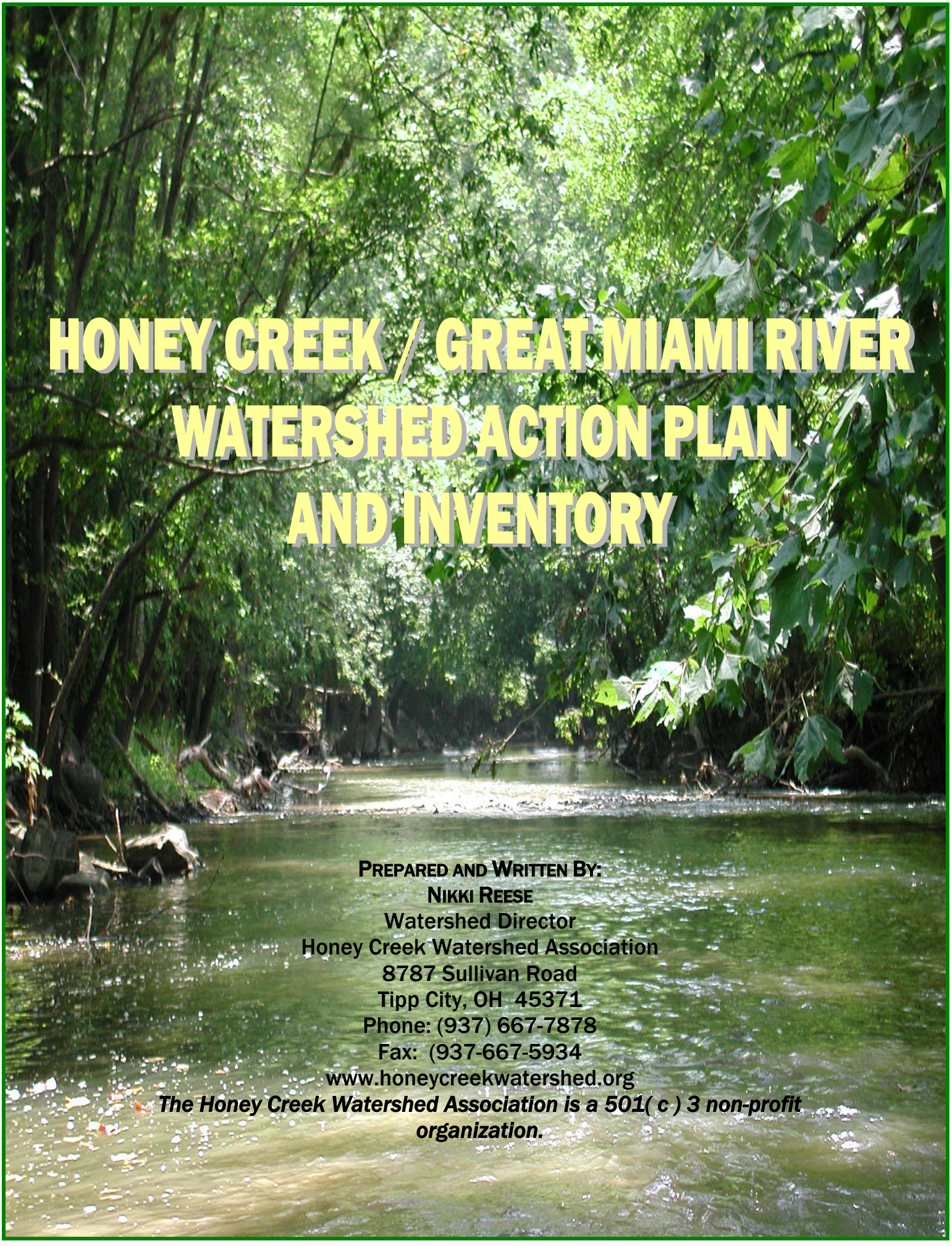

HONEY CREEK / GREAT MIAMI RIVER WATERSHED ACTION PLAN AND INVENTORY

PREPARED AND WRITTEN BY:
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The Honey Creek Watershed Association is a 501(c) 3 non-profit organization.

Writing Contributions By:

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Ron Jackson, Secretary
Amy Holden, Treasurer
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Never doubt for a moment that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has.
-Margaret Mead

PLAN ENDORSEMENT

We, the supporter of the Honey Creek Watershed Association goals and objectives, do hereby approve and agree to pursue implementation of this watershed action plan and inventory prepared and written by the Honey Creek Watershed Association Board of Directors

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The Board of Directors of the Honey Creek Watershed Association has strived to develop a watershed action plan and inventory that is reflective of the public input gathered. The development strategies were designed to create a plan adaptable, flexible and usable by the community in the process of achieving the goals and objectives of the Honey Creek Watershed Association.

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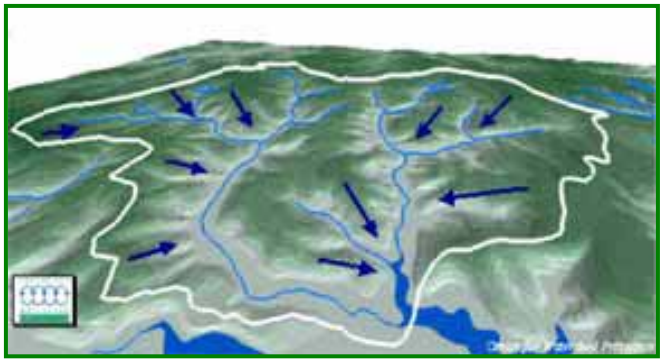
Acronyms Used

AU	Animal Units
BUSTR	Bureau of Underground Storage Tank Regulation
CMNP	Comprehensive Manure Nutrient Management Plan
CRP	Conservation Reserve Program
CSP	Conservation Security Program
DSWC	Division of Soil & Water Conservation
EQIP	Environmental Quality Incentive Program
EWH	Exceptional Warmwater Habitat
FEMA	Federal Emergency Management Agency
GIS	Geographical Information System
GMR SWS	Great Miami River Subwatershed
HCWA	Honey Creek Watershed Association
HSTS	Home Sewage Treatment System
HUC	Hydrologic Unit Code
HC SWS	Honey Creek Subwatershed
MCD	Miami Conservancy District
MCPD	Miami County Park District
MHP	Mobile Home Park
MSL	Master Sites List
MSWCD	Miami Soil & Water Conservation District
MVRPC	Miami Valley Regional Planning Commission
NRCS	Natural Resource Conservation Service
NRI	National Resources Inventory
ODA	Ohio Department of Agriculture
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
OWPP	Ohio Wellhead Protection Program
PPSI	Potential Pollutant Source Inventory
RM	River Miles
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SSA	Sole Source Aquifer
STEPL	Spreadsheet Tool for Estimating Pollutant Load
SWSs	Subwatersheds
TOT	Time of Travel
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
WAP	Watershed Action Plan
WHIP	Wildlife Habitat Incentives Program
WRP	Wetland Reserve Program
WRI	Water Resources Inventory
WWH	Warmwater Habitat
WWTP	Wastewater Treatment Plant

Preface

What is a Watershed?

A watershed is an area of land from which surface water drains into a common outlet, such as a river, lake or wetland. Depending on its size and location, a watershed can contain rivers, streams, ditches, ponds, lakes, and/or wetlands. Watersheds may also be called "drainage basins" and "hydrologic units."



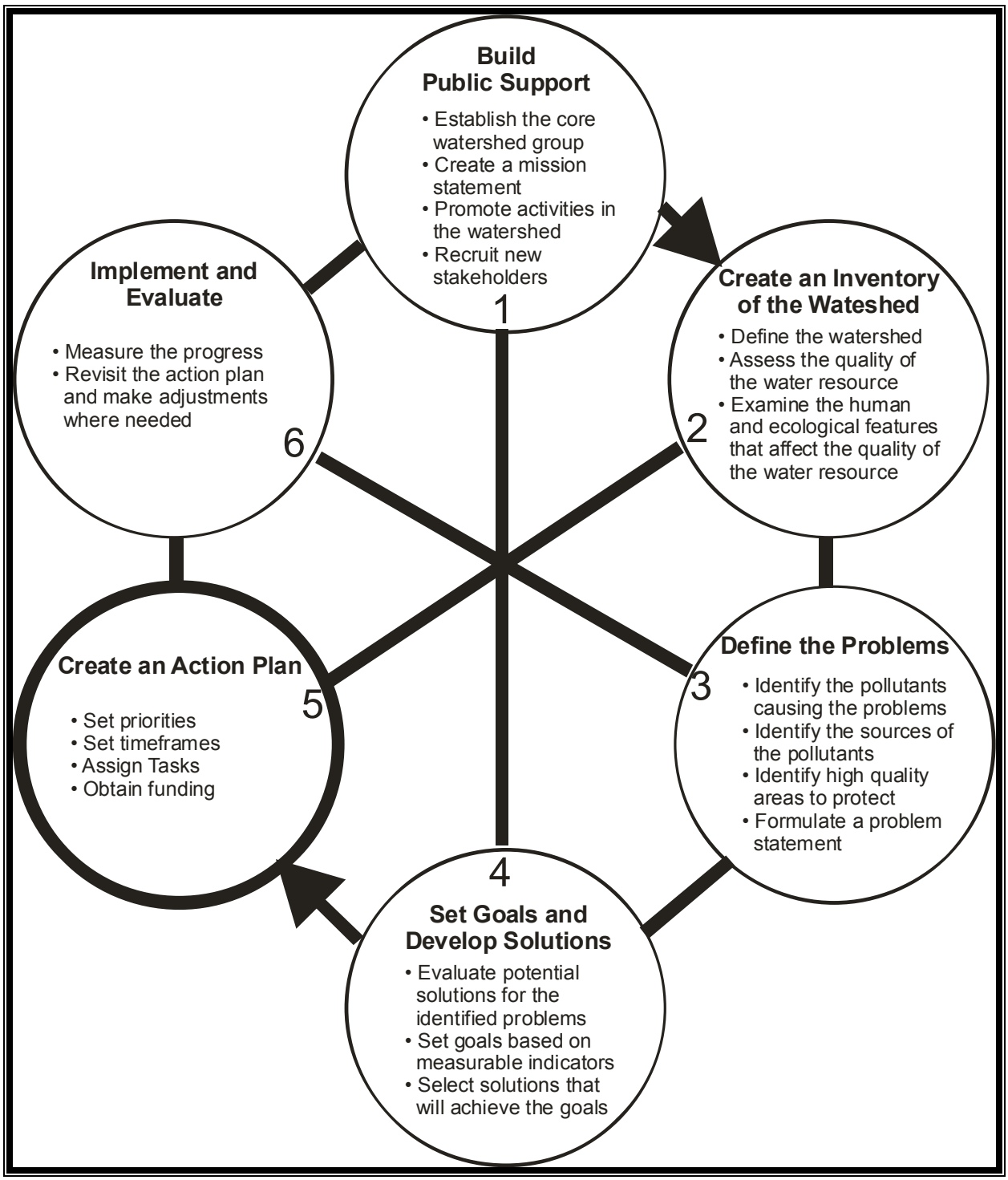
The Watershed Approach

The watershed approach refers to a planning process that is recognized as effective in achieving broad water quality goals, such as protecting sources of drinking water and quality of rivers, streams and wetlands. These goals may seek to improve already degraded water resources or may establish initiatives to protect and preserve existing high quality water resources. Actions to maintain water quality are complex, spreading over large areas and involving many individuals, agencies and businesses. The planning and implementation of watershed-based initiatives encourages understanding of water resource problems by watershed residents and stresses their involvement in all facets of the process.

What is a Watershed Action Plan?

A watershed action plan (WAP) is an itemization of the problems, priorities and activities the local watershed group would like to address. It does not have to be completed before activities can begin; rather, it serves as a guide for the watershed group by mapping a strategy for improving or protecting the watershed. The success of the plan depends on the understanding and appreciation of the water resources and an ability to work cooperatively with others, some of whom may have different interests. According to *A Guide to Developing Local Watershed Action Plans in Ohio (Ohio EPA, June 1997),* an action plan should have two (2) components: a Water Resource Inventory (WRI), fulfilling the definition of steps 2 and 3, and a Watershed Action Plan (WAP), which combines public input with the findings of the WRI. **Figure 1**

Figure 1
Implementing the Watershed Approach



Guide to Developing Local Watershed Action Plans in Ohio (Ohio EPA, June 1997)

Executive Summary

The Honey Creek / Great Miami River Watershed is a valuable natural resource located in southwest, Ohio. Two water quality studies, the Ohio EPA, Biological and Water Quality Study (1996) and the Miami Valley Regional Planning Commission's, Miami Valley Wetlands Inventory (1997), emphasized the high quality of the water resources and the wetlands of the Honey Creek Watershed. However, one of the limiting factors of this watershed is the lack of water quality data; therefore, the potential pollution problems addressed in this document are based on "best professional judgment".

In 1997, the Honey Creek/Great Miami River Steering Committee was organized. The Miami County Park District, in cooperation and partnership with the Miami Soil & Water Conservation District and Ohio State University Extension Service, organized this watershed association in an effort to protect the valuable water resources in the Honey Creek Watershed and a portion of the Great Miami River (GMR) Watershed from Tipp City to Dayton before the Stillwater River enters the GMR. The above organizations and numerous other agencies, groups and individuals worked together to develop a water resources inventory (WRI) written by Miami Valley Regional Planning Commission as the first step in the process of developing a watershed action plan. The *Honey Creek / Great Miami River Watershed Resource Inventory* was completed in 2000.

The purpose of the WRI is to establish a baseline of information regarding the water resources of the watershed that can serve as the foundation for the subsequent development and implementation of the watershed action plan. The WRI contained a compilation and analysis of the water resource-related information that is readily available for the watershed at the present. The *Watershed Action Plan of the Honey Creek / Great Miami River Watershed* was developed in 2002. In 2003, Ohio Environmental Protection Agency and Ohio Department of Natural Resources, Division of Soil & Water Conservation created Appendix 8, which is an addition to the document *A Guide to Developing Local Watershed Action Plans in Ohio (Ohio EPA, June 1997)*. Appendix 8 is a detailed outline of a watershed action plan and is a guideline tool for watershed groups to help Ohio reach its short-term goal to have 80% of streams achieving use attainment standards by 2010.

The purpose of this watershed action plan (WAP) is to provide an outline on how to restore and maintain the chemical, physical, and biological integrity of the Honey Creek / Great Miami River Watershed. It is a "community based" document that addresses the water quality and habitat degradation concerns voiced by citizens within the watershed. It is also a "living document" which will be updated and revised as new watershed information emerges and implementation practices are established. The plan is written on a ten year time frame (2008-2017) and will be evaluated each year to include updates as needed.

The Project Area consists of the Honey Creek / Great Miami River Watershed (Hydrologic Unit Code - #0508001200) and encompasses 143 square miles. It

includes all of the Honey Creek Watershed (90 square miles) and a portion of the Great Miami River Watershed (53.3 square miles). The entire watershed encompasses portions of four counties: Champaign (10.4%), Clark (17.5%), Miami (47.6%), and Montgomery (24.5%) and includes the following population centers: Christiansburg, Huber Heights, New Carlisle, North Dayton, Tipp City, and Vandalia.

The Honey Creek Watershed Association (HCWA) was formed in 2002 out of the Honey Creek / Great Miami River Watershed Steering Committee. The HCWA is a non-profit organization dedicated to protecting and enhancing the quality of our water resources. The history of the organization, goals and objectives, education activities, and funding sources are outlined in this watershed action plan. The HCWA will continue to incorporate community involvement in addressing water quality pollution problems within the watershed and searching for potential funding sources to correct these problems, as well as, providing watershed education.

The watershed action plan will serve as the "ultimate watershed guide" for the HCWA for implementing best management practices necessary to reach watershed goals. *Chapter 1* provides background information on the HCWA and the purpose of the WAP. A detailed watershed inventory of the Honey Creek / Great Miami River Watershed is outlined in *Chapter 2*. *Chapter 3* focuses on water quality standards and existing water quality data on the Honey Creek / Great Miami River Watershed; while *Chapter 4* addresses the potential impacts to water resources within the watershed. *Chapter 5* discusses two models utilized to determine pollutant loads and reductions. A detailed 14-digit subwatershed inventory outlining background information on the subwatersheds, pollutant sources and implementation strategies specific for each subwatershed is located in *Chapter 6*. Finally, *Chapter 7* lists funding strategies and evaluation techniques.

The protection of our water resources is crucial and should not be taken for granted. With our fast- paced society, we often overlook the natural beauty of our water resources we have in our own backyard. We are very fortunate that we live in a watershed with excellent water quality, plentiful water supply, and exceptional wetlands. It is extremely important that you take a step back from our busy society and appreciate the natural resource gifts we have been granted and take valuable steps to protect these for future generations.

Remember we all live downstream!

Honey Creek Watershed Association Partners

This Action Plan was developed in conjunction with the Honey Creek Watershed Association Steering Committee. The Steering Committee members included:

Member	Affiliation	Member	Affiliation
Dane Mutter	Past Honey Creek Coordinator	Anne Baird	OSU Extension, District Office
Terry Lavy	Miami County Pheasants Forever	Jim Campbell	National Trail Park & Recreation
Sarah Hippensteel	Miami Conservancy District	Jim Dillon	Montgomery SWCD
Steve Durall	City of New Carlisle	Mo Eichman	City of Tipp City
Jerry Eldred	Miami Co. Park Dist.	Tim Fine	OSU Ext., Miami Co.
John Geiger	City of Huber Heights	Dawn Coleman	Bowser Morner
Jim Hartzell	Hartzell Industries	Mike Haubner	OSU Ext., Clark Co.
Dan Heberling	Silver Lake Beach	David Heckler	Tri-Cities North Regional Wastewater Authority
Ron Jackson	Miami Co. Heath District	Angela Manuszak	Miami Conservancy District
Bob Jurick	B-W Greenways	Karen McCallister	NRCS/USDA, Miami Co.
Chris Thompson	Miami Co. Park Dist.	Michael Lucas	MVRPC
Carol McKeever	City of Tipp City	George McConkey	Clark SWCD
Linda Raterman	Miami SWCD	Cy Circle	Jackson Township
Paul Snyder	Clark SWCD	Amy Holden	Miami Health Dept.
Harvey Zimmerman	Village of Christiansburg	Holly Weatherhead	Veolia Water NA
Hugh Trimble	Ohio EPA	Carol Wilson	Veolia Water NA

CHAPTER 1: Introduction

The Honey Creek / Great Miami River Watershed (HUC # 05080001200) drains 143 square miles in west central Ohio, covering portions of four counties: Champaign (10.4%), Clark (17.5%), Miami (47.6%), and Montgomery (24.5%). The watershed includes all of the Honey Creek Watershed and a portion of the Great Miami River Watershed between the mouth of Honey Creek and the mouth of the Mad River, excluding the Stillwater River Watershed. The watershed encompasses a total of 91,803 acres and is part of the upper Great Miami River drainage basin which flows into the Ohio River. It also includes more than 140 square miles that overlies the Buried Valley Aquifer that supplies drinking water for more than 1.5 million people.

