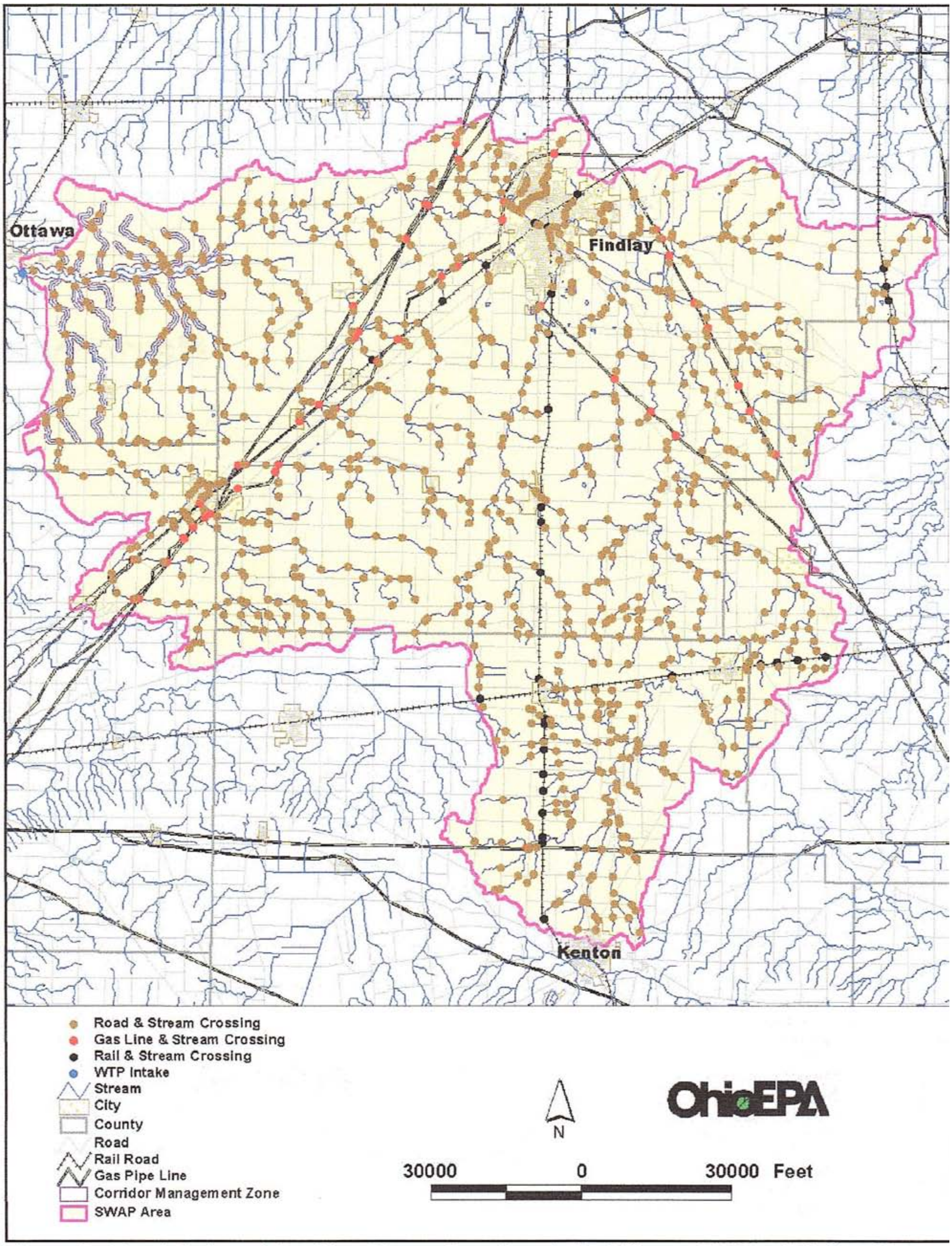

Figure 8 - Road, Rail, and Gas Line Stream Crossings in the Village of Ottawa Drinking Water Source Protection (SWAP) Area

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Appendix G

Coastal Nonpoint Pollution Control Management Plan - Ohio

August 2006

GUIDANCE FOR WATERSHED PROJECTS TO ADDRESS OHIO'S COASTAL NONPOINT POLLUTION CONTROL PROGRAM (CNPCP)

A brief history of the Coastal Nonpoint Pollution Control Program

In recognition of the intense pressures facing our nation's coastal regions, Congress enacted the Coastal Zone Management Act (CZMA) which was signed into law on October 27, 1972. To address more specifically the impact of nonpoint source pollution on coastal water quality, Congress enacted section 6217 of the Coastal Zone Act in November 1990. Section 6217 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 conjunction with other State and local authorities."

To gain Federal approval, each state CNPCP must provide for the implementation, at a minimum, of management measures in conformance with those specified in the USEPA guidance published under subsection (g) of section 6217.

Status of Ohio's Coastal Nonpoint Pollution Control Program (CNPCP)

(November 24, 2003)

The Ohio CNPCP is administered by the ODNR Division of Soil and Water Conservation. Ohio received conditional approval of the CNPCP on June 4, 2002.

Year One Conditions

Ohio was provided one year to submit a legal opinion verifying that Ohio "has in place back-up authorities that can be used as enforceable policies and mechanisms in order to prevent nonpoint source based pollution and require management measure implementation." The legal opinion was developed by John Shailer, Assistant Attorney General - Environmental Enforcement Section/ODNR, and submitted by ODNR Office of Coastal Management to NOAA and USEPA June 4, 2003. The one-year conditions have been met.

Year Two Conditions

There are specific conditions that will need to be met for Ohio to receive final approval of its CNPCP. These conditions are organized by the major nonpoint source categories and subcategories. **These can be found on page 8 of the Appendix 8 update - outline of a watershed plan from "A guide to Developing Local Watershed Action Plans in Ohio."**

<u>NPS Management Measures that need addressed by Lake Erie Basin Watersheds</u>

This area includes the entire Lake Erie Watershed, which includes portions of 35 counties and covers an area of 11,649 square miles. **The major sub-watersheds, or streams within the Lake Erie watershed include the Maumee, Portage, Sandusky, Huron, Vermillion, Black, Rocky, Chagrin, Cuyahoga, Grand and Ashtabula.** Watershed plans within the Ohio Lake Erie Basin must (others are strongly encouraged) describe how the following **Management Measures** of the Ohio Coastal Nonpoint Pollution Control Program will be implemented within the specific watershed, if watershed inventory or sources and causes of impairment indicate applicability.

Management Measures (Defined)

Management measures are defined in section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) as economically achievable measures to control the addition of pollutants to our coastal waters, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives.

Management Practices (Defined)

In addition to specifying management measures, this chapter also lists and describes management practices for illustrative purposes only. While State programs are required to specify management measures in conformity with this guidance, State programs need not specify or require the implementation of the particular management practices described in this document. However, as a practical matter, EPA anticipates that the management measures generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices listed in this document have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measures. EPA has also used some of these practices, or appropriate combinations of these practices, as a basis for estimating the effectiveness, costs, and economic impact of achieving the management measures. (Economic impact of the management measures are addressed in a separate document entitled *Economic Impacts of EPA Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*.)