Great Miami River at Ross Road, Miami County.

Population centers include Tipp City, New Carlisle, and Christiansburg in the north and portions of Dayton, Harrison Township, Huber Heights, and Vandalia in the south. The general character of the watershed is small, town/rural in the upper portions of the Honey Creek Watershed, transitioning to urban in the central and southern portions of the Great Miami River subwatershed.

The Honey Creek / Great Miami River Watersheds are broken down into six 14-digit hydrologic unit codes for the planning and implementation purposes of this plan **Map 1**. A brief description of each subwatershed is shown in **Table 1**.

What is a Hydrologic Unit Code (HUC)?

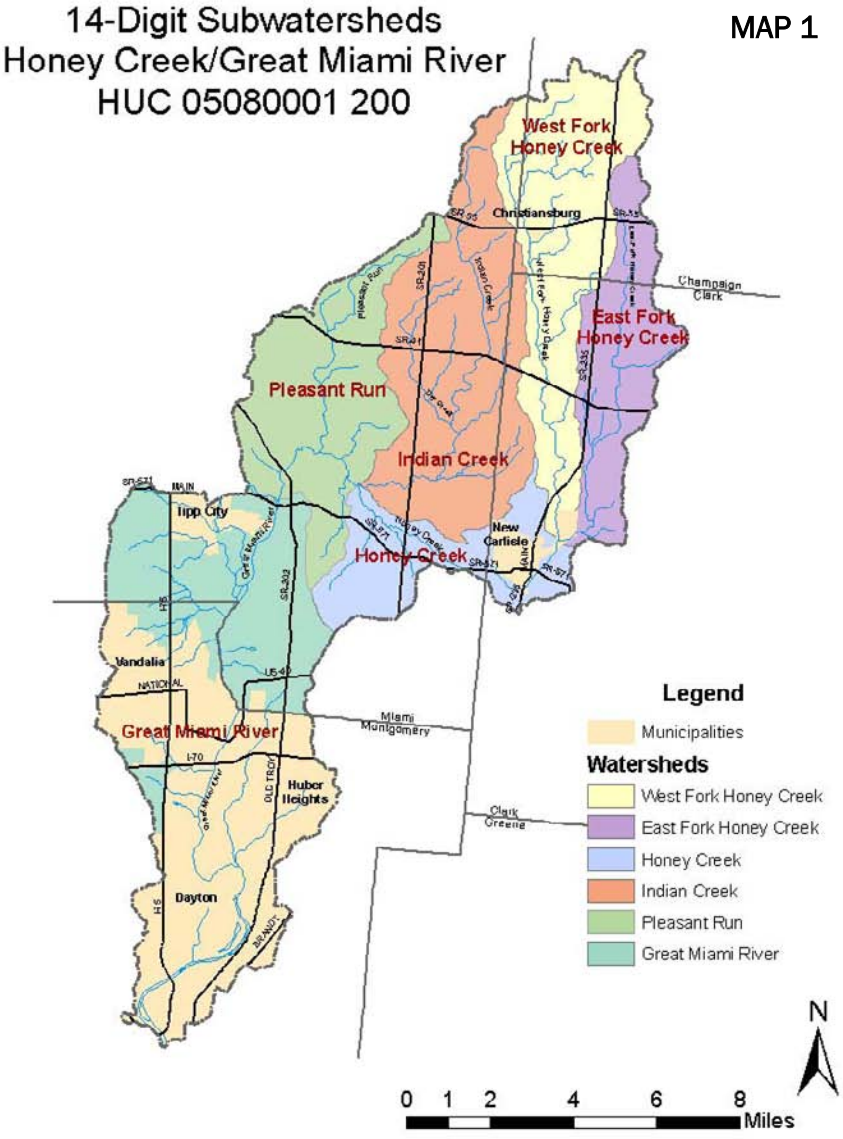
HUCs were developed by the US Geological Survey in cooperation with the US Water Resource Council. Each number or group of numbers in the code represents a specific landscape area (The longer the number the smaller the watershed). This code provides common language for organizations and agencies to use. Each code attached to a specific watershed is unique and is known as its watershed address. A 00 in the two-digit accounting unit field indicates that the accounting unit and the sub-region are the same. Likewise, if the cataloging unit field is 00, it is the same as the accounting unit.

The Honey Creek / Great Miami River Watershed's 11-digit watershed address is broken down as follows:

Region	Subregion	Accounting Unit	Cataloging Unit	Cataloging Subunit
05	08	00	01	200

Table 1
14- Digit USGS Hydrologic Unit Codes of the Honey Creek / Great Miami River Watershed (HUC # 05080001200).

Name	14-digit HUC	Drainage Area (sq. miles)	% of Watershed
West Fork HC	0508001 200 010	20.9	14.57%
East Fork HC	0508001 200 020	12.9	9.00%
Honey Creek (HC)	0508001 200 030	11.6	8.09%
Indian Creek	0508001 200 040	25.6	17.87%
Pleasant Run	0508001 200 050	19	13.28%
Great Miami River	0508001 200 060	53.3	37.20%



Mission Statement

"The mission of the Honey Creek Watershed Association is to protect and enhance the Honey Creek / Great Miami River Watershed resources for the benefit of the region through education and demonstrating water quality improvements."

Vision Statement

"The vision of the Honey Creek Watershed Association is to be a leader in protecting and enhancing the Honey Creek/ Great Miami River Watershed and a resource for educating the community on water quality enhancement and watershed concepts."

Goals of the Honey Creek Watershed Association (HCWA)

- *Preserve our surface and ground water resources*
- *Provide opportunities for education on watershed issues*
- *Promote implementation of watershed best management practices*
- *Develop and implement strategies to assist landowners in maintaining and operating household sewage treatment systems*
- *Operate strategically to assure the sustainability of the HCWA*

The following is a list of goals and objectives for the entire Honey Creek / Great Miami River Watershed. They have developed over several years from five main sources:

- Concerns expressed by residents at Town Hall meetings
- Priorities of the HCWA Steering Committee
- Findings of the WRI
- 2006 HCWA Fundraising Committee
- HCWA Board of Directors

A more detailed outline of implementation strategies are listed in the ***Chapter 6: Subwatershed Inventory Section.***

Goals of the Honey Creek Watershed Association (HCWA)

GOALS	*OBJECTIVES*	*TIMEFRAME*	*BUDGET(2007-2017)*
1. Preserve our surface and ground water resources.	1.1 Annually collect and review surface and groundwater quality data for pollutants and share information with the region.	Annually	N/A
	1.2 Contact landowners of quality wetlands to discuss long-term management.	2008-2017	$2,000
	1.3 Increase the riparian corridor at least by 25% in each 14-digit subwatershed	2008-2017	Promote CRP, other BMP cost share program.
	1.4. Quarterly monitor surface water for the following parameters: temperature, dissolved oxygen, pH, phosphorus, ammonia, total Kjeldahl nitrogen, fecal coliform and total suspended solids.	4X's / year (10 sites)	$70,000
	1.5. Assess & monitor the watershed's floodplains and streambank erosion sites through proper training and funding.	2008-2017	$10,000
2. Provide opportunities for education on watershed issues	2.1 Develop and implement a watershed wide education plan for youth and adults of our area, which addresses non-point source pollution.	Ongoing	$350,000
	2.2 Maintain cooperative relationships and programs with local universities.	Ongoing	N/A
	2.3 Develop and maintain stream team groups to monitor the watershed.	Ongoing	$6,600
	2.4 Hold an annual watershed festival	Annually	$30,000
	2.5 Maintain HCWA website.	Ongoing	$500
	2.6 Develop a "State of the Watershed" report yearly.	Annually	N/A (distribute through newsletter)
	2.7 Attend local festivals and fairs up to 10 per year to promote the HCWA.	Annually	N/A
	2.8 Hold annual picnic to promote membership of the HCWA.	Annually	$3,000
	2.9 Distribute the informational HCWA brochure to local residents	2008-2017	In-kind
	2.10 Participate in the OEPA TMDL process in 2009.	2010	N/A
	2.11 Produce a yearly calendar of upcoming watershed events in the Honey Creek / Great Miami River Watershed.	Annually	N/A
	2.12 Promote and participate in the Great Miami River Clean Up.	Annually	N/A
	2.13 Distribute watershed wide	Biannually	$24,000

	newsletters biannually.	2008-2017	
	2.14 Work with local jurisdictions on Phase II Storm Water issues	Ongoing	N/A
	2.15 Implement "Test Your Well" Program	Annually	$12,000
3. Promote implementation of watershed best management practices (BMPs) i.e. Riparian corridor, filter strips, low impact development, nutrient mgmt.	3.1 Reduce nutrient input in watershed at least by 50%.	2008-2017	N/A
	3.2 Increase number of contacts with landowners at least by 25% to inform about BMPs, MCD Water Quality Trading Program, and other incentive programs.	2008-2017	N/A
	3.3 Maintain BMP research by establishing up to 4 demonstration sites.	2008-2017	$460,000
	3.4 Work with local golf courses and nurseries to implement best management practices	Annually	N/A
	3.5 Annually evaluate BMPs on monitoring network data.	Annually	N/A
4. Develop and implement strategies to assist landowners in the maintenance and operation of household sewage treatment systems.	4.1 Educate landowners on the proper maintenance of household sewage treatment systems (HSTS). i.e. Educational brochure	Ongoing	$10,000
	4.2 Obtain grant funding and financial assistance for HSTS repairs and/or upgrades	Ongoing	N/A
	4.3 Work with the local health departments to identify problem areas within the Honey Creek / Great Miami River Watershed with failing and/or discharging HSTS.	Ongoing	N/A
	4.4 Participate in implementing 2 experimental HSTS locations.	2008-2017	$40,000
	4.5 Hold an educational HSTS workshop annually.	Annually	$2,000
	4.6 Promote the creation of HSTS Plans in Montgomery, Clark and Champaign Counties.	2008-2017	N/A
5. Operate strategically to assure the sustainability of the organization.	5.1 Organize and maintain HCWA committees.	Ongoing	N/A
	5.2 Maintain and expand HCWA membership.	Ongoing	$5,000
	5.3 Develop and implement a sustainable finance plan.	2008	N/A
	5.4 Maintain a balanced Board of Directors.	Ongoing	N/A
	5.5 Maintain area watershed networks and stay current on new technology and developments of watershed issues.	Ongoing	N/A
	5.6 Annually review the goals and objectives of the HCWA.	Annually	N/A
	5.7 Conduct monthly HCWA Board of Director meetings	Monthly	N/A

***N/A - Unable to put a cost to this objective.

Purpose of the Watershed Action Plan

The purpose of this watershed action plan is to provide an outline on how to restore and maintain the chemical, physical, and biological integrity of the Honey Creek / Great Miami River Watershed. It is a "community based" document that addresses the water quality and habitat degradation concerns voiced by citizens within the watershed. It is also a "living document" which will be updated and revised as new watershed information emerges and implementation practices are established. The plan is written on a ten year time frame (2008-2017) and will be evaluated each year to include updates as needed.

The contents of this WAP are designed to give a detailed inventory of the Honey Creek / Great Miami River Watershed (HUC – 05080001 200), its land use, natural resources, demographics, and potential pollution problems. It will cover:

- The physical definition of the watershed, such as where it is located and what incorporated areas are within its boundaries
- The demographics of the watershed, such as educational levels and economic patterns
- General watershed information
- Information about the history and structure of the Honey Creek Watershed Association and its legal status
- A detailed physical description of the watershed, including information about soils, flora, fauna, water resources and land use
- The cultural resources of the watershed
- Current and past educational activities and conservation practices implemented
- Detailed problem statements listing watershed impairments, their causes, and proposed restoration and implementation goals, and implementation timeline

Project Background

On November 4, 1991 the Miami County (Ohio), Board of Commissioners approved the *Miami County Green Space Plan.* The purpose of this plan was "to preserve river corridors and greenways so that wildlife and natural vegetation can survive, and protect the beauty of the natural landscape for the people of Miami County." The Honey Creek/Great Miami River Corridor and Honey Creek wetlands were cited in the plan as two key areas for preservation and management.

In 1997 the Miami Valley Regional Planning Commission (MVRPC) completed a two year inventory of wetlands in six southwestern Ohio counties. The study was funded by US-EPA Region 5. The most significant wetlands of the Miami Valley Region share the same buried valley aquifer, but are located in three surface watersheds: 1) Honey Creek Wetlands, Honey Creek Watershed, 2) Wenrick Fen/Medway Kettle Hole Complex, Mad River Watershed, and 3) the Beaver Creek Wetlands, in the Little Miami River Watershed. (Mutter, Miami Valley Wetlands Inventory, December 1997).

Also, in 1997, three (3) local stakeholder groups stepped forward to lead the development of the Honey Creek/Great Miami River Watershed Steering Committee: the Miami County Park District (MCPD), the Miami Soil & Water Conservation District (MSWCD), and the Ohio State University Extension (OSUE). The Committee's goal was to develop a watershed action plan (WAP) that emphasized the preservation of wetlands, groundwater, and surface water resources. Representatives from the following organizations were part of the Honey Creek/Great Miami River Watershed Steering Committee:

City of Huber Heights
City of New Carlisle
City of Tipp City
Village of Christiansburg
Miami Co. Park District
National Trail Park & Recreation
Silver Lake Beach
Miami Valley Regional Planning Commission
Miami Conservancy District
Tri-Cities North Regional Wastewater Authority
US Filter
OSU Extension
Ohio EPA, SWDO
Miami Soil and Water Conservation District
Clark Soil and Water Conservation District
Montgomery Soil and Water Conservation District
Miami Co. USDA/NRCS
Champaign Co. USDA/NRCS
Hartzell Industries
Jackson Township / Champaign County

It was quickly realized that the development of a WAP would require additional financial support. The Steering Committee applied for a $15,000 Ohio EPA 319 Grant for the development of the WAP, which was awarded in January 1998.

The Miami Valley Regional Planning Commission (MVRPC) was asked by the Steering Committee to submit a proposal for the development of the water resource inventory (WRI), the first step in the WAP process. To satisfy the additional funding needs of MVRPC in developing the WRI, the Steering Committee applied for and received another grant in 1999. This grant, in the amount of $40,000, was awarded by the US EPA Watersheds and Wetlands Section. MVRPC published the *Water Resources*

Inventory of the Honey Creek/Great Miami River Watershed in April 2000. This publication provided a baseline of information regarding the water resources of the watershed and the foundation for the development and implementation of the WAP. It was organized into four sections: background information on the HCWA and WRI methodology; general description of the surface water quality standards attainment, and information on soils, wetlands, wildlife, and groundwater resources; significant potential pollutant sources and impacts to the water resources; management and regulatory programs that are in place to address watershed protection; and major findings, conclusions, and recommendations for the watershed, key protection priorities, data gaps, and future work elements.

Building Public Support

With the WRI complete, the Steering Committee set-up seven (7) Town Hall meetings in a diversity of watershed communities to gain public input on the WRI and support of the Honey Creek Watershed Association (HCWA). Over 200 people participated in these meetings. At each meeting, the attendees where presented with short presentations about the HCWA, then asked to work in small groups to determine their top two (2) priority goals and what objectives could be used to accomplish them. The results of the goal establishing exercise are shown in **Table 2**. **Appendix A** contains a summary of town hall meetings (October 2000-August 2001)

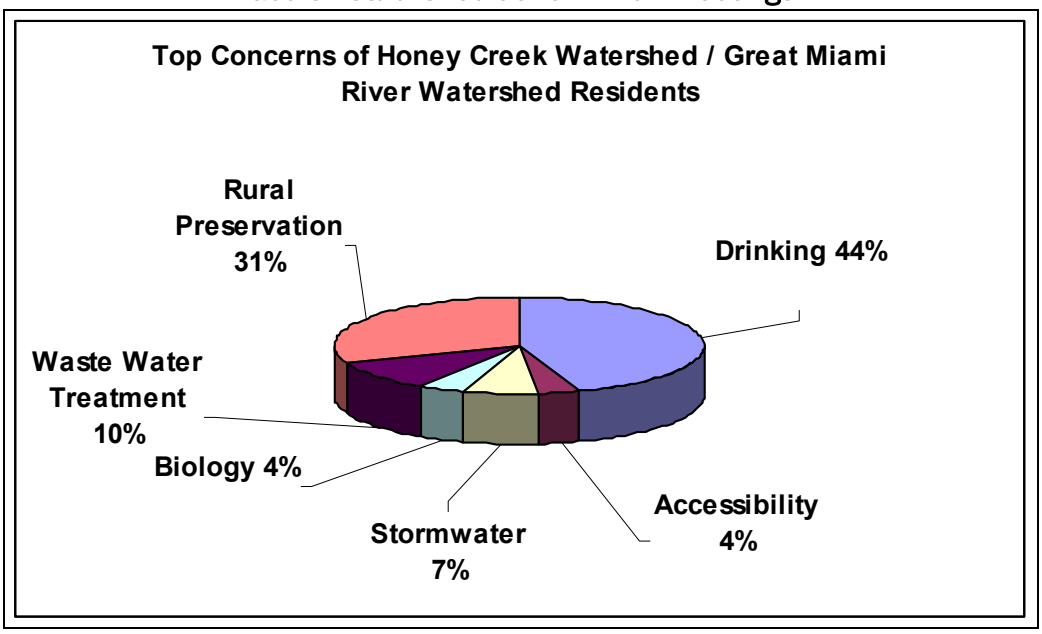
Table 2
Town Hall Meeting Goal Summary

Meeting Location	Date	No. Attend	Goal # 1	Goal # 2
NEW CARLISLE	10/12/00	68	Drinking Water	Rural Preservation
BETHEL TOWNSHIP	11/16/00	30	Drinking Water	Rural Preservation
ELIZABETH TOWNSHIP	01/11/01	46	Drinking Water	Rural Preservation
CHRISTIANSBURG	03/08/01	48	Drinking Water	Wastewater Treatment
TIPP CITY	04/05/01	17	Accessibility	Drinking
HUBER HEIGHTS	06/04/01	14	Drinking Water	Storm water
VANDALIA	08/16/01	18	Storm Water	Biology

The results of the meeting showed a strong concern by all residents to protect our drinking water. The first four (4) meetings (New Carlisle, Bethel Twp, Elizabeth Twp, and Christiansburg) are all in rural areas. Residents of these areas also expressed a strong concern for the preservation of rural lands, especially prime agriculture land. The Village of Christiansburg is without a centralized sewer system and they expressed a concern for waste water treatment in that region of the watershed.

Contrastingly, the later three (3) meetings (Tipp City, Huber Heights, and Vandalia) all occurred in more urbanized areas. These residents expressed slightly different concerns, including storm water management, accessibility to streams and wetlands, and the protection of aquatic biology. **Figure 2** illustrates the percentage of citizens concerned about the six (6) goals identified.

Figure 2
Goals Established at Town Hall Meetings



Honey Creek Watershed Association

The Honey Creek Watershed Association (HCWA) was formed in 2002 out of the Honey Creek / Great Miami River Watershed Steering Committee. The HCWA became incorporated on July 23, 2002 and on January 23, 2003 they adopted a set of by-laws that govern the HCWA. See **Appendix B** for a complete copy of the HCWA By-laws. In March 2006, the HCWA officially became a federally recognized 501 (c) nonprofit organization that serves as a public charity [170(b)(1)(A)(vi)]. **Appendix C** contains a summary of past HCWA events leading up to today.

The HCWA is managed and directed by the HCWA Board of Directors; a consortium of eleven (11) elected members serving three (3) year terms. The membership is asked to be mindful of the incorporation of representatives from all stakeholder groups in electing members to the Board of Directors. The Board of Directors sets the agenda of the HCWA by guiding the HCWA Watershed Coordinator in activities pursuant to the goals and objectives outlined by the community. **Table 3** lists the members of the 2007 HCWA Board of Directors (one position is currently vacant). The Board of Directors have the ultimate authority to do the following: establish the rules, objectives, and long range plans for the HCWA subject to approval at the annual meeting; establish operating policies; appoint a watershed coordinator for an indefinite period; evaluate the performance and progress of the association in

accomplishing its mission and purpose; authorize contracts and applications on behalf of the HCWA; designate signers for checks, drafts, and other orders for payment of money. At least nine meetings are held annually and are usually held on the second Thursday of the month to discuss financial issues and review HCWA activities. In order to conduct business, half of the ratified Board of Directors must be present.

Table 3
2007 Honey Creek Watershed Association Board of Directors

NAME	AFFLIATION
Mo Eichman, Chairman	City of Tipp City
Holly Weatherhead, Vice Chairman	Veolia Water North America
Ron Jackson, Secretary	Miami County Health Department
Amy Holden, Treasurer	Elizabeth Township (Miami Co.) Resident
Scott Myers	Miami County Park District
John Geiger	City of Huber Heights
Melvyn Roeth / Steve Hodge (Miami SWCD Position)	Miami County Soil and Water Conservation (MSWCD) Supervisors
Dawn Coleman	Jackson Township (Champaign Co.) Resident
Cyrus Circle	Jackson Township (Champaign Co.) Resident
George McConkey (Clark SWCD Position)	Clark Soil & Water Conservation District (SWCD)

Funding Sources

Table 4 is a summary of grants awarded in the Honey Creek / Great Miami River Watershed. In 2001, the HCWA and the Miami County Park District received an Ohio Department of Natural Resources Watershed Coordinator grant to fund a full time watershed coordinator. This was a six year grant in which the watershed coordinator was fully funded by ONDR the first year, with each subsequent year working with a 10% reduction, but receiving the difference through sponsorship by the Miami County Park District. This grant expired at the end of 2006. The HCWA Watershed Coordinator was an employee of MCPD and MCPD managed the ODNR, Watershed Coordinator Grant budget and personnel as an "in-kind" local match. However, with the grant ending in December 2006, the operational and financial structure of the HCWA also changed.

In October 2006, the HCWA Watershed Coordinator became a Miami Soil and Water Conservation District (SWCD) employee.

This change occurred for two reasons: 1) any local contributions from towns, cities, municipalities, townships, and counties ran through the SWCD's earmarked for the HCWA could receive state match from the Ohio Department of Natural Resources, Division of Soil and Water Conservation; and 2) the HCWA Watershed Coordinator was able to continue with the State of Ohio employee benefits.

Honey Creek Stream Bank Repair site.

The Honey Creek Watershed Association (HCWA) and the Miami Soil and Water Conservation District were recently awarded an Ohio Environmental Protection Agency (OEPA) 319 Non-point Source grant in the amount of $385,320. This three-year project will include a 510 linear foot stream bank repair on the Honey Creek and fund the HCWA Watershed Coordinator for a year and half. The project will also include an extensive education and outreach component designed to reach community members in the Honey Creek / Great Miami River Watershed.

The remaining funding comes from local and membership contributions. Membership is available to individuals or other persons with an interest in supporting the mission and purposes of the Honey Creek Watershed Association. As a member you will receive: reminders of upcoming events; an invitation to the annual membership picnic in May; and the knowledge that 100% of membership dues go directly toward education, water quality monitoring and community watershed events. The annual membership break down is as follows:

- Individual - $10
- Family - $25
- Supporting - $50
- Business Gold - $100
- Business Platinum - $500
- Lifetime Supporter - $1,000
- Township, Village (depending on budget) - $500 / $1,000
- Cities / Counties - $2,000

The annual membership drive currently takes place from January – May. The drive concludes with the annual membership meeting held in May. The HCWA has developed a four year operating budget which will focus on educational activities that will include watershed education presentations to local groups and organizations, stream team materials, watershed tours, and the annual Honey Creek Watershed Festival. The budget also includes funding for the annual HCWA Membership picnic, general operating expenses and operational support. Our goal is to raise approximately $33,000 each year.

Historically, the HCWA has been funded, by in-large, by state and federal grants. As the focus of the HCWA turns from planning to implementation, and different grants become available or are discontinued, the HCWA anticipates future funding will consist of a growing proportion contributed by local entities through memberships, matches, and donations. The HCWA will continue to pursue state and federal funding as it is available for special projects, but is strongly pushing to obtaining self-sustainability from local support.

Table 4
Grants Awarded For Conservation Efforts in the Honey Creek Watershed / Great Miami River Watershed (HUC # 050800001 200)

Grant Name	Funding Source	Local Match	Year(s)	Amount	Final Product
Section 319 Grant	OEPA	N/A	1998	$15,000	Watershed Action Plan (WAP)
Watershed & Wetlands	US EPA	N/A	1999-2000	$40,000	Watershed Resource Inventory / WAP
Watershed Coordinator	ODNR,DSWC & OEPA	MCPD	2001-2006	$200,000	Coordinator Salary and Fringe Benefits
Watershed Resources Restoration Sponsorship Project (WRRSP)	OEPA	Various	2001-2004	$1,900,000	74% of the funding was utilized for the acquisition of wetlands and water monitoring equipment. 393 acres are protected.
Operations Support Grant	ODNR,DSWC	N/A	2002-2003	$7,000	HCWA road signs, HCWA operations
Ohio Environmental Education Fund	OEPA	MCPD	2004-2006	$41,595	Honey Creek / Great Miami River Watershed Wide Education Program
Ohio EPA Water Lab Analysis Funding	OEPA	HCWA	2005	$20,695	Water sampling / analysis on 11 sites
Section 319 Grant	US EPA	Miami SWCD Various	2007-2010	$385,320	Honey Creek Stream Bank Repair Project

The HCWA has established a fundraising committee who is responsible for evaluating how the organization will obtain future funding. Currently, they are working on asset-based community development, in which they develop a list of people/businesses in the watershed that could be potential financial supporters to the HCWA. They are also developing the *"Essential Story"* for the HCWA which is a story less than two minutes and conveys the impact of our watershed work. From this they will organize a *"Traveling Sales Plan"* which will be used to gather funding from local sources in the watershed. Also, a narrated educational HCWA PowerPoint Presentation was created and will be shown to various businesses, townships, cities, counties, etc. explaining the importance of the Honey Creek / Great Miami River Watershed, pollution problems, the history of the HCWA, various HCWA activities, and much more.

Education and Community Outreach

The HCWA sponsors a wide variety of educational activities throughout the year. We hope to continue these as well as add several more educational opportunities such as: septic system / lawn care program, storm drain stenciling program, educational canoe floats, biannual newsletter and BMP tours over the next ten years.

Annual HCWA Educational Activities

Educational Activity	When Held	Average # Attending
Honey Creek Watershed Festival	April / May	500
Membership Picnic	May	40
Monthly Board of Director Meetings	2nd Thursday of the Month	10
Stream Team	Quarterly	8
"Hug the Watershed" Program	January-May	1000
Great Miami River Clean Sweep	July	1100
Adopt-A-Highway	Quarterly	5

The following is a description of the HCWA educational activities offered to date:

The Banana Slug String Band performing at the 2006 Honey Creek Watershed Festival.

Honey Creek Watershed Festival

The festival is a one-day event that occurs annually in the spring to celebrate the watershed. The event is free to the public and includes live entertainment, children's performances, games, crafts, canoe

floats, stream exploration, food, wagon rides, and much more!

Annual HCWA Membership Picnic

The Annual HCWA Membership Picnic occurs in the summer. All members, potential members, watershed residents, and anyone with an interest in the watershed are invited to attend. The meeting normally includes a picnic or pot-luck dinner, awards, auction, and voting for officers.

Seining for macroinvertebrates

Monthly Board of Director Meetings

HCWA Board of Director meetings take place on the second Thursday of every month from 2:30-4:00pm at 8787 Sullivan Road Tipp City, OH 45371. Members of the Board of Directors are required to attend, but the general public is also welcome. The meetings include discussions of upcoming events, financial status, future goals, etc.

Stream Team

The Stream Team is a group of volunteers who regularly monitor the biological integrity of streams within the watershed to determine the status of water quality. Volunteers are trained by the HCWA staff (training held every summer) to identify organisms living in the streams that are indicative of water quality. The data is complied and reviewed to determine if there have been any changes over time.

Adopt-A-Highway

All litter runs into our streams when it rains. Therefore, the HCWA has adopted a two (2) mile stretch of State Route 201 where we pick-up and dispose of litter properly. Clean-ups occur three (3) times a year.

Honey Creek Watershed Association Educational Display

Watershed Education

In 2004, MCPD and HCWA received a grant from the Ohio Environmental Education Fund (OEEF) to develop and implement a Watershed Wide Education Program ("Hug the Watershed with the Banana Slug Band" and "Watershed Rock-n-Roll with Chris Rowlands") to "promote awareness for the protection of watersheds." This program is designed to engage students, their families, and communities in learning about how everyday activities can affect the quality of water. Watershed concepts are re-enforced through songs, field trips, and

models. The Annual Honey Creek Watershed Festival is the culmination of this education program.

Adult education is provided through informational meetings, public speaking engagements, and responding to a variety of questions from interested residents. We also display watershed information at several area events, such as local fairs and festivals, and we produce and distribute watershed informational packets to area residents. The Village of Christiansburg also distributed watershed information on the aquifer and the HCWA in their "*Consumer Confidence Report*", which is a requirement of the federal and state government to notify water consumers of pollutants and violations of their water consumption. The report was sent out to approximately 250 water consumer residents.

Restoration Projects

The HCWA has applied for numerous grants to fund stream restoration projects throughout the watershed. This includes stabilizing stream banks, protecting riparian zones, and addressing water quality concerns.

Septic System Remediation

Since much of the Honey Creek Watershed is rural land (77%), many homes have household septic treatment systems (HSTS) on their property. If these systems are damaged, improperly installed, or not maintained, the waste will enter our streams. This is a major health concern for residents, who often come in physical contact with the stream, use it for livestock, or allow it to flow downstream where it may impact drinking water supplies. The HCWA works to locate areas with failing septic systems by monitoring water quality and assist the owner in improving their system for the benefit of the community.

HCWA Website

The website, www.honeycreekwatershed.org, provides a history of the HCWA, local events sponsored by the HCWA, watershed facts, Board of Director minutes and HCWA contact information.

Great Miami River Clean Sweep

Every year in July this trash clean up takes place. The clean up starts at the headwaters of the Great Miami River and goes all the way to the mouth, involving several watershed-concerned organizations in seven counties, including the Miami Conservancy District, local soil and water conservation districts, local solid waste districts, watershed groups and Veolia Water NA. The HCWA is responsible for the section of the Great Miami River from Tipp City to Taylorsville Dam.

Farmland Preservation

The HCWA appreciates the rural culture of the watershed and we work to maintain this land use through education and participation in local zoning and development decisions.

HCWA Watershed Signs

Six watershed signs are posted throughout the watershed letting residents know they are in the Honey Creek / Great Miami River Watershed. It is planned to order more signs to distribute throughout the watershed.

HCWA Watershed Sign, Rip Rap Road, Huber Heights, Ohio

HCWA Watershed Brochure

The HCWA brochure was produced to educate area residents about the activities sponsored by HCWA, the goals and objectives of the organization, and information on how to become a HCWA member.

HCWA Publications

The following publications have been produced:
Water Resources Inventory of the Honey Creek / Great Miami River Watershed (MVRPC, 2002)
Watershed Action Plan of the Honey Creek / Great Miami River Watershed (MVRPC, 2002)
Honey Creek Watershed Association Information Brochure (HCWA, 2001 ,2004, 2007)

CHAPTER 2: WATERSHED INVENTORY

Introduction

The watershed inventory section is a comprehensive list of data gathered about the Honey Creek / Great Miami River Watershed. It includes physical, biological, habitat, and land use characteristics of the watershed. The beginning portion addresses the watershed as a whole, while the later portion addresses specific attributes of the six (6) subwatersheds that form the Honey Creek / Great Miami River Watershed. The information presented is a compilation of available state and local data as well as the information gathered for the production of the Water Resource Inventory (WRI), published by MVRPC in April 2000.

Honey Creek, Bethel Township, Miami County.

Physical Characteristics

The Honey Creek / Great Miami River Watershed (HUC # 05080001200) drains 143 square miles in west central Ohio, covering portions of four counties: Champaign (10.4%), Clark (17.5%), Miami (47.6%), and Montgomery (24.5%). The watershed includes all of the Honey Creek Watershed (90 mi^2) and a portion of the Great Miami River between the mouth of Honey Creek and the mouth of the Mad River, excluding the Stillwater River Watershed (53 mi^2). **Map 2.** The watershed encompasses a total of 91,803 acres and is part of the upper Great Miami River drainage basin which flows into the Ohio River. It also includes more than 140 square miles that overlies the Buried Valley Aquifer that supplies drinking water for more than 1.5 million people.

Honey Creek / Great Miami River Watershed Fact Sheet

USGS 11 – Digit Hydrologic Unit Code	050800001 200

Counties

Champaign	10.4%
Clark	17.5%
Miami	47.6%
Montgomery	24.5%

Watershed Size

Drainage Area	143 square miles
Total Acres	91,803 acres

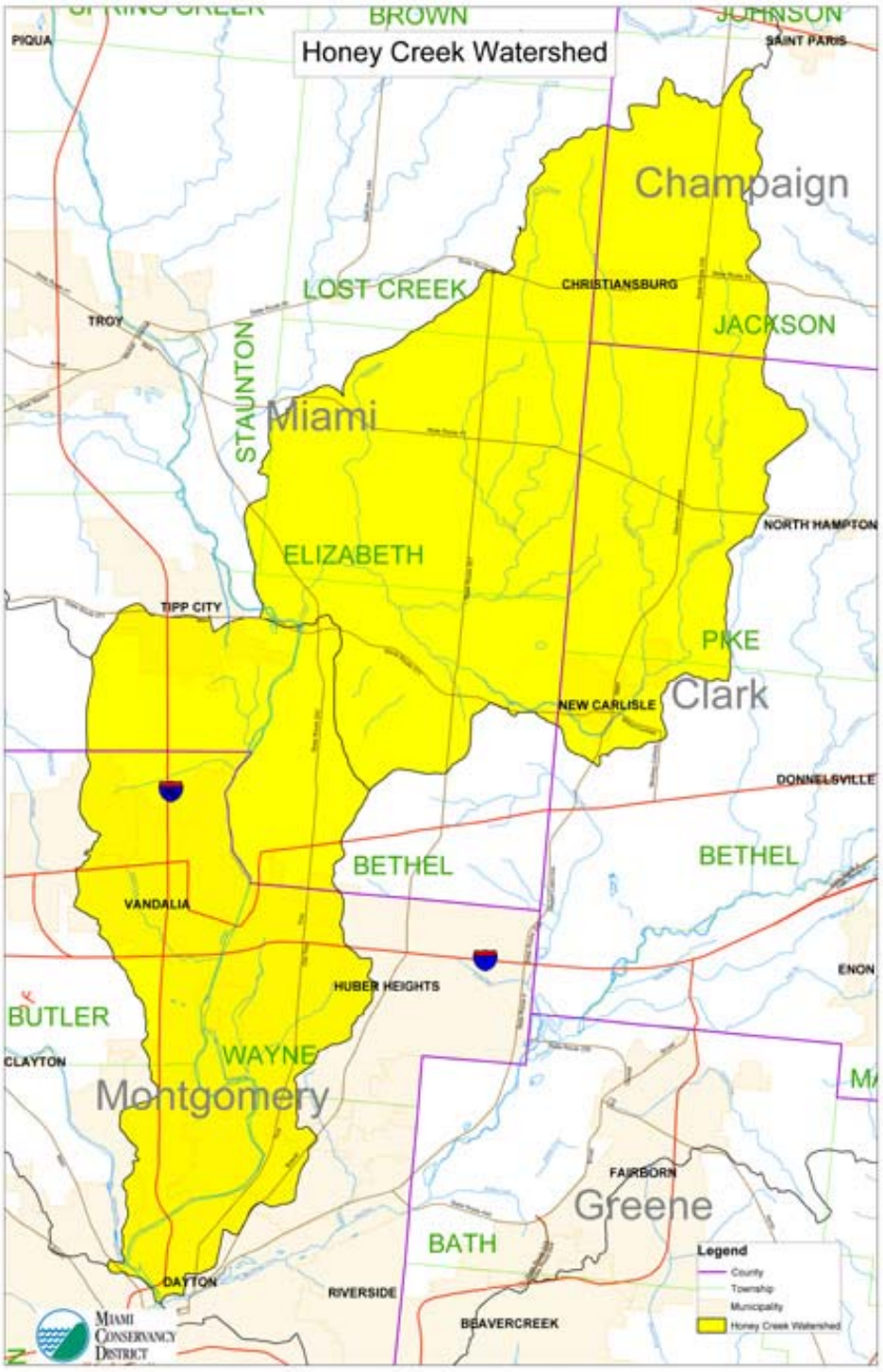
Stream Length

Main Stream	72 miles

Land Use Designations

Wooded / Forested	18.85%
Residential / Urban	28.71%
Agriculture	51.57%
Water	0.877%