EPA recognizes that there is often site-specific, regional, and national variability in the selection of appropriate practices, as well as in the design constraints and pollution control effectiveness of practices. The list of practices for each management measure is not all-inclusive and does not preclude States or local agencies from using other technically sound practices. In all cases, however, the practice or set of practices chosen by a State needs to achieve the management measure.

URBAN

New Development Management Measure - This management measure is intended to accomplish the following: (1) decrease the erosive potential of increased runoff volumes and velocities associated with development-induced changes in hydrology; (2) remove suspended solids and associated pollutants entrained in runoff that result from activities occurring during and after development; (3) retain hydrological conditions to closely resemble those of the predisturbance condition; and (4) preserve natural systems including in-stream habitat. For the purposes of this management measure, "similar" is defined as "resembling though not completely identical."

During the development process, both the existing landscape and hydrology can be significantly altered. As development occurs, the following changes to the land may occur (USEPA, 1977):

- Soil porosity decreases;
- Impermeable surfaces increase;
- Channels and conveyances are constructed;
- Slopes increase;
- Vegetative cover decreases; and
- Surface roughness decreases.

These changes result in increased runoff volume and velocities, which may lead to increased erosion of streambanks, steep slopes, and unvegetated areas (Novotny, 1991). In addition, destruction of in-stream and riparian habitat, increases in water temperature (Schueler et al., 1992), streambed scouring, and downstream siltation of streambed substrate, riparian areas, estuarine habitat, and reef systems may occur. An example of predicted effects of increased levels of urbanization on runoff volumes is presented in Table 4-4 (USDA-SCS, 1986). Methods are also available to compute peak runoff rates (USDA-SCS, 1986).

1. By design or performance:

- After construction has been completed and the site is permanently stabilized, reduce the average annual total suspended solid (TSS) loadings by 80 percent. For the purposes of this measure, an 80 percent TSS reduction is to be determined on an average annual basis, or
- Reduce the postdevelopment loadings of TSS so that the average annual TSS loadings are no greater than predevelopment loadings, and

2. To the extent practicable, maintain postdevelopment peak runoff rate and average volume at levels that are similar to predevelopment levels.

Sound watershed management requires that both structural and nonstructural measures be employed to mitigate the adverse impacts of storm water. Nonstructural Management Measures II.B and II.C can be effectively used in conjunction with Management Measure II.A to reduce both the short- and long-term costs of meeting the treatment goals of this management measure.

Applicability

This management measure is intended to be applied by States to control urban runoff and treat associated pollutants generated from new development, redevelopment, and new and relocated roads, highways, and bridges. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal nonpoint source (NPS) programs in conformity with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

For design purposes, postdevelopment peak runoff rate and average volume should be based on the 2-year/24-hour storm. **Areas under Stormwater Phase II permit requirements are exempt.**
http://www.epa.gov/owow/nps/MMGI/Chapter4/ch4-2a.html

Watershed Protection Management Measure - The purpose of this management measure is to reduce the generation of nonpoint 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.

A watershed is a geographic region where water drains into a particular receiving waterbody. As discussed in the introduction, comprehensive planning is an effective nonstructural tool available to control nonpoint source pollution. Where possible, growth should be directed toward areas where it can be sustained with a minimal impact on the natural environment (Meeks, 1990). Poorly planned growth and development have the potential to degrade and destroy entire natural drainage systems and surface waters (Mantel et al., 1990). Defined land use designations and zoning direct development away from areas where land disturbance activities or pollutant loadings from subsequent development would severely impact surface waters. Defined land use designations and zoning also protect environmentally sensitive areas such as riparian areas, wetlands, and vegetative buffers that serve as filters and trap sediments, nutrients, and chemical pollutants. Refer to Chapter 7 for a thorough description of the benefits of wetlands and vegetative buffers.

Areas such as streamside buffers and wetlands may also have the added benefit of providing long-term pollutant removal capabilities without the comparatively high costs usually associated with structural controls. Conservation or preservation of these areas is important to water quality protection. Land acquisition programs help to preserve areas critical to maintaining surface water quality. Buffer strips along streambanks provide protection for stream ecosystems and help to stabilize the stream and prevent streambank erosion (Holler, 1989). Buffer strips protect and maintain near-stream vegetation that attenuates the release of sediment into stream channels and prevent excessive loadings. Levels of suspended solids increase at a slower rate in stream channel sections with well-developed riparian vegetation (Holler, 1989).

The availability of infrastructure, specifically sewage treatment facilities, is also a factor in watershed planning. If centralized sewage treatment is not available, onsite disposal systems (OSDS) most likely will be used for sewage treatment. Because of potential ground-water and surface-water contamination from OSDS, density restrictions may be needed in areas where OSDS will be used for sewage treatment. Section VI of this chapter contains a more detailed discussion of siting densities for OSDS.

Develop a watershed protection program to:

1. Avoid conversion, to the extent practicable, of areas that are particularly susceptible to erosion and sediment loss;
2. Preserve areas that provide important water quality benefits and/or are necessary to maintain riparian and aquatic biota; and
3. Site development, including roads, highways, and bridges, to protect to the extent practicable the natural integrity of waterbodies and natural drainage systems.

Applicability

This management measure is intended to be applied by States to new development or redevelopment including construction of new and relocated roads, highways, and bridges that generate nonpoint source pollutants. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal nonpoint source programs in conformity with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.
http://www.epa.gov/owow/nps/MMGI/Chapter4/ch4-2b.html

Site Development- The goal of this management measure is to reduce the generation of nonpoint source pollution and to mitigate the impacts of urban runoff and associated pollutants from all site development, including activities associated with roads, highways, and bridges. Management Measure II.C is intended to provide guidance for controlling nonpoint source pollution through the proper design and development of individual sites. This management measure differs from Management Measure II.A, which applies to post development runoff, in that Management Measure II.C is intended to provide controls and policies that are to be applied during the site planning and review process. These controls and policies are necessary to ensure that development occurs so that nonpoint source concerns are incorporated during the site selection and the project design and review phases. While the goals of the Watershed Protection Management Measure (II.B) are similar, Management Measure II.C is intended to apply to individual sites rather than watershed basins or regional drainage basins. The goals of both the Site Development and Watershed Protection Management Measures are, however, intended to be complementary and the measures should be used within a comprehensive framework to reduce nonpoint source pollution.

Plan, design, and develop sites to:

1. Protect areas that provide important water quality benefits and/or are particularly susceptible to erosion and sediment loss;
2. Limit increases of impervious areas, except where necessary;
3. Limit land disturbance activities such as clearing and grading, and cut and fill to reduce erosion and sediment loss; and
4. Limit disturbance of natural drainage features and vegetation.

Applicability

This management measure is intended to be applied by States to all site development activities including those associated with roads, highways, and bridges. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. http://www.epa.gov/owow/nps/MMGI/Chapter4/ch4-2c.html

Existing Development Management- The purpose of this management measure is to protect or improve surface water quality by the development and implementation of watershed management programs that pursue the following objectives:

1. Reduce surface water runoff pollution loadings from areas where development has already occurred;
2. Limit surface water runoff volumes in order to minimize sediment loadings resulting from the erosion of streambanks and other natural conveyance systems; and
3. Preserve, enhance, or establish buffers that provide water quality benefits along waterbodies and their tributaries.