MAP 2
HONEY CREEK / GREAT MIAMI RIVER WATERSHED
11-DIGIT HUC # - 050800001 200



Administrative Boundaries

Jurisdiction	County	State
City of Dayton	Montgomery	Ohio
City of Huber Heights	Montgomery	Ohio
Harrison Township	Montgomery	Ohio
Butler Township	Montgomery	Ohio
City of Vandalia	Montgomery	Ohio
Monroe Township	Miami	Ohio
Bethel Township	Miami	Ohio
City of Tipp City	Miami	Ohio
Elizabeth Township	Miami	Ohio
Lost Creek Township	Miami	Ohio
City of New Carlisle	Clark	Ohio
Pike Township	Clark	Ohio
Bethel Township	Clark	Ohio
Village of Christiansburg	Champaign	Ohio
Jackson Township	Champaign	Ohio

Local Land Protection Groups

Name	Mission
Bethel Township Historical Society	Historical Preservation
B-W Greenways	Land Trust and Conservation
Champaign Co Preservation Alliance	Historical Preservation
Champaign Land Preservation	Land Trust
Champaign Co SWCD	Conservation Education
Clark Co Park District	Public Parks
Clark Co SWCD	Conservation Education
Dayton Society of Natural History	Historic Preservation and Education
Elizabeth Township Historical Society	Historical Preservation
Five Rivers MetroParks	Public Parks
The Miami Conservancy District	Land Trust / Conservation Education

Miami Co Park District	Public Parks
Miami Rural Conservation & Historical Assoc.	Conservation & Historic Education
Miami Co SWCD	Conservation Education
Miami Pheasants Forever	Conservation
Montgomery Co SWCD	Conservation Education
Miami Valley Regional Planning Commission	Conservation Education
Natural Resource Conservation Service	Conservation Education
National Trail Parks and Recreation	Public Parks
Montgomery Solid Waste District	Conservation Education
Miami Solid Waste District	Conservation Education
W-H Greenways	Land Trust and Conservation

Districts

There are several different districts within the watershed that promote water conservation and education,

- Champaign, Clark, Miami & Montgomery Soil and Water Conservation Districts
- Clark County Park District
- Clark County Combined Health District
- Clark County Waste Management District
- Miami Conservancy District
- Miami County Health District
- Miami County Park District
- Miami Solid Waste District
- Montgomery Soil Waste District
- National Trails Parks and Recreation District (Clark Co.)
- School Districts include:
    - Bethel Local Schools
    - Dayton City Schools
    - Graham Local Schools
    - Huber Heights City Schools
    - Miami East Schools
    - Tecumseh Local Schools
    - Tipp City Schools
    - Vandalia Butler Schools

There are several agricultural districts throughout the Honey Creek / Great Miami River Watershed.

Agricultural District sign

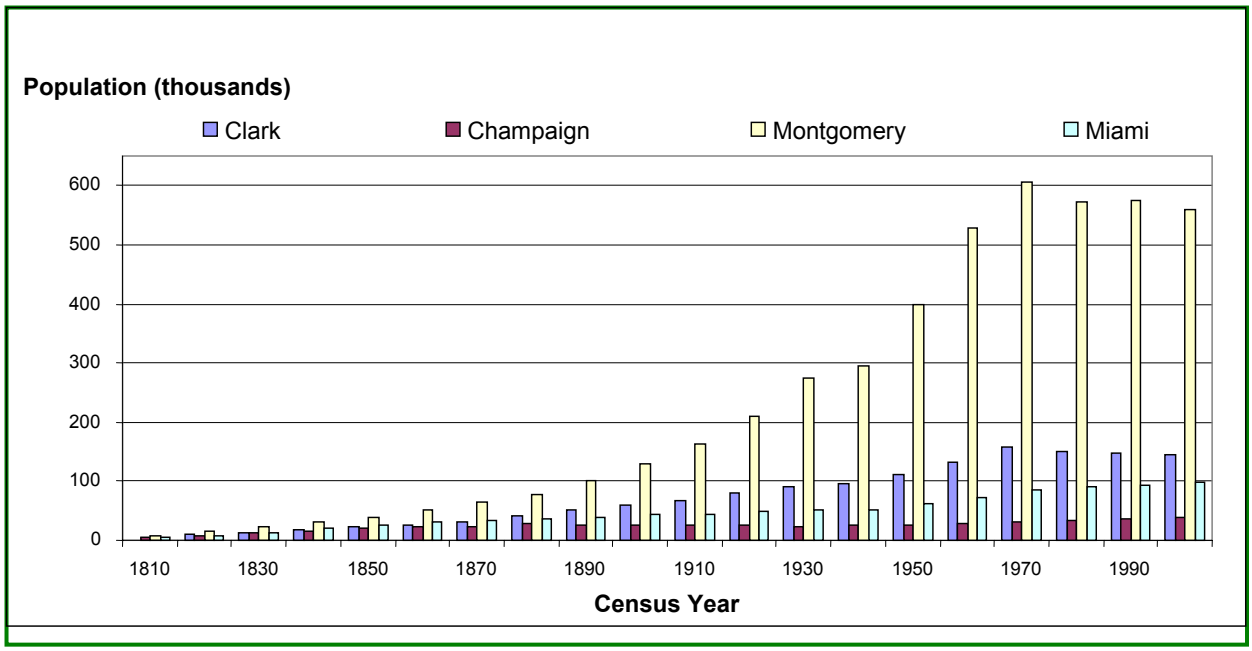
Demographics

According to the 1990 Census Block data, the total population of the Honey Creek / Great Miami River Watershed is approximately 95,000 people. The population

density of the watershed is 660 people per square mile. However, the population distribution is strongly polarized between the upper and lower portions of the watershed. Nearly 80,000 people were recorded in the Great Miami River subwatershed with a density of nearly 1,500 people/mi^2. In contrast, the Honey Creek Watershed had a population of 15,000 with density of only 173 people/mi^2.

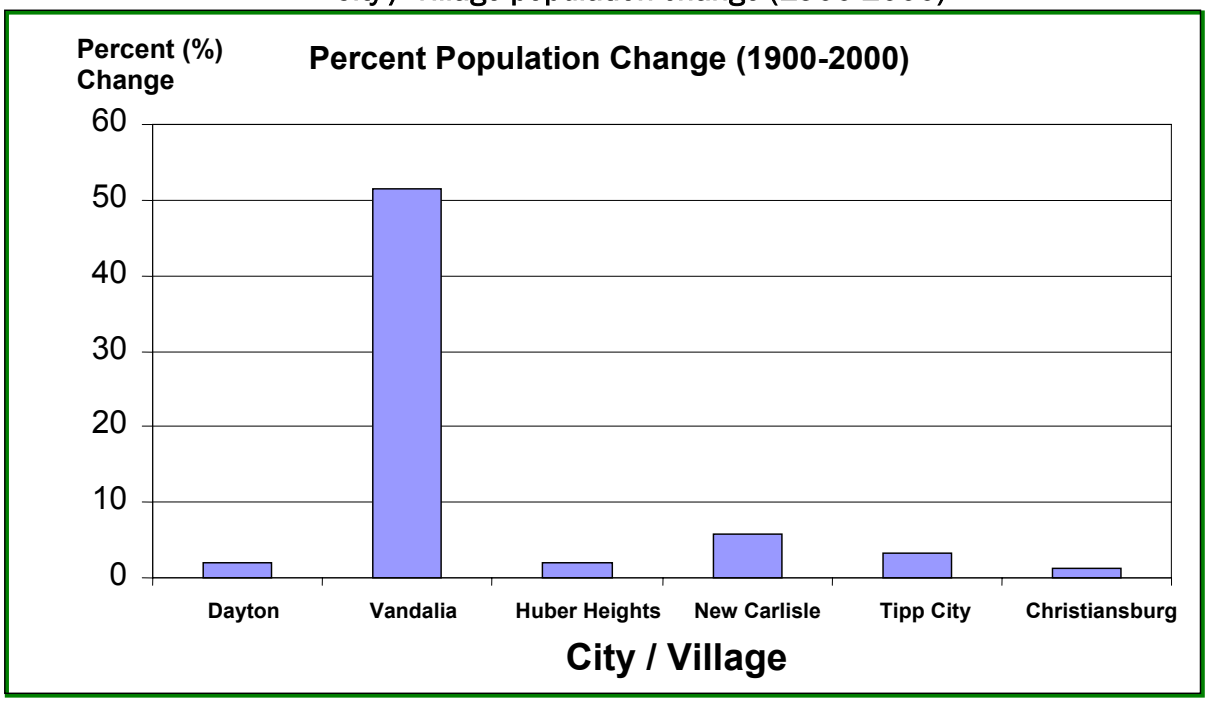
Montgomery County is the most populated county within the Honey Creek / Great Miami River Watershed, followed by Clark, Miami, and Champaign (**Figure 3**). However, Montgomery County, which includes the large metropolitan area of Dayton, is the only county that has seen a drop in population (between 1970 to 2000) as people move farther into the suburbs.

Figure 3
Population Change in the Honey Creek / Great Miami River Watershed by Counties (1810-2000)



The City of Vandalia, and the surrounding Butler Township, is the fastest growing areas in the watershed. In the past century, the City of Vandalia's population has increased by 51.4%, compared to Dayton (1.9%), Huber Heights (2%), New Carlisle (5.7%), Tipp City (3.2%), and Christiansburg (1.1%) (**Figure 4**). However, these statistics are misleading because they indicate population following incorporation of the city or village. For example, the City of Huber Heights was not incorporated until 1960, but has seen a population boom that is not evident in the census data.

Figure 4
City / Village population change (1900-2000)



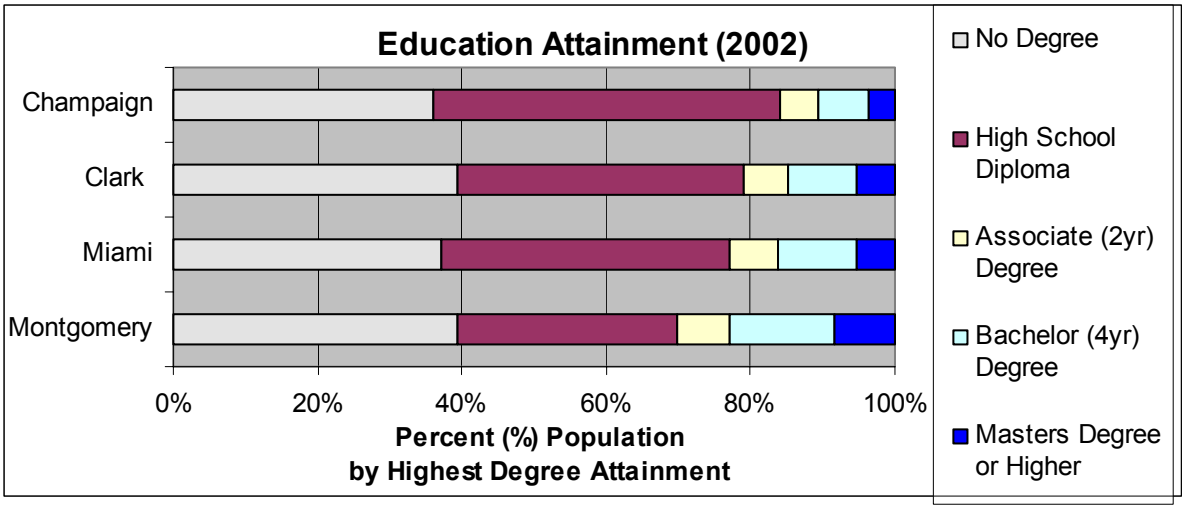
Economics

The median household income, unemployment rate, and percent of the population in the work force are listed in **Table 5.** The deviation between counties is minimal. Education level, also an indicator of economic status, indicates between 35-40% of residents have no high school degree. Montgomery County has the largest percent of residents with upper level degrees (beyond high school) and Champaign has the lowest. See **Figure 5** for more information.

Table 5
Economic Indicators by County (2002 Census Data)

County	Median Household Income	Unemployment Rate	% Population in Work Force
Montgomery	$40,156	5.6%	64.1%
Miami	$44,109	5.5%	68.7%
Clark	$40,340	5.2%	63.7%
Champaign	$43,139	6.3%	67.4%

Figure 5
Education Attainment by County

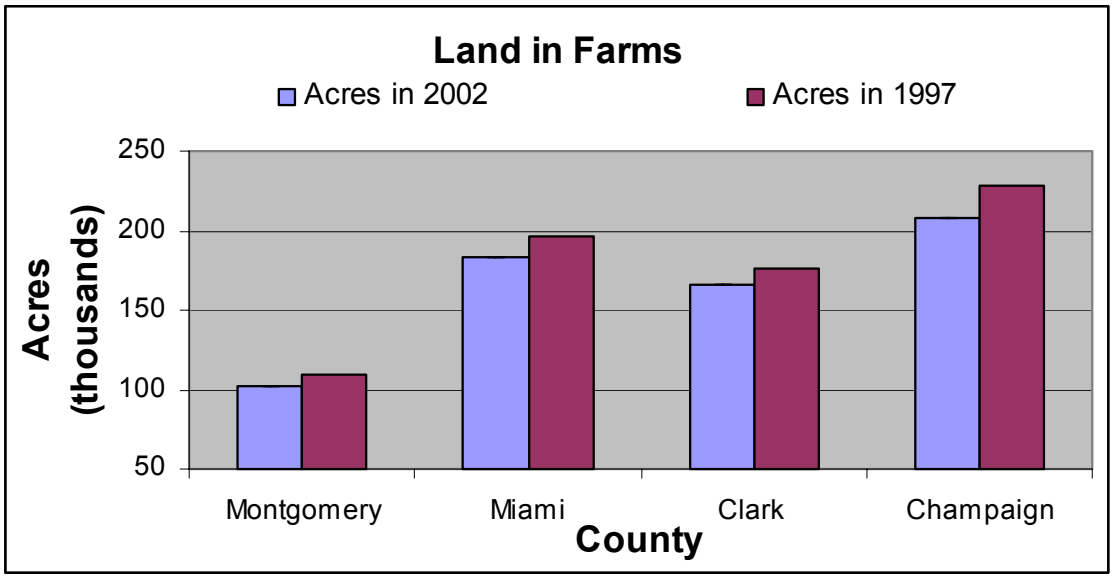


Agriculture & Economy

The entire Honey Creek / Great Miami River Watershed is dominated by agricultural land use. Of the four (4) counties within the watershed, Champaign and Miami contain the most acres of farmland. However, all four (4) counties have experienced a decrease in farm area between 1997 and 2002 **(Figure 6 & Table 6)**. The percent of farm land lost ranges from a 6% decrease in Miami and Clark Counties, 7% decrease in Montgomery County, and 9% decrease in Champaign County. This loss can be attributed to a scattered large-lot residential development pattern seen in the Great Miami River subwatershed and Honey Creek subwatershed. The market value of produce in each county has also decreased, by as little as 4% in Clark County, up to 39% in Miami County.

Farm Operation in the Honey Creek Watershed.

Figure 6
Farm Land (acres) by County



Cropland constitutes between 84% and 89% of all agricultural land in the watershed, with the top crops being (in order) soybeans, corn for grain, forage crops (e.g. hay), and wheat. Between 7.8% and 10.8% of farmland in the watershed is used for livestock. The most common type of livestock is cattle/calves, followed closely by hogs/pigs. Horses and sheep fill the next two (2) slots, but are in much smaller abundance than the latter. Refer to the *Subwatershed Inventory & Feedlot Sections* for a more detailed account of the livestock numbers.

The following tables list agricultural statistics provided by the 2002 Census of Agriculture County Profiles.

Table 6
Farm Numbers and Acreages by County

	Champaign	**Clark**	**Miami**	**Montgomery**
Number of Farms 2002	937	756	1,071	832
Number of Farms 1997	952	769	1,102	895
Land in Farms 2002	207,554 acres	165,366 acres	184,028 acres	101,912 acres
Land in Farms 1997	228,737 acres	176,674 acres	196,511 acres	109,831 acres
Avg. Size of Farm 2002	222 acres	219 acres	172 acres	122 acres
Avg. Size of Farm 1997	240 acres	230 acres	178 acres	123 acres
Market Value of Production 2002	$50,447,000	$70,910,000	$39,809,000	$32,940,000
Market Value of Production 1997	$72,789,000	$74,169,000	$65,692,000	$36,296,000

Throughout most of the farmland in the watershed, a drainage system has been installed in areas consisting of inundated soils to improve crop production. Soil erosion is a serious problem in the watershed. The majority of sediment runoff is due to intensive agricultural practices and a lack of streamside filter strips.

Geology & Topography

The Honey Creek / Great Miami River Watershed is located in the Till Plains section of the Central Lowlands physiographic province. Over much of the area the topography is mostly level to gently sloping with slopes of 2% or less. Steeper relief is found along the major stream valleys and in areas of glacial kames and end moraines.

The watershed crosses the boundary of two geological systems: the Ordovician system (formed between 505-438 million years ago) in the southwestern portion of the watershed, and the Silurian system (formed between 438-408 million years ago) in the northeast portion. These layers were exposed when the bedrock bent upward, exposing the edges in a north-south pattern, presumably during the up-lifting of the Appalachian Mountains. The Ordovician system is characterized by layers of limestone and shale formed during a period when a shallow ocean covered the region. As a result, fossilized sea creatures are common in Ordovician rock. The Silurian layer was deposited later and is called Brassfield limestone.

Charleston Falls, Bethel Township, Miami County.

As the land lifted upward and arched with the forming of the Appalachian range, the region was raised above sea level. A large river system, the Teays, flowed from southeast to northwest through this region, extensively eroding the southwest part of Ohio until the glacial period, beginning approximately 200 million years ago.

A major, Wisconsin-age end moraine (Miami Lobe) extends into the watershed from the northeast straddling the north-south boundary between Miami, Clark and Champaign Counties. The end moraine is about 5 miles wide. This end moraine terminates at the main Honey Creek valley in southeast Miami County. A few isolated kames can be found along the margins of the Great Miami River and main Honey Creek valleys in Miami and Clark Counties. Kames consist of mounds of well-sorted glacial sand and gravel from 10 to 200 feet thick. (**Figure 7)**

Aquifer Types

The watershed is characterized by two distinctly different types of hydrogeologic environments[1]: 1) buried valleys, and 2) uplands. The general characteristics of each within the watershed are described below.