Maintenance of water quality becomes increasingly difficult as areas of impervious surface increase and urbanization occurs. For the purpose of this guidance, urbanized areas are those areas where the presence of "man-made" impervious surfaces results in increased peak runoff volumes and pollutant loadings that permanently alter one or more of the following: stream channels, natural drainageways, and in-stream and adjacent riparian habitat so that predevelopment aquatic flora and fauna are eliminated or reduced to unsustainable levels and predevelopment water quality has been degraded. Increased bank cutting, streambed scouring, siltation damaging to aquatic flora and fau na, increases in water temperature, decreases in dissolved oxygen, changes to the natural structure and flow of the stream or river, and the presence of anthropogenic pollutants that are not generated from agricultural activities, in general, are indications of urbanization.

The effects of urbanization have been well described in the introduction to this chapter. Protection of water quality in urbanized areas is difficult because of a range of factors. These factors include diverse pollutant loadings, large runoff volumes, limited areas suitable for surface water runoff treatment systems, high implementation costs associated with structural controls, and the destruction or absence of buffer zones that can filter pollutants and prevent the destabilization of streambanks and shorelines.

Comprehensive watershed planning facilitates integration of source reduction activities and treatment strategies to mitigate the effects of urban runoff. Through the use of watershed management, States and local governments can identify local water quality objectives and focus resources on control of specific pollutants and sources. Watershed plans typically incorporate a combination of nonstructural and structural practices.

An important nonstructural component of many watershed management plans is the identification and preservation of buffers and natural systems. These areas help to maintain and improve surface water quality by filtering and infiltrating urban runoff. In areas of existing development, natural buffers and conveyance systems may have been altered as urbanization occurred. Where possible and appropriate, additional impacts to these areas should be minimized and if degraded, the functions of these areas restored. The preservation, enhancement, or establishment of buffers along waterbodies is generally recommended throughout the section 6217 management area as an important tool for reducing NPS impacts. The establishment and protection of buffers, however, is most appropriate along surface waterbodies and their tributaries where water quality and the biological integrity of the waterbody is dependent on the presence of an adequate buffer/riparian area. Buffers may be necessary where the buffer/riparian area (1) reduces significant NPS pollutant loadings, (2) provides habitat necessary to maintain the biological integrity of the receiving water, and (3) reduces undesirable thermal impacts to the waterbody. For a discussion of protection and restoration of wetlands and riparian areas, refer to Chapter 7.

Institutional controls, such as permits, inspection, and operation and maintenance requirements are also essential components of a watershed management program. The effectiveness of many of the practices described in this chapter is dependent on administrative controls such as inspections. Without effective compliance mechanisms and operation and maintenance requirements, many of these practices will be ineffective.

Where existing development precludes the use of effective nonstructural controls, structural practices may be the only suitable option to decrease the NPS pollution loads generated from developed areas. In such situations, a watershed plan can be used to integrate the construction of new surface water runoff treatment structures and the retrofit of existing surface water runoff management systems.

Retrofitting is a process that involves the modification of existing surface water runoff control structures or surface water runoff conveyance systems, which were initially designed to control flooding, not to serve a water quality improvement function. By enlarging existing surface water runoff structures, changing the inflow and outflow characteristics of the device, and increasing detention times of the runoff, sediment and associated pollutants can be removed from the runoff. Retrofit of structural controls, however, is often the only feasible alternative for improving water quality in developed areas. Where the presence of existing development or financial constraints limits treatment options, targeting may be necessary to identify priority pollutants and select the most appropriate retrofits.

Once key pollutants have been identified, an achievable water quality target for the receiving water should be set to improve current levels based on an identified objective or to prevent degradation of current water quality. Extensive site evaluations should then be performed to assess the performance of existing surface water runoff management systems and to pinpoint low-cost structural changes or maintenance programs for improving pollutant-removal efficiency. Where flooding problems exist, water quality controls should be incorporated into the design of surface water runoff controls. Available land area is often limited in urban areas, and the lack of suitable areas will frequently restrict the use of conventional pond systems. In heavily urbanized areas, sand filters or water quality inlets with oil/grit separators may be appropriate for retrofits because they do not limit land usage.

Develop and implement watershed management programs to reduce runoff pollutant concentrations and volumes from existing development:

1. Identify priority local and/or regional watershed pollutant reduction opportunities, e.g., improvements to existing urban runoff control structures;
2. Contain a schedule for implementing appropriate controls;
3. Limit destruction of natural conveyance systems; and
4. Where appropriate, preserve, enhance, or establish buffers along surface waterbodies and their tributaries.

Applicability

This management measure is intended to be applied by States to all urban areas and existing development in order to reduce surface water runoff pollutant loadings from such areas. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA). **Areas under Stormwater Phase II permit requirements are exempt.**
http://www.epa.gov/owow/nps/MMGI/Chapter4/ch4-4.html

New On-Site Disposal Systems - The purpose of this management measure is to protect the 6217 management area from pollutants discharged by Onsite Disposal Systems (OSDS). The measure requires that OSDS be sited, designed, and installed so that impact to waterbodies will be reduced, to the extent practicable. Factors such as soil type, soil depth, depth to water table, rate of sea level rise, and topography must be considered in siting and installing conventional OSDS.

1. Ensure that new Onsite Disposal Systems (OSDS) are located, designed, installed, operated, inspected, and maintained to prevent the discharge of pollutants to the surface of the ground and to the extent practicable reduce the discharge of pollutants into ground waters that are closely hydrologically connected to surface waters. Where necessary to meet these objectives: (a) discourage the installation of garbage disposals to reduce hydraulic and nutrient loadings; and (b) where low-volume plumbing fixtures have not been installed in new developments or redevelopments, reduce total hydraulic loadings to the OSDS by 25 percent. Implement OSDS inspection schedules for preconstruction, construction, and postconstruction.

2. Direct placement of OSDS away from unsuitable areas. Where OSDS placement in unsuitable areas is not practicable, ensure that the OSDS is designed or sited at a density so as not to adversely affect surface waters or ground water that is closely hydrologically connected to surface water. Unsuitable areas include, but are not limited to, areas with poorly or excessively drained soils; areas with shallow water tables or areas with high seasonal water tables; areas overlaying fractured bedrock that drain directly to ground water; areas within floodplains; or areas where nutrient and/or pathogen concentrations in the effluent cannot be sufficiently treated or reduced before the effluent reaches sensitive waterbodies.

3. Establish protective setbacks from surface waters, wetlands, and floodplains for conventional as well as alternative OSDS. The lateral setbacks should be based on soil type, slope, hydrologic factors, and type of OSDS. Where uniform protective setbacks cannot be achieved, site development with OSDS so as not to adversely affect waterbodies and/or contribute to a public health nuisance.

Establish protective separation distances between OSDS system components and

1. groundwater which is closely hydrologically connected to surface waters. The separation distances should be based on soil type, distance to ground water, hydrologic factors, and type of OSDS.

2. Where conditions indicate that nitrogen-limited surface waters may be adversely affected by excess nitrogen loadings from ground water, require the installation of OSDS that reduce total nitrogen loadings by 50 percent to ground water that is closely hydrologically connected to surface water.

Applicability

This management measure is intended to be applied by States to all new OSDS including package plants and small-scale or regional treatment facilities not covered by NPDES regulations in order to manage the siting, design, installation, and operation and maintenance of all such OSDS. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this management measure and will have flexibility in doing so. The application of this management measure by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. http://www.epa.gov/owow/nps/MMGI/Chapter4/ch4-2c.html

Operating On-Site Disposal Systems -The purpose of this management measure is to minimize pollutant loadings from operating OSDS. This management measure requires that OSDS be modified, operated, repaired, and maintained to reduce nutrient and pathogen loadings in order to protect and enhance surface waters. In the past, it has been a common practice to site conventional OSDS in coastal areas that have inadequate separation distances to ground water, fractured bedrock, sandy soils, or other conditions that prevent or do not allow adequate treatment of OSDS-generated pollutants. Eutrophication in surface waters has also been attributed to the low nitrogen reductions provided by conventional OSDS designs.

1. Establish and implement policies and systems to ensure that existing OSDS are operated and maintained to prevent the discharge of pollutants to the surface of the ground and to the extent practicable reduce the discharge of pollutants into ground waters that are closely hydrologically connected to surface waters. Where necessary to meet these objectives, encourage the reduced use of garbage disposals, encourage the use of low-volume plumbing fixtures, and reduce total phosphorus loadings to the OSDS by 15 percent (if the use of low-level phosphate detergents has not been required or widely adopted by OSDS users). Establish and implement policies that require an OSDS to be repaired, replaced, or modified where the OSDS fails, or threatens or impairs surface waters.

2. Inspect OSDS at a frequency adequate to ascertain whether OSDS are failing.

3. Consider replacing or upgrading OSDS to treat influent so that total nitrogen loadings in the effluent are reduced by 50 percent. This provision applies only:

- where conditions indicate that nitrogen-limited surface waters may be adversely affected by significant ground water nitrogen loadings from OSDS, and
- where nitrogen loadings from OSDS are delivered to ground water that is closely hydrologically connected to surface water.

Applicability

This management measure is intended to be applied by States to all operating OSDS. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. This management measure does not apply to existing conventional OSDS that meet all of the following criteria: (1) treat wastewater from a single family home; (2) are sited where OSDS density is less than or equal to one OSDS per 20 acres; and (3) the OSDS is sited at least 1,250 feet away from surface waters.
http://www.epa.gov/owow/nps/MMGI/Chapter4/ch4-5b.html

Planning, Siting and Developing Roads and Highways (Local Only) - The best time to address control of NPS pollution from roads and highways is during the initial planning and design phase. New roads and highways should be located with consideration of natural drainage patterns and planned to avoid encroachment on surface waters and wet areas. Where this is not possible, appropriate controls will be needed to minimize the impacts of NPS runoff on surface waters.

Plan, site, and develop roads and highways to:

1. Protect areas that provide important water quality benefits or are particularly susceptible to erosion or sediment loss;
2. Limit land disturbance such as clearing and grading and cut and fill to reduce erosion and sediment loss; and
3. Limit disturbance of natural drainage features and vegetation.

Applicability

This measure is intended to be applied by States to site development and land disturbing activities for new, relocated, and reconstructed (widened) roads (including residential streets) and highways in order to reduce the generation of nonpoint source pollutants and to mitigate the impacts of urban runoff and associated pollutants from such activities. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this management measure and will have some flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of

Commerce. http://www.epa.gov/owow/nps/MMGI/Chapter4/ch4-7a.html

Bridges (Local Only) - This measure requires that NPS runoff impact on surface waters from bridge decks be assessed and that appropriate management and treatment be employed to protect critical habitats, wetlands, fisheries, shellfish beds, and domestic water supplies. The siting of bridges should be a coordinated effort among the States, the FHWA, the U.S. Coast Guard, and the Army Corps of Engineers. Locating bridges in coastal areas can cause significant erosion and sedimentation, resulting in the loss of wetlands and riparian areas. Additionally, since bridge pavements are extensions of the connecting highway; runoff waters from bridge decks also deliver loadings of heavy metals, hydrocarbons, toxic substances, and deicing chemicals to surface waters as a result of discharge through scupper drains with no overland buffering. Bridge maintenance can also contribute heavy loads of lead, rust particles, paint, abrasive, solvents, and cleaners into surface waters. Protection against possible pollutant overloads can be afforded by minimizing the use of scuppers on bridges traversing very sensitive waters and conveying deck drainage to land for treatment. Whenever practical, bridge structures should be located to avoid crossing over sensitive fisheries and shellfish-harvesting areas to prevent washing polluted runoff through scuppers into the waters below. Also, bridge design should account for potential scour and erosion, which may affect shellfish beds and bottom sediments.

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.

Applicability (Local Only)

This management measure is intended to be applied by States to new, relocated, and rehabilitated bridge structures in order to control erosion, streambed scouring, and surface runoff from such activities. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this management measure and will have some flexibility in doing so. The application of management measures by States is described more fully in Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. http://www.epa.gov/owow/nps/MMGI/Chapter4/ch4-7b.html

Operation and Maintenance of Roads, Highways and Bridges - Incorporate pollution prevention procedures into the operation and maintenance of roads, highways, and bridges to reduce pollutant loadings to surface waters.

Substantial amounts of eroded material and other pollutants can be generated by operation and maintenance procedures for roads, highways, and bridges, and from sparsely vegetated areas, cracked pavements, potholes, and poorly operating urban runoff control structures. This measure is intended to ensure that pollutant loadings from roads, highways, and bridges are minimized by the development and implementation of a program and associated practices to ensure that sediment and toxic substance loadings from operation and maintenance activities do not impair coastal surface waters. The program to be developed, using the practices described in this management measure, should consist of and identify standard operating procedures for nutrient and pesticide management, road salt use minimization, and maintenance guidelines (e.g., capture and contain paint chips and other particulates from bridge maintenance operations, resurfacing, and pothole repairs).

Incorporate pollution prevention procedures into the operation and maintenance of roads, highways, and bridges to reduce pollutant loadings to surface waters.

Applicability

This management measure is intended to be applied by States to existing, restored, and rehabilitated roads, highways, and bridges. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this management measures and will have some flexibility in doing so. The application of measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. **Areas under Stormwater Phase II permit requirements are exempt. http://www.epa.gov/owow/nps/MMGI/Chapter4/ch4-7e.html**

Runoff Systems for Roads, Highways, and Bridges - Develop and implement runoff management systems for existing roads, highways, and bridges to reduce runoff pollutant concentrations and volumes entering surface waters.

This measure requires that operation and maintenance systems include the development of retrofit projects, where needed, to collect NPS pollutant loadings from existing, reconstructed, and rehabilitated roads, highways, and bridges. Poorly designed or maintained roads and bridges can generate significant erosion and pollution loads containing heavy metals, hydrocarbons, sediment, and debris that run off into and threaten the quality of surface waters and their tributaries. In areas where such adverse impacts to surface waters can be attributed to adjacent roads or bridges, retrofit management projects to protect these waters may be needed (e.g., installation of structural or nonstructural pollution controls). Retrofit projects can be located in existing rights-of-way, within interchange loops, or on adjacent land areas. Areas with severe erosion and pollution runoff problems may require relocation or reconstruction to mitigate these impacts.