The buried valley aquifers consist of thick deposits of highly permeable outwash sand and gravel interbedded with less permeable, discontinuous lenses of till, silt, and clay. These glacial deposits fill ancient pre-glacial valleys carved in the region's limestone and shale bedrock formations underlying the present day drainages of the Great Miami River and Honey Creek. The saturated sand and gravel deposits are extremely permeable and regionally connected, allowing for the transmission and storage of vast amounts of groundwater. Lower permeability zones of till, silt and clay slow and redirect groundwater flow. Throughout most of the area the buried valley floor is based in relatively impermeable Ordovician shale bedrock. The buried valley walls consist of shale formations capped in some areas with younger, more permeable Silurian limestone formations through which groundwater flow may occur.

The buried valleys within the watershed are within the area designated by the USEPA as the Great Miami / Little Miami buried valley Sole Source Aquifer (SSA) in 1988 [2]. The bedrock aquifers that underlie the uplands are mainly composed of fractured limestone and dolomite formations that are capable of storing and yielding varying amounts of groundwater. The amount of groundwater that can be drawn from the bedrock is governed by the degree to which the fractures are interconnected and the availability of recharge. Yields from these aquifers are sufficient to support private and small community water supplies. SSA designation serves several purposes. First, it focuses attention on and raises public awareness about the aquifer system, its vulnerability to contamination, and the watershed area's dependence on groundwater. Second, it provides for a review of certain federal financially assisted projects to insure that they pose minimal threat to groundwater. Third, it makes the watershed area eligible for any federal funds that may become available under the Safe Drinking Water Act amendments for SSAs. Other State of Ohio programs currently recognize the SSA designation including the Ohio EPA in its rules for siting landfills and the Bureau of Underground Storage Tank Regulations (BUSTR) in its sensitive area and tank siting.

The overlying glacial aquifers are composed of mixtures of sand, gravel, clay and till materials that are deposited in various configurations and thicknesses across the upland terrain. Higher proportions of lower permeability deposits such as clay and till tend to impede groundwater flow, and in conjunction with low permeability soils act as significant barriers against groundwater contamination. In the upland glacial

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1 MVRPC. 1990. A Groundwater Protection Strategy for the Miami Valley Region. Vols. 1,2, 3 & 4.

2 MVRPC, 1987. Petition Requesting Sole Source Aquifer Designation for Portion of the Buried Valley Aquifer System of the Great Miami / Little Miami Basins in the Miami Valley Regional of Southwestern Ohio.

materials, private drinking water supplies are typically drawn from lenses and pockets of sand and gravel.

Groundwater Yields

The Ohio Department of Natural Resources (ODNR) describes the water bearing and yield characteristics of the geologic materials within the watershed on its series of County Groundwater Resource Maps[3]. For the purposes of this watershed action plan, MVRPC simplified the ODNR yield classifications into five categories ranging from greater than 500 gallons per minute (gpm) to less than 3 gpm.

The areas of greatest potential yield (>500 gpm) include portions of the Great Miami River buried valley near Tipp City and between Dayton and the Miami County line, in addition to smaller areas associated with the Mad River and Honey Creek buried valleys in southwestern Clark County. Yields from these sand and gravel aquifers may go up to and exceed 1,000 gpm. The remaining portions of the mainstem Great Miami River and Honey Creek buried valley typically have yields from the sand and gravel deposits of 100 to 500 gpm. About 23% of the Great Miami River Subwatershed (GMR SWS) and 12% of the Honey Creek Watershed (HC SWS) consist of the highly productive deposits included in these two yield categories.

In the upland areas flanking the buried valleys, groundwater yields are smaller, more varied, and come from both bedrock and scattered sand and gravel sources. A large area (44% of the HC SWS) falls within the 20 to 100 gpm yield category. In this area, yields from limestone bedrock aquifers may reach 100 gpm with yields from overlying sand and gravel zones up to 35 gpm. Approximately 13% of the GMR SWS has deposits in the 20 to 100 gpm yield range.

Large areas in both subwatersheds have potential groundwater yields in the 3 to 20 gpm category where supplies come from shallow limestone bedrock and sand and gravel ones in the relatively thin glacial deposits. Approximately 41% of the GMR SWS and 44% of the HC SWS have yields in this range. About 23% of the area within the GMR SWS has yields of less than 3 gpm. These areas are located in bands along the flanks of the Great Miami buried valley where the glacial deposits are very thin and overlying low permeability shale bedrock. No significant areas of this low yield category are found in the HC SWS.

[3] ODNR, County Groundwater Resources Maps. Miami Co.(Schmidt, 1984); Clark Co. (Schmidt, 1982); Champaign Co. (Schmidt, 1985); Montgomery Co. (Schmidt, 1986).

FIGURE 7
GENERALIZED GEOLOGIC SECTION OF THE HONEY CREEK / GREAT MIAMI RIVER WATERSHED

SYSTEM	SERIES	FORMATION (average thickness)	GENERAL DESCRIPTION
Quaterary	Pleistocene	Quaternary Undifferentiated Glacial Deposits (5 - >200 feet)	Moraine consisting of sequences of low permeability glacial till interbedded with thin discontinuous zones of sand and gravel. Private water supplies drawn from permeable lenses of sand and gravel.
Silurian	Niagaran	Cedarville Dolomite (50+ feet)	Massive to thick bedded, white to medium gray dolomite. Groundwater primarily occurs in fractures, joints, bedding planes, and solution cavities. Yields of 10 to 20 gpm for most private water supplies. Yields of up to 100 gpm for larger diameter industrial and municipal wells installed in the most porous zones. Spring zones commonly form along top of less permeable beds along valley walls. These formations also known as the Lockport Dolomite in northwestern and west-central Ohio.
		Springfield Dolomite (14 feet)	
		Euphemia Dolomite (8 feet)	
	Alexandrian	Laurel Dolomite (5 feet)	Mostly thin to thick bedded, light gray to brown dolomite and limestone. Low permeability Osgood Shale is calcareous with thin beds of limestone. Groundwater primarily occurs in fractures, joints, bedding planes, solution cavities, and on top of shale zones. Spring zones commonly form along top of less permeable beds along valley walls. Yields up to and exceeding 75 gpm possible in highly permeable fracture zones. These formations also known as the sub-Lockport in northwestern and west-central Ohio.
		Osgood Shale (8 feet)	
		Dayton Limestone (8 feet)	
		Brassfield Limestone (30 feet)	
Ordovician	Cincinnatian	Richmond/Maysville Undifferentiated (1,000+ feet)	Soft calcareous shale interbedded with thin beds of limestone. Generally a poor source of groundwater within the Miami Valley Region.

Source: After Norris et al. (1948, 1950), Selby (1978), and ODNR County Groundwater Pollution Potential Reports (various dates).

Well Field Protection Areas

In accordance with Ohio's Wellhead Protection Program[4] many communities in the Miami Valley have or are developing programs to identify and manage potential risks to their groundwater supplies. These programs generally include the delineation of protection areas surrounding wells, and inventory of potential sources of pollution, and the development of an overall management strategy that includes education and broad-based community input. The regulations include some prohibitions related to waste disposal and substance storage, as well as require reporting and the use of best management practices.

In the GMR SWS, the City of Dayton has established a comprehensive well field protection program to mainly manage threats from commercial and industrial facilities surrounding its well fields along the Mad and Great Miami Rivers. Dayton's program is largely based on the use of overlay zoning districts and regulations that prohibit certain types of waste disposal and substance storage, as well as require reporting and the use of best management practices. Huber Heights has not yet developed a well field protection program. The Huber Heights south well field is however receiving some level of protection as it is embedded in the City of Dayton's well field protection area and the City of Huber Heights has enacted a well field protection ordinance for its jurisdiction within Dayton's well field protection areas. The Al Ballinger Mobile Home Park community water supply is located in southern Miami County. While it has not developed its own well field protection program, a preliminary delineation of a well field protection area for planning purposes was done by MVRPC in 1990[5]. The protection areas for the Dayton, Huber Heights, and Al Ballinger MHP well fields are shown on **Map 3**.

In the HC SWS, the City of Tipp City and the Village of New Carlisle have both begun to develop and implement well field protection programs. Each has defined protection areas around its well field as shown on **Map 3**. Both have also conducted potential pollutant sources inventories within these areas. This information was reviewed for this Project and included as appropriate. Tipp City has also prepared and implemented a groundwater monitoring plan and in 1994 adopted overlay zoning regulations for the 1 year groundwater Time of Travel (TOT) zone within its jurisdiction boundaries. All required jurisdictions within the watershed have zoning regulations in place for the 1 year TOT and 5 year TOT.

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[4] Ohio EPA, 1992. Ohio Wellhead Protection Program

[5] MVRPC. 1990. A Groundwater Protection Strategy for the Miami Valley Region. Vol. 4.

Community Water Systems

As defined by Ohio EPA, a community water system has at least 15 connections used by year-round residents or regularly serves at least 25 year-round residents. Examples of a community water system include cities, villages, nursing homes, and mobile home parks. Refer to **Map 3.**

According to information obtained from Ohio EPA Division of Drinking and Ground Waters, there are 10 community water systems within the watershed. These are listed in **Table 7**. With the exception of the Village of Christiansburg, all of these water systems obtain their supplies from the buried valleys associated with the Great Miami River buried valley aquifer system.

More than 36 million gallons per day (mgd) are withdrawn from aquifers in the watershed. Over 97% of the volume is withdrawn from the buried valley aquifer in the GMR SWS. This water is served to 238,000 people, which is significantly higher than the 1990 population of 95,000 for the watershed. The majority of groundwater produced for public supplies is served to the large population outside of the watershed, primarily Dayton. The population served by the Dayton-Miami Water Plant (184,000) is nearly double the population of the watershed.

Table 7
COMMUNITY WATER SYSTEMS WITHIN THE
HONEY CREEK / GREAT MIAMI RIVER WATERSHED

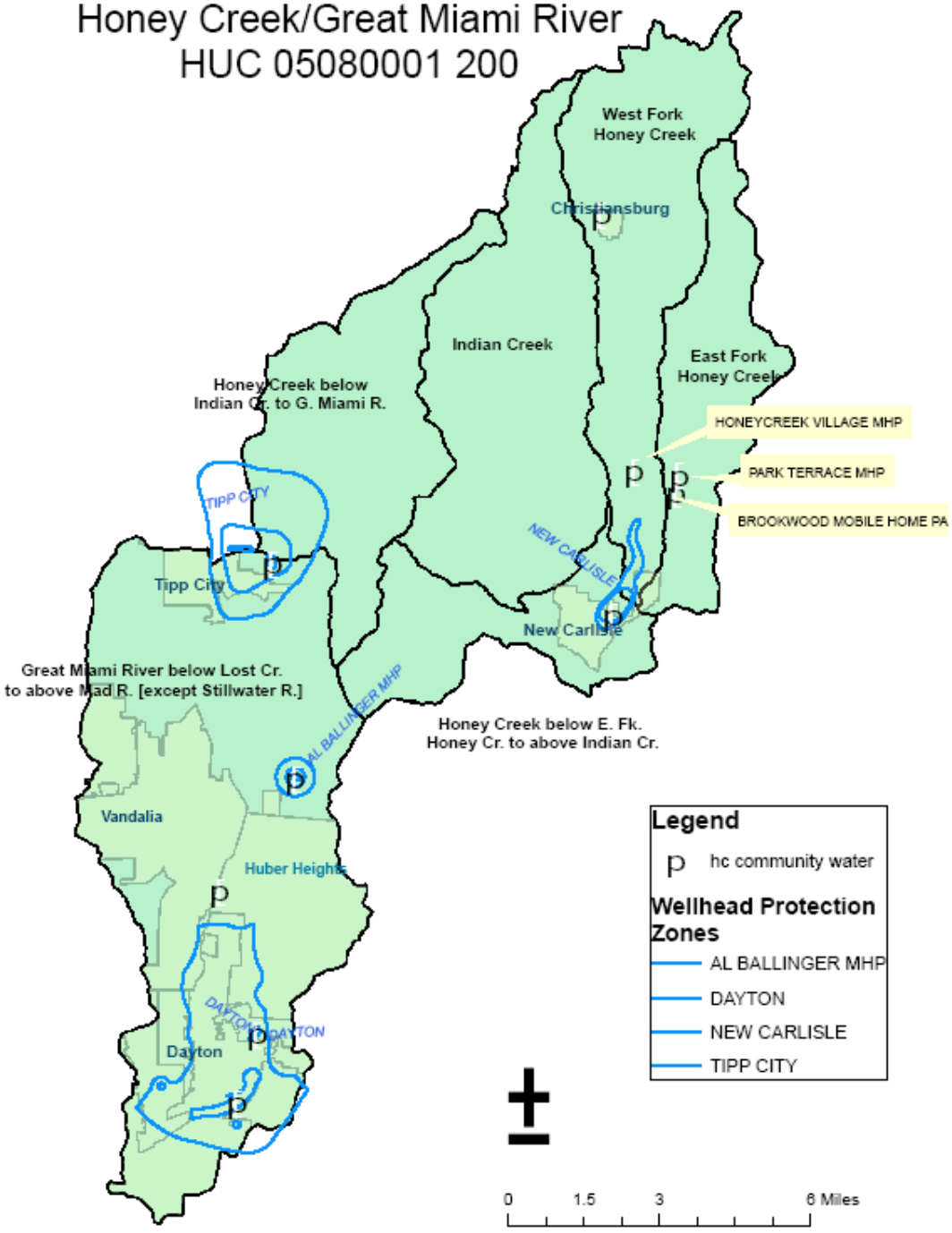
Community Water System	State ID No.	Sub-watershed	Population Served	Average Daily Production (gal)
Al Ballinger MHP	5500312	GMR	75	22,500
Dayton, City of - Miami Plant	5700712	GMR	184,000	28,640,000
Huber Heights Plant-1	5702012	GMR	29,250	3,146,000
Huber Heights Plant-2	5702022	GMR	9,750	1,321,000
Tipp City, City of	5501512	GMR	7,000	2,323,000
GMR TOTAL			***230,075***	***35,452,500***
Brookwood MHP	1200212	EFHC	199	15,000
Christiansburg, Village of	1100112	WFHC	599	74,000
Honeycreek Village MHP	1202612	WFHC	570	18,000
New Carlisle, City of	1203312	HC	6,700	691,000
Park Terrace MHP	1203712	EFHC	120	7,000
Project Area TOTAL			***238,263***	***36,257,500***

(Great Miami River Subwatershed – GMR; East Fork Honey Creek – EFHC; West Fork Honey Creek – WFHC; Honey Creek – HC)

Based on this data, the average daily withdrawal is 150 gallons per person served. If the groundwater production within the watershed was only to serve the watershed population, a total of 14 mgd would be needed. Since the actual production is three times this amount, the need for protection of the aquifers and their recharge areas in the watershed is extremely important.

MAP 3

Wellhead Protection Areas and Water Suppliers
Honey Creek/Great Miami River
HUC 05080001 200



Groundwater Pollution Potential

Because of the potential connection between surface water and groundwater resources the relative vulnerability of an aquifer to potential contamination is a key concern in watershed protection. The physical and chemical characteristics of the soil, unsaturated zone, and aquifer materials largely control the movement of contaminants and the subsequent threat they may pose to underlying groundwater and drinking water supplies.

The pollution potential of the groundwater resources within the watershed has been mapped by ODNR using the DRASTIC mapping system[6]. The DRASTIC system uses existing data to: 1) identify mappable units representing various hydrogeologic settings, and 2) to rank the relative pollution potential of each mappable unit based on a number of influential physical factors. These factors include (D)epth to water, net (R)echarge, (A)quifer media, (S)oil type, (T)opography, (I)mpact of the vadose (unsaturated) zone media, and (C)onductivity of the aquifer. Using available data in conjunction with a numerical ranking and weighting system, a final pollution potential index or score is determined for each mappable unit. Units with higher index scores are more vulnerable to groundwater contamination than units with lower scores.

For this inventory, ODNR's digitized Pollution Potential Maps for Montgomery[7], Miami[8], Clark [9] and Champaign[10] Counties were used. Refer to **Map 4.** In the entire watershed the DRASTIC index scores range from 75 to 206. Approximately 16.6% of the watershed consists of "high" groundwater pollution potential. This includes the buried valley aquifers underlying the Great Miami River and Honey Creek valleys. The vast majority of the area, 44.5%, falls in the "intermediate" groundwater pollution potential. This mostly includes the large upland areas in the Honey Creek Watershed north and west of the Honey Creek valleys in Miami, Clark, and Champaign Counties and in the Great Miami River Subwatershed both east and west of the Great Miami River valley in northeast Montgomery County. Approximately 38.8% of the watershed consists of "low" groundwater pollution potential. This mainly occurs in the upland areas flanking the Great Miami River valley in northeast Montgomery County in the GMR SWS.

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[6] Aller, L., T. Bennett, and L. H. Lehr. 1987. Drastic: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings. U.S. Environmental Protection Agency.