Runoff management systems are a combination of nonstructural and structural practices selected to reduce nonpoint source loadings from roads, highways, and bridges. These systems are expected to include structural improvements to existing runoff control structures for water quality purposes; construction of new runoff control devices, where necessary to protect water quality; and scheduled operation and maintenance activities for these runoff control practices. Typical runoff controls for roads, highways, and bridges include vegetated filter strips, grassed swales, detention basins, constructed wetlands, and infiltration trenches2. Establish schedules for implementing appropriate controls.

1. Identify priority and watershed pollutant reduction opportunities (e.g., improvements to existing urban runoff control structures; and
2. Establish schedules for implementing appropriate controls.

Applicability

This management measure is intended to be applied by States to existing, resurfaced, restored, and rehabilitated roads, highways, and bridges that contribute to adverse effects in surface waters. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this management measure and will have some flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. **Areas under Stormwater Phase II permit requirements are exempt.** http://www.epa.gov/owow/nps/MMGI/Chapter4/ch4-7f.html

HYDROMODIFICATION

Channelization and Channel Modification

(Physical and Chemical Characteristics of Suface Waters) - The purpose of this management measure is to ensure that the planning process for new hydromodification projects addresses 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 B (Instream 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 for new projects will require a two-pronged approach:

1. Evaluate, with numerical models for some situations, the types of NPS pollution related to instream changes and watershed development.
2. Address some types of NPS problems stemming from instream changes or watershed development with a combination of nonstructural and structural practices.

Applicability

This management measure is intended to be applied by States to public and private channelization and channel modification activities in order to prevent the degradation of physical and chemical characteristics of surface waters from such activities. This management measure applies to any proposed channelization or channel modification projects, including levees, to evaluate potential changes in surface water characteristics, as well as to existing modified channels that can be targeted for opportunities to improve the surface water characteristics necessary to support desired fish and wildlife. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with management measures and will have some flexibility in doing so. The application of this management measure by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.
http://www.epa.gov/owow/nps/MMGI/Chapter6/ch6-2a.html#Description

Channelization and Channel Modification

(Instream and Riparian Habitat Restoration) - The purpose of this management measure is to correct or prevent detrimental changes to instream and riparian habitat from the impacts of channelization and channel modification projects. Implementation of this management measure is intended to occur concurrently with the implementation of Management Measure A (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. Levees set back away from the streambank (setback levees) can be constructed to allow for overbank 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-channel 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 overbank with suitable vegetation completes the design.

Preservation of ecosystem benefits can be achieved by site-specific design to obtain predefined optimum or existing ranges of physical environmental conditions. Mathematical models can be used to assist in site-specific design. Instream 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.

Applicability

This management measure pertains to surface waters where channelization and channel modification have altered or have the potential to alter instream and riparian habitat such that historically present fish or wildlife are adversely affected. This management measure is intended to apply to any proposed channelization or channel modification project to determine changes in instream and riparian habitat and to existing modified channels to evaluate possible improvements to instream and riparian habitat. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with management measures and will have some flexibility in doing so. The application of this management measure by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

Dams

(Protection of Surface Water Quality and Instream 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.

Applicability

This management measure is intended to be applied by States 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.

This measure does not apply to projects that fall under NPDES jurisdiction. This measure also does not apply to the extent that its implementation under State law is precluded under *California* v. *Federal Energy Regulatory Commission*, 110 S. Ct. 2024 (1990) (addressing the supersedence of State instream flow requirements by Federal flow requirements set forth in FERC licenses for hydroelectric power plants under the Federal Power Act). http://www.epa.gov/owow/nps/MMGI/Chapter6/ch6-3c.html

Eroding Streambanks and Shorelines - Several streambank and shoreline stabilization techniques will be effective in controlling coastal erosion wherever it is a source of nonpoint pollution. Techniques involving marsh creation and vegetative bank stabilization ("soil bioengineering") will usually be effective at sites with limited exposure to strong currents or wind-generated waves. In other cases, the use of engineering approaches, including beach nourishment or coastal structures, may need to be considered. In addition to controlling those sources of sediment input to surface waters which are causing NPS pollution, these techniques can halt the destruction of wetlands and riparian areas located along the shorelines of surface waters. Once these features are protected, they can serve as a filter for surface water runoff from upland areas, or as a sink for nutrients, contaminants, or sediment already present as NPS pollution in surface waters.

Applicability

This management measure is intended to be applied by States to eroding shorelines in coastal bays and to eroding streambanks in coastal rivers and creeks. The measure does not imply that all shoreline and streambank erosion must be controlled. Some amount of natural erosion is necessary to provide the sediment for beaches in estuaries and coastal bays, for point bars and channel deposits in rivers, and for substrate in tidal flats and wetlands. The measure, however, applies to eroding shorelines and streambanks that constitute an NPS problem in surface waters. It is not intended to hamper the efforts of any States or localities to retreat rather than to harden the shoreline. Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this measure and will have some flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. http://www.epa.gov/owow/nps/MMGI/Chapter6/ch6-4.html

ADDITIONAL INFORMATION ON OHIO'S COASTAL NONPOINT POLLUTION CONTROL PROGRAM:

http://www.dnr.state.oh.us/soilandwater/coastalnonpointprogram.htm

The website above is a link to the ODNR, Division of SWC's coastal program. The following information came from that site:
In order to address the unique nonpoint pollution concerns within the Lake Erie basin and to focus public resources on the most achievable solutions, the Ohio Department of Natural Resources and the Ohio Environmental Protection Agency with funding from

the National Oceanic and Atmospheric Administration (NOAA) developed the Ohio Coastal Nonpoint Pollution Control Program Plan. The plan was submitted to NOAA and the U.S. Environmental Protection Agency for comment in September 2000. We arrived at this important milestone thanks to the hard work of numerous individuals, organizations, and other Lake Erie stakeholders. With this achievement, we look confidently toward a successful future.

A copy of the Executive Summary is available for viewing or downloading by clicking on the link below:

Executive Summary (in Acrobat Reader 4.0* format) <docs/CNPCPexecsumm.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/CNPCPexecsumm.pdf

Executive Summary (Microsoft Word format or text only) <docs/ExecutiveSummaryText.doc>

http://www.dnr.state.oh.us/soilandwater/docs/ExecutiveSummaryText.doc

You can also view or download the complete program plan in Acrobat Reader 4.0* format by clicking on the link below:

Coastal Nonpoint Pollution Control Program Plan (36.4 mb) <docs/FinalCNPCP.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/FinalCNPCP.pdf

Or, download or view a specific chapter by clicking on the corresponding link below:

Chapter 1 (Introduction and Program Summary) <docs/Chapter%2001.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2001.pdf

Chapter 2 (General Program Overview) <docs/Chapter%2002.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2002.pdf

Chapter 3 (Management Measures for Agricultural Sources) <docs/Chapter%2003.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2003.pdf

Chapter 4 (Management for Forestry:Request for Exclusion for Forestry) <docs/Chapter%2004.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2004.pdf

Chapter 5 (Management Measures for Urban Areas) <docs/Chapter%2005.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2005.pdf

Chapter 6 (Management Measures for Marinas and Recreational Boating) <docs/ Chapter%2006.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2006.pdf

Chapter 7 (Management Measures for Hydromodification) <docs/Chapter%2007.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2007.pdf

Chapter 8 (Management Measures for Wetlands and Riparian Areas) <docs/Chapter% 2008.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2008.pdf

Chapter 9 (Additional Management Measures for Critical Coastal Areas and Impaired or Threatened Areas) <docs/Chapter%2009.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2009.pdf

Chapter 10 (Developing Sustainable Watershed Protection Programs) <docs/Chapter% 2010.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2010.pdf

Chapter 11 (Water Quality Monitoring and Tracking Techniques) <docs/Chapter% 2011.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2011.pdf

Chapter 12 (Conclusions) <docs/Chapter%2012.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2012.pdf

Chapter 13 (References and Bibliography) <docs/Chapter%2013.pdf>

http://www.dnr.state.oh.us/soilandwater/docs/Chapter%2013.pdf

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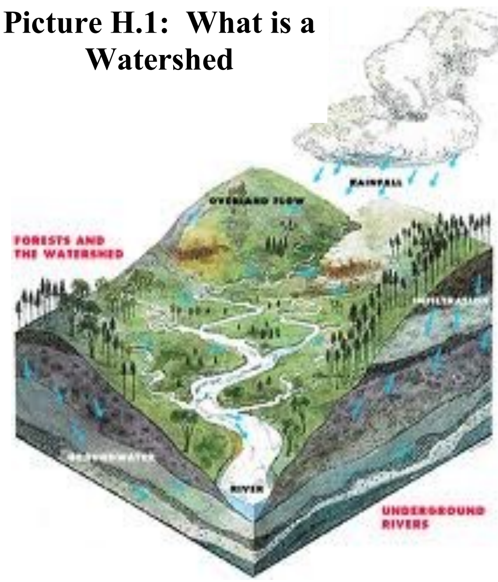
Appendix H

What is a Watershed?

What is a Watershed???

What is a Watershed??? This question gets several different answers, most of them wrong. Some of the answers have been… "where the birds and animals hand-out", "a place to store water", "a place to fill water bottles", or "deals with flooding". Actually, a ***watershed*** is the area drained by a river and its tributaries. A watershed is also known as a basin. Picture H.1, to the right show a typical watershed. Precipitation falls on the land and flows into small streams which flow into larger streams and eventually to a main river. The area from which the water flows to the river is the watershed for that river.

Picture H.1: What is a Watershed



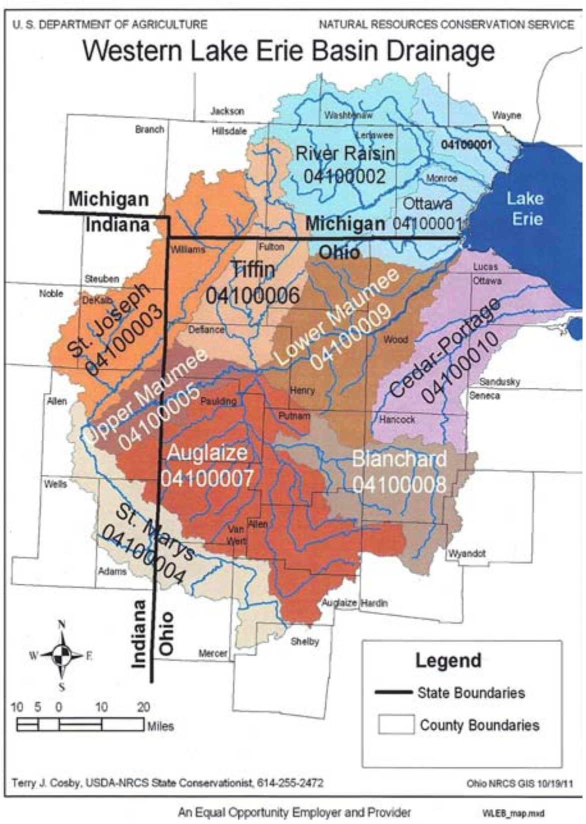
At the "Leisure Living" show in Findlay, the question was asked on a survey if the person lived in a watershed. 65% of the people that responded state No or they didn't know if they live in a watershed. Everyone lives in a watershed. In fact a person lives in more than one watershed based in the level being studied. Many people in Hancock County have heard of the Blanchard River watershed. The Blanchard River watershed is the main watershed in Hancock County (71%). If one travels north of Findlay on Main Street (CR 220) towards Van Buren, you will leave the Blanchard River watershed at Mortimer and enter the Cedar-Portage River watershed. Water from this area travels all the way to Port Clinton before entering Lake Erie. The very northwest corner of Hancock county is located in the Lower Maumee watershed. All of these watershed have been designated as 8-digit watershed for identification purposes by the United States Geological Survey (USGS). The watersheds are given a hydrological unit code (HUC) based on the size of the watershed.

What is the Make-up of the Blanchard River watershed??

There are two major watersheds in Ohio, the Ohio River watershed and the Great Lakes watershed. The next time you travel to Columbus you can see a sign south of Upper Sandusky that states, "Entering Ohio River Watershed". A sign with the same message can be found south of Wapakoneta when you are going south. This means that all precipitation eventually flows south to the Ohio River from the point southward. If you are heading north on these two roads, the signs will read "Entering the Lake Erie watershed". This means that all precipitation eventually flows north to Lake Erie from the point northward. The Blanchard River is located in this area. Map H.1 to the right shows the make-up and location of the Blanchard River in the Great Lakes watershed. The Great Lakes watershed has an HUC code of 04. The yellow area in the picture shows the Lake Erie watershed. The Blanchard River is located in the western part of this region. The HUC for the Western Lake Erie Basin is 0410.