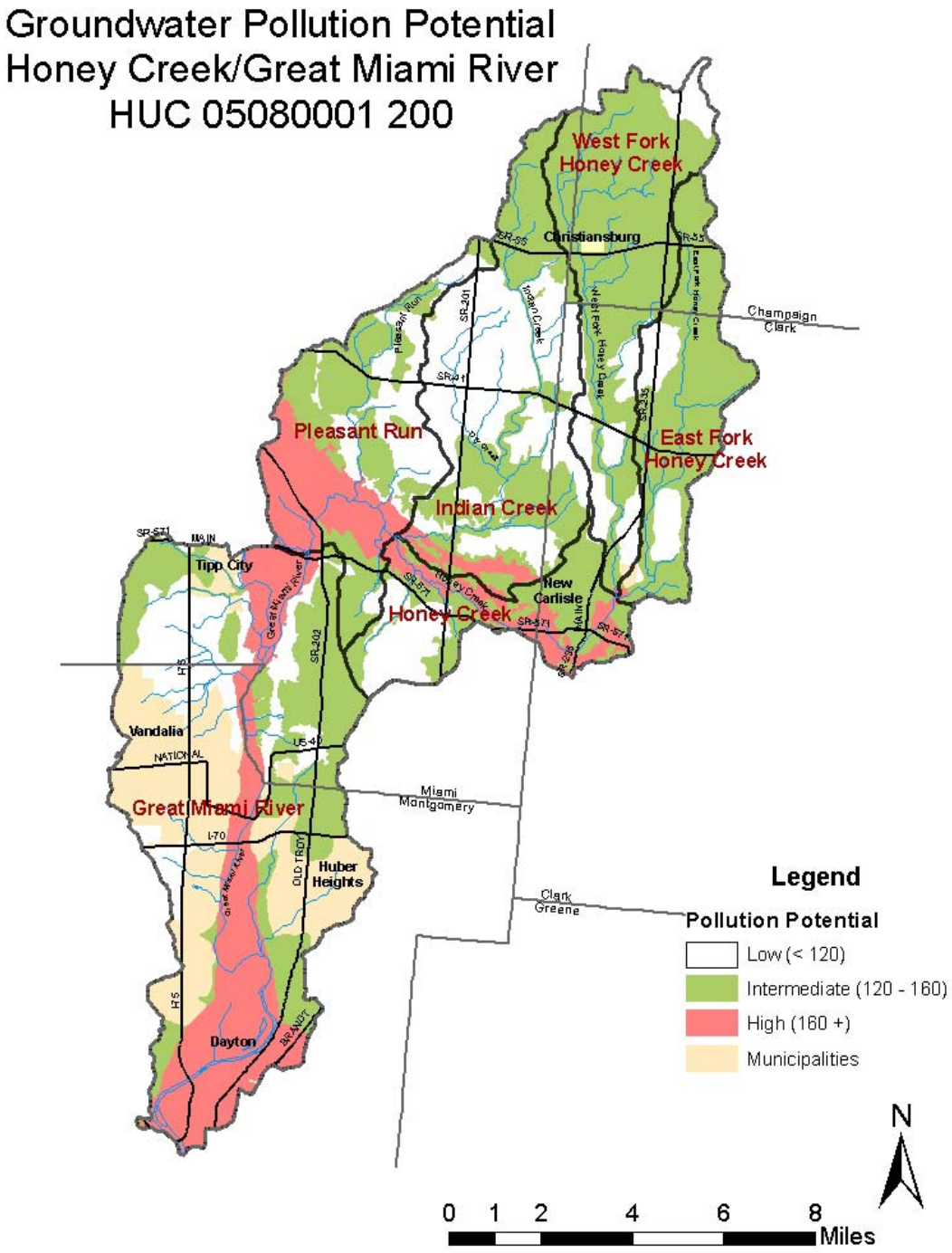
[7] Hallfrisch, M. and M. P. Angle. 1995. Ground Water Pollution Potential of Montgomery County, Ohio. Report No. 28. Ohio Department of Natural Resources, Division of Water.

[8] Spahr, P. N. 1995. Ground Water Pollution Potential of Miami County, Ohio. Report No. 27. Ohio Department of Natural Resources, Division of Water.

[9] Vormelker, J.D., Angle, M. and Jones, W. 1995. Ground Water Pollution Potential of Clark County, Ohio. Report No.38. Ohio Department of Natural Resources, Division of Water.

[10] Jones, W. 1995 Ground Water Pollution Potential of Champaign County, Ohio. Report No.39. Ohio Department of Natural Resources, Division of Water.

MAP 4


Groundwater Pollution Potential
Honey Creek/Great Miami River
HUC 05080001 200
West Fork Honey Creek
Christiansburg
Champaign
Clark
Pleasant Run
East Fork Honey Creek
Indian Creek
Tipp City
New Carlisle
Honey Creek
Vandalia
Great Miami River
Miami
Montgomery
Huber Heights
Clark
Greene
Dayton
Legend
Pollution Potential
Low (< 120)
Intermediate (120 - 160)
High (160 +)
Municipalities
N
0 1 2 4 6 8
Miles

The DRASTIC pollution potential maps should be used as a regional planning tool in comparing one area's pollution potential to another and should not be used to evaluate specific sites of less than 100 acres. The DRASTIC maps do not account for all the hydrogeologic conditions at a specific site. Land uses and activities that include the storage, handling, and disposal of potentially contaminating substances need to be carefully managed to protect both public and private groundwater supplies.

Table 8
Total % of Drastic Pollution Potential in
Honey Creek / Great Miami River Subwatershed

Groundwater Pollution Potential Index	% of the Total Subwatershed
Low (Less than 120)	38.8%
Intermediate (120-160)	44.5%
High (160 +)	16.6%

Areas around the City of New Carlisle in the Honey Creek Subwatershed and the southern portion of Indian Creek Subwatershed are heavily populated with the majority of the homes on HSTS. *This is a potential pollution concern of the HCWA since the locations of these homes have a high groundwater pollution potential index. Education on the proper maintenance of HSTS will be emphasized and funding will be sought for surface and groundwater sampling to further evaluate the area.*

Soils in the Watershed

(Information for this section was taken from County Soil Surveys (USDA, NRCS)

Soils form with the weathering of bedrock, the deposition of new materials, and as the result of biotic activity. The main soil forming source in this watershed is deposition. As mentioned, the bedrock of the region extensively eroded during the existence of the Teays River system. The erosive forces left many deep river valleys and exposed older layers of bedrock (Ordovician and Silurian systems). Most of these valleys were later filled-in with glacial till during the Pleistocene era.

The general characteristic soils of the watershed are loamy till plains. Commonly found soil associations include Miamian silt loam, Brookston silt clay loam, Celina silt loam, and Crosby silt loam.

Digital soil coverage was collected from ODNR and NRCS sources for all four (4) counties in the watershed. All the soils data are from SURGO soils except Clark County. Using this data, **Maps 5 & 6** were created on a sub-watershed basis for highly erodible soils (glacial end moraines) and hydric soils. Refer to the ***Subwatershed Inventory Section*** for percentages of HEL and hydric soils for each 14-digit subwatershed.

HONEY CREEK / GREAT MIAMI RIVER WATERSHED SOIL ASSOCIATIONS

Champaign County

Crosby-Brookston-Celina association: Nearly level and undulating, moderately well drained to very poorly drained, medium-textured and moderately fine-textured soils on uplands.

Clark County

Miamian-Kokomo-Celina association: Nearly level to steep soils; on till plains; 0 – 30 percent slope range

Crosby-Kokomo-Celina association: Nearly level and gently sloping soils; on till plains; 0-6 percent slope range

Eldean-Lippincott association: Nearly level to sloping soils; on outwash plains, valley trains; 0-12 percent slope range

Westland-Milford-Ockley association: Nearly level to sloping soils; on outwash plains and lacustrine areas; 0-6 percent slope range.

Miami County

Crosby-Brookston association: Somewhat poorly drained and very poorly drained, deep, nearly level to gently sloping soils that formed in loam glacial till; on uplands

Crosby-Miamian-Brookston association: Well-drained to very poorly drained, deep, nearly level to sloping soils that formed in loam glacial till; on uplands

Milton-Miamian, limestone substratum- Randolph association: Well-drained and somewhat poorly drained, moderately deep and deep, nearly level to moderately steep soils that formed in glacial till underlain by limestone bedrock; on uplands.

Miamian-Celina association: Well drained and moderately well drained, deep, gently sloping to steep soils that formed in loam glacial till; on uplands.

Eldean-Genesee-Ross association: Well-drained, deep, level to gently sloping soils that formed in glacial outwash and alluvium; on outwash terraces and flood plains.

Montgomery-Westland-Shoals association: Very poorly drained and somewhat poorly drained, deep level to nearly level soils that formed in alluvium and outwash material; on old glacial lake beds, stream terraces and flood plains

Montgomery County

Miami-Celina association: Deep, mainly gently sloping to moderately steep, well drained and moderately well drained soils that have moderately fine textured and fine textured subsoil; formed in thin loess and glacial till.

Brookston-Crosby association: Deep, mainly nearly level to gently sloping, very poorly drained and somewhat poorly drained soils that have moderately fine textured and fine textured subsoil; formed in thin loess and glacial till.

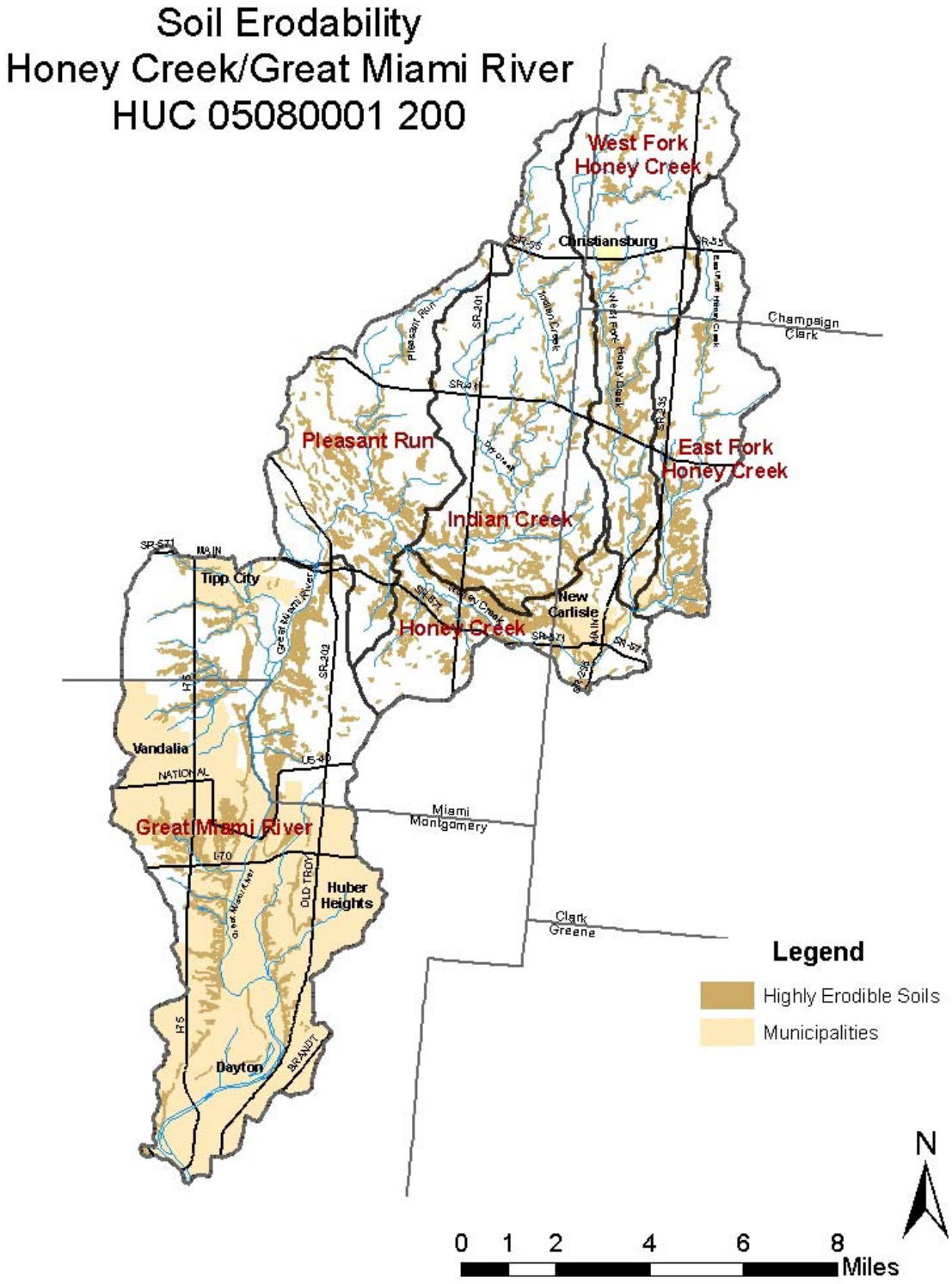
Milton-Richey-Millsdale association: Moderately deep and shallow, nearly level to very steep, well-drained and very poorly drained soils that have a moderately fine textured and fine textured subsoil; formed in glacial till over limestone.

Fox-Ockley association: Deep, nearly level to moderately steep, well-drained soils that have moderately fine textured subsoil; formed in loess and loamy outwash underlain by calcareous sand and gravel.

Westland-Montgomery association: Deep, nearly level to depressional, very poorly drained soils that have dominantly moderately fine textured and fine textured subsoil; formed in loamy outwash and clayey lacustrine material.

Ross-Medway association: Deep, nearly level, well drained and moderately well drained soils that have a dominantly moderately coarse textured and medium textured subsoil or underlying material; formed in loamy alluvium.

MAP 5


Soil Erodability
Honey Creek/Great Miami River
HUC 05080001 200
West Fork
Honey Creek
Christiansburg
Champaign
Clark
Pleasant Run
East Fork
Honey Creek
Indian Creek
Tipp City
New
Carlisle
Honey Creek
Vandalia
Great Miami River
Miami
Montgomery
Huber
Heights
Clark
Greene
Dayton
Legend
Highly Erodible Soils
Municipalities
N
0 1 2 4 6 8
Miles

MAP 6


Hydric Soils
Honey Creek/Great Miami River
HUC 05080001 200
West Fork
Honey Creek
Christiansburg
Champaign
Clark
Pleasant Run
East Fork
Honey Creek
Indian Creek
Tipp City
New
Carlisle
Honey Creek
Vandalia
Great Miami River
Miami
Montgomery
Huber
Heights
Clark
Greene
Dayton
Legend
Hydric Soils
Municipalities
N
0 1 2 4 6 8
Miles

Land Use

Land use can give an indication of potential non-point pollution sources in the watershed. Land use types generally relate to land cover that can have differing effects on water quality depending on the activities. **Table 9** breaks out the different land uses and their percentages in the watershed.

Table 9
Land Use in Honey Creek / Great Miami River Watershed (HUC # 050800001 200)

Land Use	# of Acres	Percent
Urban / Residential/ Commercial	26,352	28.7 %
Row Crop / Pasture	47,345	51.6%
Woody Wetlands	1,112	1.2%
Open Water	805	0.88%
Forest	16,189	17.6%

The primary rural-based non-point source pollutants are nutrients (particularly nitrogen and phosphorus), sediment, animal wastes, pesticides, and salts. Rural non-point sources include those associated with agricultural and residential/suburban land uses. Non-point source pollutants may enter surface water through direct surface runoff or through seepage to ground water which discharges to a surface water outlet. Various farming and construction/development activities can result in the erosion of soil particles. The sediment produced by erosion can damage fish habitat and wetlands and, in addition, often transports excess agricultural chemicals resulting in contaminated runoff. This runoff in turn affects changes to aquatic habitat such as temperature increases and decreased oxygen levels. The most common sources of excess nutrients in surface water from non-point sources are chemical fertilizers, failing septic systems, and manure from animal facilities. Such nutrients cause eutrophication in surface water. Pesticides and herbicides used for lawn, garden, plant nurseries, and crops can also contaminate surface water, as well as, groundwater resources.

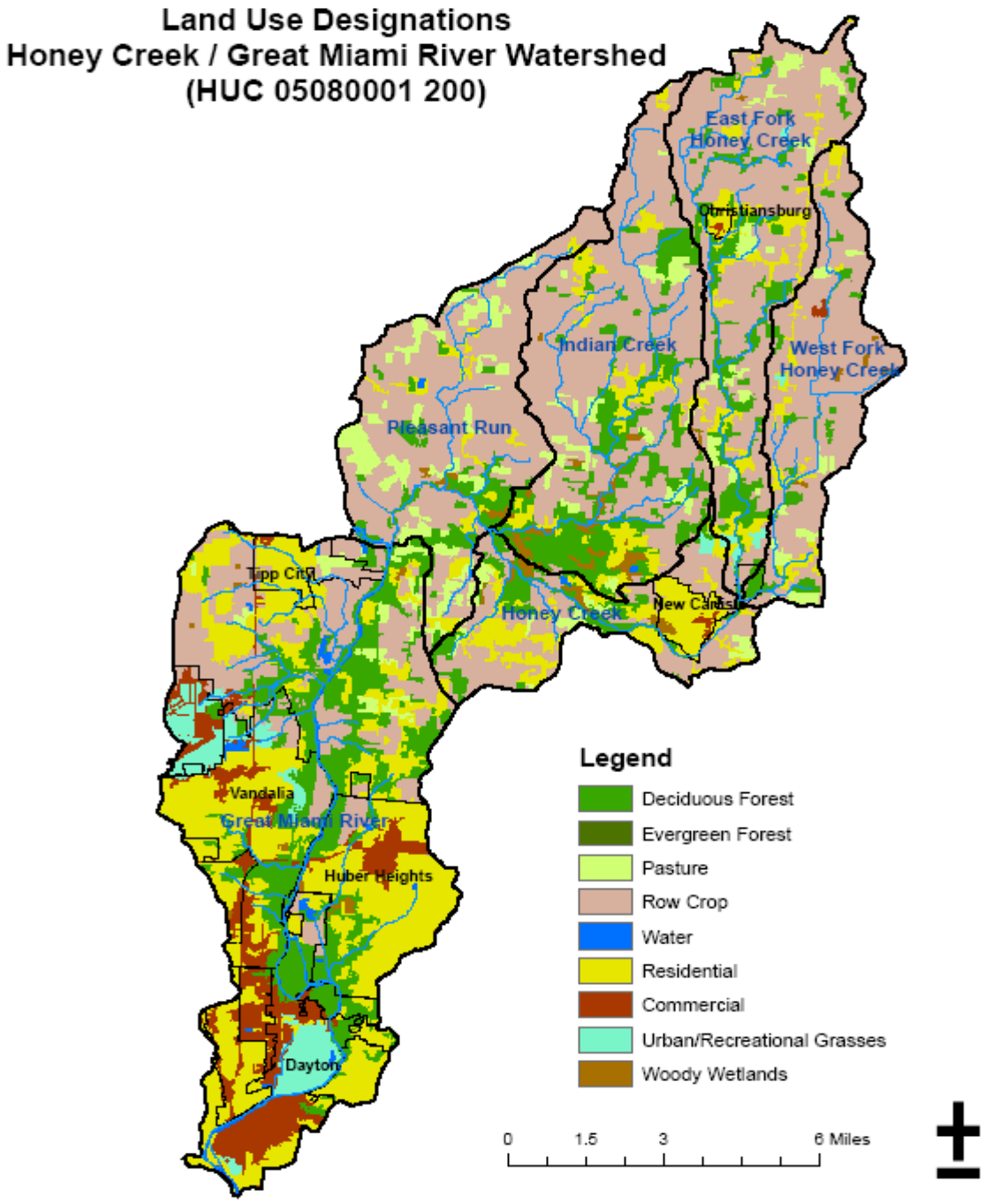
Another source of non-point source pollutants is nonporous urban landscapes. They do not allow runoff to slowly percolate into the ground. As a result, water remains above the surface, accumulates, and runs off in large amounts. Cities install storm sewer systems that quickly channel this runoff from roads and other impervious surfaces. Large volumes of quickly flowing runoff erode streambanks, damage streamside vegetation, and widen stream channels. This results in lower water depths during non-storm periods, higher than normal water levels during wet weather periods, increased sediment loads, and higher water temperatures. Urbanization also increases the variety and amount of pollutants transported to receiving waters, including: sediment from development and new construction; oil, grease, and toxic chemicals from automobiles; nutrients and pesticides from turf management and gardening; viruses and bacteria from failing septic systems; road salts; and heavy

metals. Sediments and solids constitute the largest volume of pollutant loads to receiving waters in urban areas. When runoff enters storm drains, it carries many of these pollutants with it. In older cities, this polluted runoff is released directly into the water without any treatment. Increased pollutant loads can harm fish and wildlife populations, kill native vegetation, foul drinking water supplies, and make recreational areas unsafe.

The distribution of land use types within a watershed can affect the water quality impact of this land cover. The character of the land cover in riparian corridors close to streams is an example. Vegetation cover in riparian areas can buffer the streams from pollutants associated with runoff. Vegetation slows overland flow, which allows sediments and related pollutants to drop from the runoff, and the vegetation can filter excess nutrients from runoff. Sixty-six percent of the riparian area (within 300 feet of streams) is agricultural, and 26% is forested, with only 4% urban/residential.

Agriculture is the dominant land use in the upper portions of the watershed (all of the Honey Creek Watershed) covering more than 89% of the area, with forest a distant second at 10%. The Great Miami River Watershed is only 17% agriculture with 58% urban/residential. Development in the Great Miami River Watershed is concentrated along the north-south Interstate 75 and east-west Interstate 70 corridors, whereas development in the Honey Creek Watershed occurs near villages scattered throughout the watershed. (Map 7)

MAP 7


Land Use Designations
Honey Creek / Great Miami River Watershed
(HUC 05080001 200)
East Fork Honey Creek
Christiansburg
Indian Creek
West Fork Honey Creek
Pleasant Run
Tipp City
Honey Creek
New Carlisle
Vandalia
Great Miami River
Huber Heights
Dayton
Legend
Deciduous Forest
Evergreen Forest
Pasture
Row Crop
Water
Residential
Commercial
Urban/Recreational Grasses
Woody Wetlands
0
1.5
3
6 Miles

Forested Areas & Riparian Corridor

(Information contained in this section was taken from the Miami County and Clark County Soil Surveys)

Honey Creek, Bethel Township, Miami County.

Most of the Honey Creek / Great Miami River Watershed was forested at the time of the earliest land surveys. However, when the first settlers arrived in 1798, the watershed was heavily timbered (USDA 1941). In the next 150 years a relentless and constant diminishing of the forest resource followed as more and more acreage was cleared for farming. The first annual report of the Ohio Forestry Bureau in 1886 stated that half of the original forest cover had been removed by 1850. By 1941, the forest resource had been reduced to 3.4 percent. At that time, even this woodland was virtually devoid of seedlings and saplings as a result of the widespread, destructive practice of allowing livestock to graze in the woods.

From 1941 to the present, stand condition has improved somewhat and total acreage of woodland has increased slightly. Most woodland in Miami County is on sloping Miamian soils, steep to very steep Miamian and Hennepin soils, and Lorenzo and Rodman soils along the major streams and tributaries. Many frequently flooded soils, such as Shoals, Eel, Medway, and Genesee soils and some areas of muck soils are still wooded. Farm woodlots are generally on the less accessible flat uplands. Brookston and Crosby soils are in these areas.

Woodlands are becoming increasingly more important for its recreational value. As the population increases the need increases for areas to hike, camp and hunt. Also, residents are beginning to understand the importance that woodlands have in protecting water quality by stabilizing banks, shading the water, taking up nutrients and filtering pollutants. Windbreaks on farms have also become a much needed benefit of protecting the farmstead from winds in winter and early spring.

Table 10
Tree Species in the Honey Creek / Great Miami River Watershed
(List was created by Scott Costello)

American Plum	Eastern Hemlock	Oak, Shingle
Alternate-Leaf Dogwood	Elderberry, Shrub	Oak, Swamp White
Apple	Elm, American	Oak, White
Ash, Green	Elm, Slippery	Osage-orange
Ash, White	Hackberry	Paperbirch - Deciduous
Ash, Blue	Hawthorn	Pawpaw
Ash, Black	Hickory, Bitternut	Common Persimmon
Austrian Pine, Evergreen	Hickory, Mockernut	Pine, Eastern white
Bald Cypress	Hickory, Pignut	Poison Ivy
Basswood, American	Hickory, Shagbark	Poison Oak – vine
Beech, American	Honeylocust	Yellow – Poplar
Black gum	Hophornbeam, Eastern	Redbud, Eastern
Black Maple	Hoptree	Redcedar, Eastern
Boxelder	Locust, Black	Sassafras – Sassafras
Buckeye, Ohio	Maple, Red	Serviceberry
Burning Bush	Maple, Silver	Sourgum
Bush Honeysuckle	Maple, Sugar	Spruce, Norway
ButtonBush	Mulberry, Red	Sumac, Smooth
Catalpa, Northern	Mulberry, White	Sumac, Staghorn
Cherry, Black	MultiFlora Rose	Sumac,
Chestnut, American	Oak, Black	Sweetgum
Chokeberry	Oak, Bur	Sycamore, American
Coffeetree, Kentucky	Oak, Shumard	Tree-of heaven
Common Winterberry Holly	Oak, Chinkapin	Tulip Poplar
Common Witch Hazel	Oak, Northern Red	Virgin Creeper Vine
Cottonwood, Eastern	Oak, Pin	Walnut, Black
Dogwood, Flowering		Wanoo, Shrub
Douglas Fir – Evergreen		White Cedar, Northern
Douglas Red Osier- Shrub		Willows
Downy Juneberry		Viburnum

Riparian corridors are extremely important to a healthy stream system. The extensive network of tree roots hold the soils of the bank in place, reducing erosion and keeping the streambanks stable. The shade provided by the trees help to stabilize stream temperatures and maintain high oxygen levels that benefit many kinds of aquatic wildlife. Also, fallen leaves and other organic debris deposited in the water provide energy to aquatic life.

Currently, 492,978 linear feet (excluding the GMR subwatershed) of streambank has less than 30 feet of riparian corridor in the watershed. This has greatly contributed to excess sediment and nutrients entering the waterways. One of the goals of this

Watershed Action Plan is to install and enhance the riparian areas / forest lands in the entire watershed.

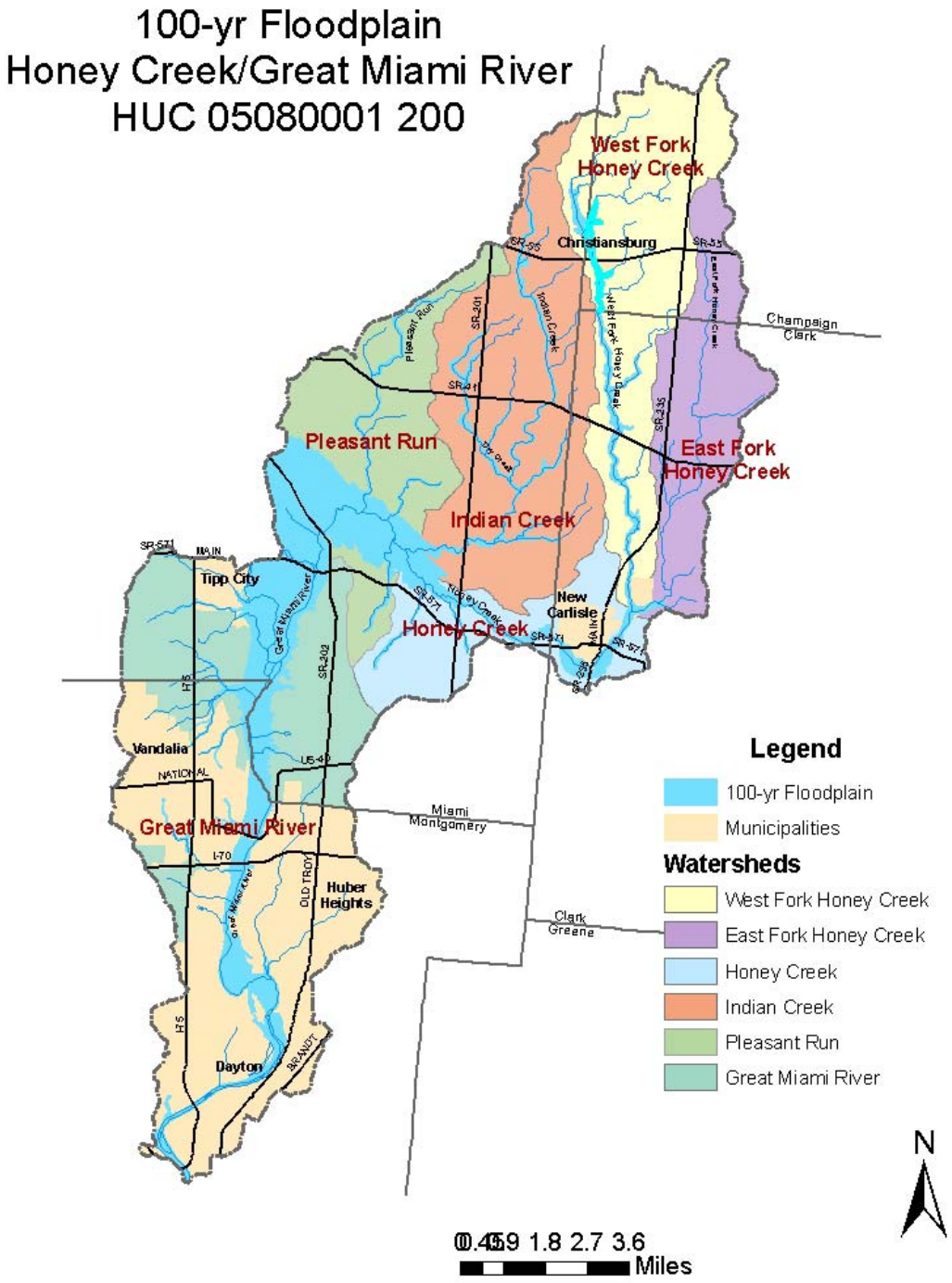
Floodplains

Floodplains play a vital role in the health and dynamics of the Honey Creek / Great Miami River Watershed. Hydraulically, they serve as buffer zones that allow for the overflow and distribution of high flows and provide areas for sediment deposition and excess flow infiltration. The flood plains in the watershed offer some recharge component to underlying glacial and bedrock aquifers. Ecologically, the floodplains also provide unique habitats for plant and animal species that require or can withstand periodic saturation.

Floodplains present severe limitations for development because costly building and landscape measures must be employed to insure that destructive damage does not occur to structures and property during a flood event. Flood hazard insurance for developments within floodplains can be expensive or even unavailable to property owners. Floodplain areas can be determined in two ways: 1) from the presence of alluvial soils as determined in County Soil Surveys and 2) flood hazard areas designated under the Federal Emergency Management Agency's (FEMA) flood insurance program. For the purposes of this Watershed Action Plan the FEMA flood hazard boundaries have been used to indicate areas within the watershed that are within the 100-year floodplain and are shown in **Map 8.** FEMA's 100 year floodplain is generally used as the basis for flood plain requirements and restrictions in local zoning codes. The total acres of the 100-year floodplain in the Honey Creek / Great Miami River Watershed are 11,488 acres (13% of the total watershed).

The watershed also is within the flood management boundaries of the Miami Conservancy District (MCD). MCD is the local agency responsible for a system of dams and retarding basins within the Great Miami River basin. The MCD boundaries encompass the Great Miami River and Honey Creek corridors in the portions of Miami and Montgomery County included in the watershed. The MCD boundaries do not include the stream corridors within the Champaign and Clark County portions of the watershed. MCD owns certain lands within its District, including the dam properties, portions of the retardation basins up-gradient of the dams, and levees and channels within incorporated areas. In addition, MCD designs, constructs and/or maintains amenities such as, river corridors, walkways, bikeways, low head dams, river plazas, canoe portages and boat launches. MCD also has the responsibility of reviewing designs for all bridges that cross rivers and tributaries within the District. The retardation basin north of the Taylorsville Dam includes large portions of the river corridor and flood plain areas in the Great Miami SWS and the eastern portion of the Honey Creek SWS.

MAP 8


100-yr Floodplain
Honey Creek/Great Miami River
HUC 05080001 200
West Fork Honey Creek
Christiansburg
Champaign
Clark
Pleasant Run
East Fork Honey Creek
Indian Creek
Tipp City
New Carlisle
Honey Creek
Vandalia
Great Miami River
Miami
Montgomery
Huber Heights
Clark
Greene
Dayton
Legend
100-yr Floodplain
Municipalities
Watersheds
West Fork Honey Creek
East Fork Honey Creek
Honey Creek
Indian Creek
Pleasant Run
Great Miami River
N
0 0.45 0.9 1.8 2.7 3.6
Miles

Precipitation & Climate

The Honey Creek / Great Miami River Watershed is located in a humid temperate continental climate zone characterized by wide annual and daily temperature ranges. The average winter temperature is approximately 35 degrees Fahrenheit and summer temperature averages about 72 degrees Fahrenheit. The average precipitation in the watershed ranges from 36 to 38 inches per year. Precipitation is greatest in the winter and early spring and the lowest in the fall. The growing season is approximately 168 days long from the beginning of May to the middle of October.

Surface Water Resources

One of the greatest concerns of the Honey Creek Watershed Association is protecting the surface water resources in the Honey Creek / Great Miami River Watershed. The watershed is made up of approximately 72 miles of streams (only main stems). The general flow of the Honey Creek is west where it converges with the Great Miami River just east of Tipp City. The general flow of the Great Miami River is south.

14- Digit USGS Hydrologic Units of the Honey Creek / Great Miami River Watershed
(HUC # 05080001200)

Name	14-digit HUC	Drainage Area (sq. miles)	% of Watershed
West Fork HC	0508001 200 010	20.9	14.57%
East Fork HC	0508001 200 020	12.9	9.00%
Honey Creek (HC)	0508001 200 030	11.6	8.09%
Indian Creek	0508001 200 040	25.6	17.87%
Pleasant Run	0508001 200 050	19	13.28%
Great Miami	0508001 200 060	53.3	37.20%

The headwaters of the Honey Creek begin in Champaign County, Jackson Township where the East and West Fork of the Honey Creek begins. The East Fork of the Honey Creek is 8 miles long and drains 13 square miles. The East Fork HC flows south where it converges with the West Fork HC in Clark County, Bethel Township to form the Honey Creek. The West Fork of the Honey Creek is 4.3 miles long and drains 21 square miles. The Honey Creek is 18.6 miles long and drains 90 square miles flowing west to the Great Miami River just outside of Tipp City, Ohio.

The largest tributary of the Honey Creek is Indian Creek. Indian Creek is 5.5 miles and drains 25.6 square miles flowing south and then west where it empties into the Honey Creek in Miami County, Bethel Township. Another large tributary of the Honey Creek is Pleasant Run. Pleasant Run is not recognized in the Gazetteer of Ohio Streams (Second Edition). It is approximately 5.3 miles and drains 19 square miles

(a small portion of the Honey Creek is included in this drainage area) flowing south to the Honey Creek in Miami County, Elizabeth Township.

The main stem of the Honey Creek begins in New Carlisle, Ohio in Clark County. The stream flows west and is well protected by the topography and riparian corridor. The East and West Fork of the Honey Creek and Indian Creek are not as well protected. These subwatersheds are heavily farmed and lack riparian corridor. A more detailed summary of these subwatersheds is described in the ***Subwatershed Inventory Section***.

The Honey Creek / Great Miami River Watershed has seven streams that are listed in the *Gazetteer of Ohio Streams* (ODNR, 2001). The list includes details about the fall characteristics (steepness) and drainage area of each tributary.

Stream Code	Stream Name	Flows Into	County (at mouth)	Length (miles)	Elev. (source)	Elev. (mouth)	Avg. Fall (ft/mile)	Drains (sq. mile)
Approx. ##	Great Miami River	Ohio River	Hamilton	17.8	790	730	3.4	53.3
301. 31	Poplar Creek	GMR	Montg.	3.1	990	762	73.5	4.22
301. 32	Honey Creek	GMR	Miami	18.6	1147	782	19.6	89.4
301. 3201	Indian Creek	Honey Creek	Miami	5.5	950	805	26.4	25.6
301. 320101	Dry Creek	Indian Creek	Miami	1.7	935	898	21.7	7.78
301. 3202	West Fork HC	Honey Creek	Clark	4.3	1005	897	25.1	20.9
301. 3203	East Fork HC	Honey Creek	Clark	8	1147	890	32.1	13
Approx. ##	Pleasant Run*	Honey Creek	Miami	5.3	960	800	30.2	19

** Pleasant Run is not recognized in the Gazetteer of Ohio Streams. The information above for Pleasant Run was determined by using USGS topography maps.*

Wetlands

Wetlands are generally defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soils. Wetlands include marshes, swamps, bogs, fen, wetland meadows, and wetland prairies. In order to be identified as a wetland, an area must exhibit each of the following:

Arrowhead Plant

- wetland hydrology (flooded sometime during the growing season)
- hydric soils (poorly drained, anaerobic, saturated soils)
- hydrophytic vegetation (vegetation adapted to life in saturated or flooded conditions).

Wetlands are an important ecological feature in the Honey Creek / Great Miami River Watershed. They provide habitat for a large variety of flora and fauna, some of which depend on the wetland conditions. Wetlands also perform filtering and flood storage functions that improve the water quality in the area. Wetlands are often degraded or destroyed when lands are converted to agriculture.

According to the National Wetland Inventory, 290 wetland sites occur in the watershed. As part of the 1997 Miami Valley Wetland Inventory[11], twenty-two of these sites were visited and site analyses and functional assessments were performed. The visited wetlands ranged in size from less than one/half acre to over 42 acres. More than half of the sites are larger than five acres. Of special note is the large concentration of high quality wetlands that occur in the Honey Creek subwatershed area (HUC #0508001 200 03). Nearly all the sites have diverse native plant species and more than half have diverse vegetation cover types. While all sites provide wildlife habitat, half of the sites provide habitat for regionally scarce wildlife and flora. Eighteen percent of the assessed sites have scarce plant or animal species as listed in the Natural Heritage Inventory.