Map H.1: Great Lakes watershed

Map H.2: Western Lake Erie Basin

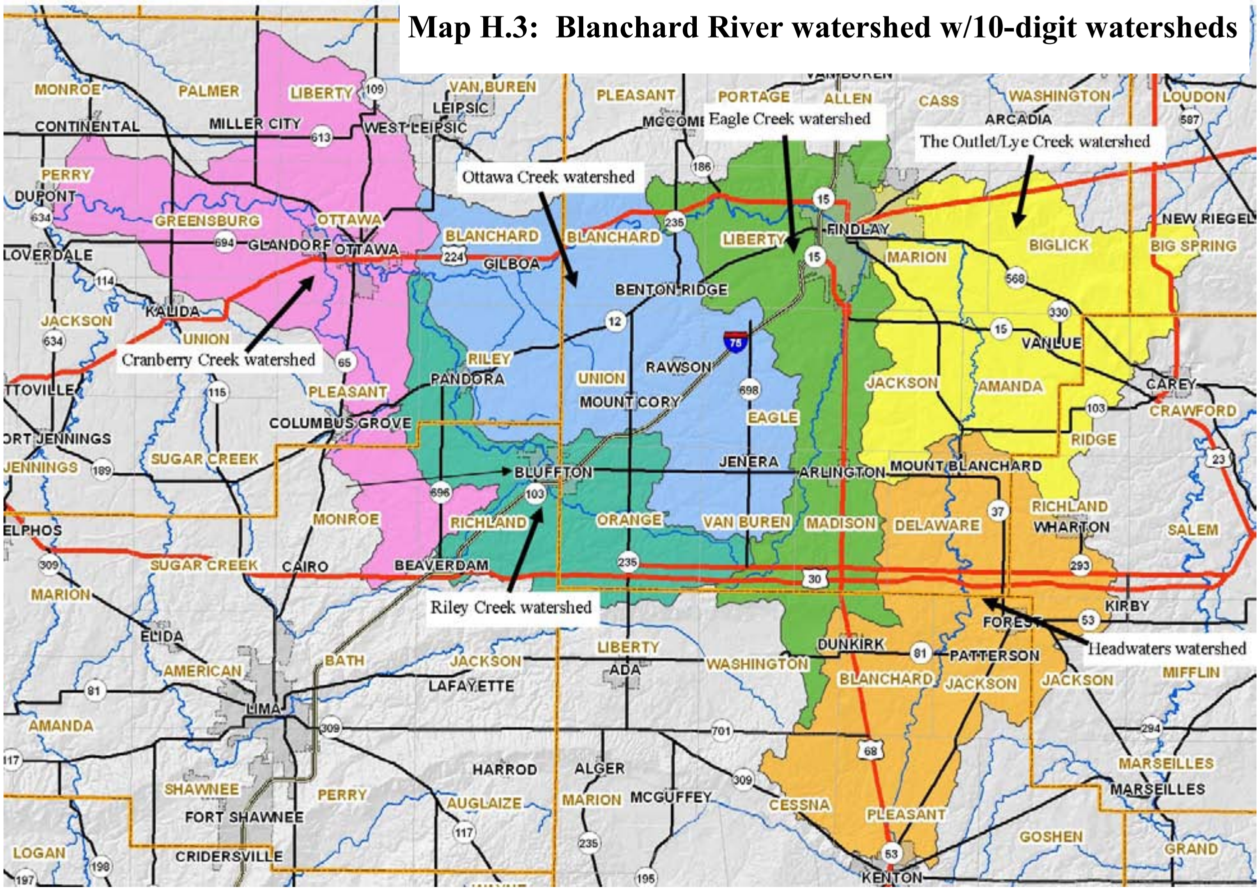


The picture to the left shows the 8-digit HUC watersheds in the Western Lake Erie Basin (WLEB). You can see that the Blanchard River watershed has an HUC of 04100008. This is the identification number for the Blanchard River watershed. Even in the WLEB there are smaller groupings of the watersheds. The Blanchard River flows into the Auglaize River on the west end of Putnam County. From here the Auglaize River flows north to the Maumee River which flows northeast into Lake Erie. All the watersheds that flow into the Maumee River comprise the Maumee River watershed or basin. These watershed make-up the Maumee River Conservancy District.

In review, the Blanchard River watershed is a part of the Maumee River watershed which is a part of the Western Lake Erie basin. The WLEB is a part of the Great Lakes watershed. Eventually, the Great Lakes watershed becomes a part of the Atlantic Ocean watershed.

But what happens if we look at the Blanchard River watershed going in the smaller direction. As mentioned earlier, the Blanchard River watershed has an 8-digit HUC code of 04100008. If we go one level lower to the 10-digit level, we will find that there are six smaller watersheds in the Blanchard River watershed. The Map H.3 below shows the six 10-digit watersheds in the Blanchard River watershed.

Map H.3: Blanchard River watershed w/10-digit watersheds



The Blanchard River Watershed Partnership's mission in to help improve and maintain the water quality within the watershed. Specifically, the BRWP focus is on Nonpoint Source Pollution (NPS). Nonpoint Source Pollution is pollution that does not have a specific source or the source is widely spread. The US EPA reports that NPS is the leading remaining cause of water quality problems. **Nonpoint source pollution can include:**

- Excess fertilizers, herbicides and insecticides from agricultural lands and residential areas
- Oil, grease and toxic chemicals from urban runoff and energy production
- Sediment from improperly managed construction sites, crop and forest lands, and eroding Streambanks
- Bacteria and nutrients from livestock, pet wastes and faulty septic systems
- Atmospheric deposition and hydromodification.

In addressing the impairments caused by NPS, the Blanchard River Watershed Partnership is writing watershed action plans (WAP) that are endorsed by the Ohio EPA and Ohio Department of Natural Resources (ODNR). These WAP are being written at the 10-digit watershed level. The WAP focuses on the smaller 12-digit watershed in each of the 10-digit watersheds. The Table H.1 below summarizes the 10 and 12-digit watersheds.

Table H.1: Blanchard River watershed - 10 & 12-digit watersheds
(HUC 04100008) 771 sq. miles, 493,434 acres

Headwaters Watershed (HUC 0410008 01) 140.8 sq. miles, 90,095 acres

- ***Cessna Creek Watershed*** (HUC 04100008 01 01) 23.2 sq. miles, 14,855.2 acres
- ***Headwaters Blanchard River Watershed*** (HUC 04100008 01 02) 19.7 sq. miles, 12,582.6 acres
- ***The Outlet-Blanchard River Watershed*** (HUC 04100008 01 03) 34.1 sq. miles, 21,821.9 acres
- ***Potato Run Watershed*** (HUC 04100008 01 04) 27.8 sq. miles, 17,822.5 acres
- ***Ripley Run-Blanchard River Watershed*** (HUC 04100008 01 05) 36.9 sq. miles, 23,639.4 acres

The Outlet/Lye Creek Watershed (HUC 0410008 02) 133.4 sq. miles 85,384 acres

- ***Brights Ditch Watershed*** (HUC 04100008 02 01) 28.4 sq. miles, 18,200 acres
- ***The Outlet Watershed*** (HUC 04100008 02 02) 38.3 sq. miles, 24,542.5 acres
- ***Findlay Upground Reservoirs-Blanchard River Watershed*** (HUC 04100008 02 03) 22.5 sq. miles, 14,393 acres
- ***Lye Creek Watershed*** (HUC 04100008 02 04) 27.5 sq. miles, 17,631.1 acres
- ***City of Findlay Riverside Park-Blanchard River Watershed*** (HUC 04100008 02 05) 16.2 sq. miles, 10,377.5 acres

Eagle Creek Watershed (HUC 04100008 03) 115.0 sq. miles 73,601 acres

- ***Upper Eagle Creek Watershed*** (HUC 04100008 03 01) 26.4 sq. miles, 16,874.6 acres
- ***Lower Eagle Creek Watershed*** (HUC 04100008 03 02) 34.0 sq. miles, 21,763.9 acres
- ***Aurand Run Watershed*** (HUC 04100008 03 03) 18.0 sq. miles, 11,534.4 acres
- ***Howard Run-Blanchard River Watershed*** (HUC 04100008 03 04) 36.3 sq. miles, 23,212.2 acres

Riley Creek Watershed (HUC 04100008 04) 85.6 sq. miles 54,814 acres

- ***Binkley Ditch-Little Riley Creek Watershed*** (HUC 04100008 04 01) 14.4 sq. miles, 9,193.9 acres
- ***Upper Riley Creek Watershed*** (HUC 04100008 04 02) 14.4 sq. miles, 9185.0 acres
- ***Marsh Run-Little Riley Creek Watershed*** (HUC 04100008 04 03) 16.3 sq. miles, 10,404.6 acres
- ***Middle Riley Creek Watershed*** (HUC 04100008 04 04) 15.6 sq. miles, 9.995.5 acres
- ***Lower Riley Creek Watershed*** (HUC 04100008 04 05) 25.1 sq. miles, 16,094.6 acres

Ottawa Creek Watershed (HUC 04100008 05) 148.9 sq. miles, 95,286 acres

- ***Tiderishi Creek Watershed*** (HUC 04100008 05 01) 19.2 sq. miles, 12,267.1
- ***Ottawa Creek Watershed*** (HUC 04100008 05 02) 44.9 sq. miles, 28,747.5 acres
- ***Moffitt Ditch Watershed*** (HUC 04100008 05 03) 13.5 sq. miles, 8,663.4 acres
- ***Dukes Run Watershed*** (HUC 04100008 05 04) 15.0 sq. miles, 9,613.7 acres
- ***Dutch Run Watershed*** (HUC 04100008 05 05) 14.8 sq. miles, 9,449.5 acres
- ***Village of Gilboa-Blanchard River Watershed*** (HUC 04100008 05 06) 41.2 sq. miles, 26,364.6 acres

Cranberry Creek Watershed (HUC 04100008 06) 147.3 sq. miles, 94.258 acres

- ***Cranberry Creek Watershed*** (HUC 04100008 06 01) 45.3 sq. miles, 28,969.4 acres
- ***Pike Run-Blanchard River Watershed*** (HUC 04100008 06 02) 28.6 sq. miles, 18,329.1 acres
- ***Miller City Cutoff Watershed*** (HUC 04100008 06 03) 22.6 sq. miles, 14,492.3 acres
- ***Bear Creek Watershed*** (HUC 04100008 06 04) 12.7 sq. miles, 8112.3 acres
- ***Deer Creek-Blanchard River Watershed*** (HUC 04100008 06 05) 39.4 sq. miles, 25,196.5 acres

Watershed Impairments

The Ohio EPA completed and water quality study of the Blanchard River watershed in 2005. The final report was released in 2009 as the ***Total Maximum Daily Loads for the Blanchard River Watershed (TMDL).*** The entire report can be found at: http://www.epa.ohio.gov/portals/35/tmdl/BlanchardRiverTMDL_final_may09_wo_app.pdf. The report identified the impairments and the sources of these impairments in the watershed. In 2010 the Ohio EPA released the ***Ohio 2010 Integrated Water Quality and Assessment Report on the Blanchard River Watershed.*** The assessment report can be found at: http://www.epa.ohio.gov/dsw/tmdl/2010IntReport/2010OhioIntegratedReport.aspx. The reports present a complete summary of each 12-digit watersheds within the Blanchard River watershed. The report includes assessments for Aquatic Life Use, Recreation Use, Public Drinking Water Supply, and Fish Tissue. ***Land Use*** has the greatest influence in impairments in the Blanchard River watershed. By far the largest land use (80%) is agricultural cropland. The Blanchard River watershed was once a part of the Great Black Swamp. In order to farm the land, channelization of the land was needed. Originally, clay tile was used, but now plastic tile is being used. The system of drainage has allow the very fertile land to be used to grow mainly wheat, corn, and soybeans. Installing of the drainage tile has resulted a channelization of the tributaries and direct habitat alteration. The Table H.2 below list the causes and sources of impairments in the Blanchard River watershed.

Table H.2: Summary of the Impairments - Blanchard River watershed

Causes of Impairments	*Sources of Impairments*
◊ direct habitat alterations	◊ channelization
◊ nitrate/nitrite	◊ crop production with subsurface drainage
◊ organic enrichment (sewage)	◊ combined sewer overflows
◊ total phosphorus	◊ failing Home Septic Treatment Systems
◊ water temperature (too high)	◊ streambank modification/destabilization
◊ low flow alterations	◊ municipal point source pollution
◊ nutrient/eutrophication*	◊ dam or impoundment
◊ ammonia	◊ urban stormwater
◊ low dissolved oxygen	◊ upstream impoundments
◊ sedimentation/siltation	◊ package plant or other permitted small flow discharges

What Can You Do?

The sources for all the impairments are man related activities. So, by stopping all the man related activities, the sources of the impairments would be eliminated. But that does make any sense nor is it possible. ***What can you do than???*** More than you think and with very little effort. Several of the things you can do will not be done directly by you, but by officials and agencies in the area. Your influence on these officials and agencies with your input and membership. Take pictures and record sites of impairments. Let the people in charge know your findings. Other things you can do are listed in Table H.3 below.

Table H.3: Suggestion of Things You can do...

Urban Areas

- Use Phosphorus Free Fertilizer - your grass will be fine
- Use Rain Barrels - plant a rain garden
- Direct downspouts away from paved surfaces
- When living by a stream - create a buffer
- Never dump anything down storm drains or in streams
- Wash your car in the yard or at a car was
- Pick up after your pet
- Check you car for leaks and recycle your motor oil
- Recycle all medicines - do not flush or dump down the drain
- Have your septic tank pumped and system inspected regularly

Agriculture Areas

- Develop a Nutrient Management Plan for your farm
- Use ***Cover Crops*** every year
- Conservation Crop Rotation
- Drainage Management Plan
- Filter Strips/Riparian Buffers
- Residue/Tillage Management Plan - No Till, Mulch Tillage, and Conservation Tillage
- Wetland Creation/Restoration
- Have your septic tank pumped and system inspected regularly

There are many local agencies that can help you will find and install the Best Management Practice(s). The local Soil Water Conservation Districts (SWCD), local NRCS, and the BRWP have specialists who would be happy to met with you and go over the BMP that are best for your farm. Some of these programs are Lake Erie CREP, EQIP, CRP and others.

What are the Benefits of Clean Water???

The primary benefit of reducing pollution loads in the streams of the Blanchard River Watershed to meet water quality standards is cleaner water. ***But, How will Citizens and the Communities in the watershed benefit?*** Benefits of clean water to the stakeholders of the watershed include:

◊ Improved public health - one of the major pollutants found in the waterways is pathogens or fecal bacteria. The source(s) of these pathogens is failing home septic systems, animal waste, and combined sewer overflows (CSO). Reducing pathogens will make the water safer for living organisms and for drinking.
◊ Conservation of natural resources - soil and nutrients - Sediment and nutrient loadings into the waterways creates many problems for the water quality. Algal Blooms are the direct result of phosphorus loading. The problem with Harmful Algal Blooms in Lake Erie are partially due to phosphorus loading from the Blanchard River watershed. High level of nitrates in the drinking water can cause problems for pregnant women. High sediment levels requires more treatment to remove the sediment and make the water safe to drink. High sediment levels also destroy aquatic habitat.
◊ Improved riparian habitat
◊ Improved aquatic habitat
◊ Reductions in the amount of flood damage
◊ Improved recreational opportunities - clean water in the Blanchard River and
◊ Greater direct economic benefits - improved agricultural benefits and tourism
◊ Greater indirect economic benefits - enhanced real estate values for farms and homes. Business more likely to build in an area with high water quality