The location of wetlands in a watershed can increase the functional importance of even small sites. More than 70% of the assessed sites are contiguous to a permanent water body including 45% within 1000 feet of a stream. Sixty-four percent of assessed sites have the potential to perform significant flood attenuation, and in fact, half of the sites are inside the FEMA designated floodplains. In many

[11] MVRPC. 1997. Miami Valley Wetlands Inventory: Clark, Darke, Greene, Miami, Montgomery, and Preble Counties in Southwest Ohio.

cases, wetlands serve as visible and functional recharge and discharge connections between surface water and groundwater. The ecological functions of these wetlands, combined with their potential hydrogeologic functions in this watershed make wetland preservation a priority for the Honey Creek Watershed Association.

The *1997 Miami Valley Wetland Inventory* identified several wetland sites within the watershed that possessed scarce plant and/or animal species included on the ODNR Natural Heritage Inventory. These areas are concentrated along the Honey Creek corridor.

Invasive Non-Native Plants

(The following information was obtained from Invasive Plants of Ohio: A series of fact sheets describing the most invasive plants in Ohio's Natural Areas. The publication was published in May 2000 and funded by an Ohio EPA Environmental Education Grant. The information was complied by ODNR, Division of Natural Areas & Preserves, The Nature Conservancy, and Ohio Metro Parks.)

Invasive non-native plants are species that were not known from Ohio prior to the time of substantial European settlement around 1790. Listed below are reasons why these plants are invasive in natural areas:

- tolerate a wide range of environmental conditions
- lack natural predators and diseases, which would help control them in their natural habitats
- fast growth rates
- rapid vegetative spread, especially in recently disturbed sites
- high fruit production
- efficient seed dispersal and germination

These species out-compete our native plants and potentially take over entire woodlands, prairie fields and wetlands. The end result is the loss of our native plant species, biodiversity of our native woodlands, prairie fields, and wetlands, alteration to the food web, and wildlife displacement. Table 11 lists common invasive non-native plants in the Honey Creek / Great Miami River Watershed.

Table 11
Invasive Non-native Plants in the Honey Creek / Great Miami River Watershed

Common Name	Scientific Name	Habitat	Risk
Amur Honeysuckle	*Lonicera maackii*	Woodlands	Decreased biodiversity, poor habitat & forage
Canada Thistle	*Cirsium arvense*	Prairie fields	Decreased biodiversity, poor bird habitat
Common Reed	*Phragmites australis*	Wetlands	Decreased biodiversity, poor habitat

Common Teasel	*Dipsacus fullonum*	Prairie fields	Decreased biodiversity & bird habitat
Garlic Mustard	*Alliaria petiolata*	Woodlands	Decreased biodiversity
Multiflora Rose	*Rosa multiflora*	Woodlands, Prairie fields	Decreased biodiversity, poor habitat & forage
Reed Canary Grass	*Phalaris arundinacea*	Wetlands	Decreased biodiversity, poor habitat
Narrow-leaved Cattail	*Typha angustifolia*	Wetlands	Decreased biodiversity, poor habitat
Autumn olive	*Elaeabnus umbellate*	Woodlands, fields	Decreased biodiversity, poor habitat
Russian olive	*Elaeagnus angustifolia*	Woodlands, Prairie fields	Decreased biodiversity, poor habitat
Japanese honeysuckle	*Lonicera japonica*	Woodlands	Decreased biodiversity, poor habitat
Erasian water-milfoil	*Myriophyllum spicatum*	Streams, lakes	Decreased biodiversity, poor habitat, fish & aquatic invertebrate habitat
Smooth brome	*Bromus inermis*	Woodlands, Prairie fields	Decreased biodiversity, poor habitat
White sweet-clover	*Melilotus alba*	Prairie fields	Decreased biodiversity, poor habitat
Yellow sweet-clover	*Melilotus officinalis*	Prairie fields	Decreased biodiversity, poor habitat
Tree-of-Heaven	*Ailanthus altissima*	Woodlands	Decreased biodiversity, poor habitat

Threatened & Endangered Species

The ODNR, Division of Natural Areas and Preserves maintains the Ohio Heritage Database which records known occurrences of threatened and endangered species with official protection, other species of concern and unique natural or geologic features. In most cases, these records are based on observations from individuals rather

Indiana Bat, Myotis sodalis – Federal & State Endangered Species List

than extensive surveys of the area. Based on the records in the Heritage Database, there are 13 occurrences of federally- and state-listed threatened or endangered species in the watershed. **Table 12** lists the state endangered species in the Honey Creek / Great Miami River Watershed.

Table 12
Threatened & Endangered Species in the Honey Creek / Great Miami River Watershed.

COMMON NAME	*SCIENTIFIC NAME*	STATUS
PLANTS		
Harebell	*Campanula rotundifolia*	State Threatened
Wood's Hellebore	*Veratrum woodii*	State Threatened
Limestone Savory	*Satureja arkansana*	State Threatened
Rock Serviceberry	*Amelanchier sanguinea*	State Endangered
Hazel Dodder	*Cuscuta coryli*	State Endangered
Wheat Sage	*Carex atherodes*	State Endangered
Leafy Blue Flag	*Iris brevicaulis*	State Endangered
Ashy Sunflower	*Helianthus mollis*	State Threatened
Smooth Rose	*Rosa blanda*	State Threatened
Grove Sandwort	*Arenaria lateriflora*	State Threatened
ANIMALS		
Sedge Wren	*Cistothorus plantensis*	State Endangered
Upland Sandpiper	*Bartramia longicauda*	State Threatened
Indiana Bat	*Myotis sodalis*	State and Federal Endangered

Wildlife

The wildlife habitat is diverse considering much of the watershed is in agriculture. Park districts, city parks, public hunting areas, the Miami Conservancy District's flood control easements, and other open space areas add to the habitat or biodiversity potential. Over 200 species of birds, permanent and migratory, may be found in the watershed. While some wildlife species are considered rare and endangered, others have increased in numbers that may even exceed pre-settlement population levels. Several that have adapted to more than 200 years of intensive agriculture and development include the Canada geese, Virginia white-

Beaver have made a tremendous comeback in the last 10 years to the Honey Creek / Great Miami River Watersheds

tailed deer, pileated woodpeckers, and beavers.

Table 13 lists the mammals found in the Honey Creek / Great Miami River Watershed. This list was created by Wildlife Biologist, Lynn Holtzman, ODNR, Division of Wildlife.

Table 13
Mammals sighted in the Honey Creek / Great Miami River Watershed

RACCOON	GRAY FOX	VIRGINIA OPUSSUM
WHITE-TAILED DEER	LITTLE BROWN BAT	NORWAY RAT
GROUNDHOG	COYOTE	SHORT-TAILED SHREW
EASTERN COTTONTAIL RABBIT	MINK	LEAST SHREW
GRAY SQUIRREL	EASTERN MOLE	SKUNK
FOX SQUIRREL	DEER MOUSE	SOUTHERN FLYING SQUIRREL
RED SQUIRREL	MEADOW VOLE	LONG-TAILED WEASEL
EASTERN CHIPMUNK	WHITE-FOOTED MOUSE	LEAST WEASEL
BEAVER	MUSKRAT	RED FOX

Table 14 lists the reptiles and amphibians found in the Honey Creek / Great Miami River Watershed. This list was created by Wildlife Biologist, Lynn Holtzman, ODNR, Division of Wildlife.

Table 14
Reptiles and amphibians sighted in the Honey Creek / Great Miami River Watershed

SNAPPING TURTLE	RED-SPOTTED NEWT
EASTERN BOX TURTLE	AMERICAN TOAD
PAINTED TURTLE	NORTHERN SPRING PEEPER
EASTERN SPINY SOFTSHELL TURTLE	GRAY TREEFROG
NORTHERN WATER SNAKE	BULLFROG
EASTERN GARTER SNAKE	GREEN FROG
BLACK RAT SNAKE	NORTHERN LEOPARD FROG

Table 15 lists birds found in the Honey Creek / Great Miami River Watershed.

Table 15
Birds sighted in the Honey Creek / Great Miami River Watershed

AMERICAN CROW	DARKEYED JUNCO	MALLARD
AMERICAN GOLDFINCH	DOWNY WOODPECKER	MOURNING DOVE
AMERICAN KESTREL	EASTERN BLUEBIRD	NORTHERN CARDINAL
AMERICAN ROBIN	EASTERN MEADOWLARK	NORTHERN HARRIER
AMERICAN WOODCOCK	EASTERN PHOEBE	NORTHERN MOCKINGBIRD
BALTIMORE ORIOLE	EASTERN SCREECH OWL	OSPREY
BARN SWALLOW	EASTERN TOWHEE	PILEATED WOODPECKER
BARRED OWL	EASTERN WILD TURKEY	PROTHONOTARY WARBLER
BELTED KINGFISHER	EASTERN WOOD-PEWEE	PURPLE FINCH
BLACK-CAPPED CHICKADEE	EUROPEAN STARLING	RED-BELLIED WOODPECKER
BLACK-THROATED BLUE WARBLER	FIELD SPARROW	RED-TAILED HAWK
BLUE JAY	GOLDEN-CROWNED KINGLET	RED-WINGED BLACKBIRD
BLUE-GRAY GNATCATCHER	GRAY CATBIRD	RING-NECKED PHEASANT
BROWN CREEPER	GREAT BLUE HERON	RUBY-CROWNED KINGLET
BROWN THRASHER	GREAT HORNED OWL	RUBY-THROATED HUMMINGTON
BROWN-HEADED COWBIRD	GREEN HERON	SONG SPARROW
CANADA GOOSE	HAIRY WOODPECKER	TREE-SWALLOW
CAROLINA CHICKADEE	HOUSE FINCH	TURFED TITMOUSE
CAROLINA WREN	HOUSE SPARROW	TURKEY VULTURE
CEDAR WAXWING	HOUSE WREN	WHITE CROWNED SPARROW
CHIMNEY SWIFT	INDIGO BUNTING	WHITE-BREASTED NUTHATCH
CHIPPING SPARROW	KILLDEER	WHITE-EYED VIREO
COMMON GRACKLE	LEAST FLYCATCHER	WOOD DUCK
DARKEYED JUNCO		

Table 16 lists fish found in the Honey Creek / Great Miami River Watershed.

Table 16
Fish sighted in the Honey Creek / Great Miami River Watershed

AMERICAN BROOK LAMPREY	RIVER CHUB	SILVERJAW MINNOW
CENTRAL MUDMINNOW	BIGEYE CHUB	FATHEAD MINNOW
GRASS PICKEREL	BLACKNOSE DACE	BLUNTNOSE MINNOW
BLACK REDHORSE	CREEK CHUB	CENTRAL STONEROLLER
GOLDEN REDHORSE	SILVER SHINER	YELLOW BULLHEAD
NORTHERN HOG SUCKER	ROSEFIN SHINER	ROCK BASS
WHITE SUCKER	STRIPED SHINER	SMALLMOUTH BASS
LOG PERCH	SPOTFIN SHINER	LARGEMOUTH BASS
JOHNNY DARTER	SAND SHINER	GREEN SUNFISH
GREENSIDE DARTER	RAINBOW DARTER	BLUEGILL SUNFISH
BANDED DARTER	MOTTLED SCULPIN	

Recreation

The following list describes the recreational areas located within the Honey Creek / Great Miami River Watershed. The subwatershed in which the recreational area is located is in parenthesis.

Golf Courses

Cassel Hills Golf Club
201 S. Cassel Rd
Vandalia, OH 45377
(Great Miami River Subwatershed)

Cliffside Golf Course
6510 S. St. Rt. 202
Tipp City, OH 45371
(Great Miami River Subwatershed)

Hidden Lake Golf Course
5370 E. St. Rt. 571
Tipp City, OH 45371
(Honey Creek Subwatershed)

Kitty Hawk Golf Course
3383 Chuck Wagner Ln
Dayton, OH 45424
(Great Miami River Subwatershed)

Sugar Isle Golf Course
2469 St. Rt. 235 N
New Carlisle, OH 45344

(Honey Creek Subwatershed)

Willow Ponds Golf Course
4250 Gibson Drive
Tipp City, OH 45371
(Great Miami River Subwatershed)

Sportsman Clubs
Shiloh Sportsman Park
Shiloh Sportsman Club
(Great Miami River Subwatershed)

Taylor's Shooting Preserve
(Honey Creek Subwatershed)

North Dayton Anglers
(Indian Creek Subwatershed)

Printing Arts Inc. (John Taylor)
(Honey Creek Subwatershed)

Silver Lake Beach Club
(Indian Creek Subwatershed)

Parks
Charleston Falls Preserve
Miami County Park District
Russ Road
Tipp City, OH 45371
(Great Miami River Subwatershed)

Honey Creek Preserve
Miami County Park District
St. Rt. 202 / St. Rt. 571
Tipp City, OH 45371
(Pleasant Run Subwatershed)

Taylorsville Reserve
Five Rivers Metro Park
US 40
Vandalia, OH 45377
(Great Miami River Subwatershed)

The historic barn located at the Honey Creek Preserve, Miami County Park District property, Bethel Township.

Historical Information

(*From notes presented at the October 1999 Honey Creek Watershed Meeting by Ben Sutherly, Dayton Daily News)*

The First Settlement

The Livingston Settlement was reported to be the first recorded (1796-1797) settlement in Miami County. It was located at the mouth of the Honey Creek and consisted of a few log structures. The Livingston site was selected for two reasons. First, it was located near Freeman's Prairie, a 200-300 acre area right across the river in Monroe Township, Miami County, that was ready for the plow since the Indians had previously tilled and grown corn there. More importantly, Livingston was located at the southern end of the "Ninety-nine Islands", a long chain of tiny islands in the Great Miami River that grounded flatboats and made navigation to the north much more difficult. Livingston thrived for a time as the head of navigation for flat boats. But the settlement was repeatedly hit by seasonal floods and began disbanding as its early inhabitants made inroads into the wilderness and moved inland.

John H. Crawford, who had settled in the area in 1800, made the area's first land entry on December 31, 1802. In 1815, David Staley – brother of Elias Staley, who owned Staley Mill on Indian Creek – established a grist mill near the mouth of Honey Creek. Daniel Babb took over the mill's operations in 1831 and also oversaw a store, a cooper shop and a blacksmith shop.

Is the name Honey Creek legend or fact?

Daniel Boone and Abraham Thomas named Honey Creek after the two had "an encounter" with a bee tree which fell into the water as they chopped it down. The incident probably happened in August, 1782. They were tracking a band of fleeing Shawnee Indians as advance scouts for George Rogers Clark's rowdy army of more than 1000 Kentuckians. As they approached the creek they stumbled upon a large bear. The scouts failed to scare off the bear, which seemed interested in some bees swarming about a hollow tree overhanging the creek. Rather than waste precious ammunition, Boone yelled "Boo" at the bear while "staring" him down. The bear ran away, Boone and Thomas felled the tree across the creek spilling the golden honey into the water. The stream has since been known as Honey Creek.

Historical Sites/Districts

(Information was taken from the National Register of Historic Places)

Miami County, Ohio

Elizabeth Township Rural Historic District

(added 1997 - #97000160)

Roughly bounded by Lost Cr., Miami and Clark Co. line, and Casstown Clark Co. and Elizabeth Bethel Rds., Casstown (198810 acres, 943 buildings, 105 structures, 15 objects)

Staley Farm
(added 1980 - Building - #80003161)
N of Brandt at 7095 Staley Rd., Brandt

Old Tippecanoe Main Street Historic District
(added 1983 - #83002009)
5-439 W. Main St. and 3-225 E. Main St., Tipp City
(220 acres, 75 buildings, 1 structure)

Andrew Sheets House
(1988-02-01)
6880 LeFevre Rd.
Elizabeth Township

Weddle, Callahill & Priscilla House
(1987-06-18)
5710 LeFevre Rd.
Troy, Ohio

Montgomery County, Ohio
Ausenbaugh-McElhenny House (added 1975 - **Building** - #75001503)
7373 Taylorsville Rd., Dayton

Beard, John, Farm (added 1999 - **Building** - #78002151)
Also known as *Karns' Farm*
S of Vandalia on Mulberry Lane, Vandalia

Taylorsville Dam

(Information was taken from the Miami Conservancy District Website, www.miamiconservancy.org)
In March of 1913, the Miami Valley witnessed a natural disaster unparalleled in the region's history. Three storms converged on the state, dumping 8 to 11 inches of rain on already soaked and frozen ground March 23-25, producing a 90-percent runoff and causing the Great Miami River and its tributary streams to overflow. More than 360 people lost their lives; property damage exceeded $100 million (nearly $2 billion in today's economy).

In the wake of this tragedy, Miami Valley citizens rallied to initiate plans to prevent future flooding. Some 23,000 citizens contributed more than $2 million to begin a comprehensive flood protection program on a valley-wide basis.

Arthur Morgan, an engineer based in Memphis, Tennessee, was hired to develop the system. The result was an unfailing flood protection system of five dry dams – Germantown, Englewood, Lockington, Taylorsville and Huffman – and levees that have protected the Miami Valley from flooding by the Great Miami River more than 1,500 times since 1922.

Taylorsville Dam is located in the Great Miami River subwatershed (HUC 050001 200 060). It is an earthen embankment located across the Great Miami River in northern Montgomery County near the City of Vandalia. U.S. State Route 40 goes across the top of the dam. Construction of the dam began in February of 1918 and was completed in November of 1921.

Taylorsville Dam Statistics

- 2,980 feet long
- 67 feet high
- 397 feet wide at dam base
- 1.235 million cubic yards of earth in the embankment
- Four concrete conduits
- Each conduit is 40 feet long, 19.2 feet high and 15 feet wide
- The spillway is 132 feet long
- Volume of concrete in the conduits and spillway is 48,000 yards
- Drainage area above Taylorsville Dam is 11,000 square miles

Elevation and Hydraulic Information

- Elevation of the dam is 837 feet above sea level
- Peak elevation probable maximum flood is 829 feet above sea level
- Spillway elevation is 818 feet above sea level
- Peak elevation Official Plan Flood (OPF) is 820 feet above sea level
- Elevation where storage begins is 775 feet above sea level
- Peak discharge for OPF is 55,000 cubic feet per second
- Time to empty the storage area after an Official Plan Flood is five days
- Water stored to the spillway would inundate 11,000 acres of land upstream from Taylorsville Dam. The 186,000 acre-feet of water would extend along the Great Miami River 14 miles to Ohio 41 in Troy, Miami County.

Nurseries

There are three large nurseries in the Honey Creek / Great Miami River Watersheds. The Honey Creek Watershed Association plans to work with each to develop a pesticide / insecticide management plan.

Table 17
List of Nurseries in the Honey Creek / Great Miami River Subwatershed.

Nursery Name	14-Digit Subwatershed	Acres	Items Sold
Spring Hill Nurseries Garden Center	Great Miami River	12	Trees, shrubs, perennials, annuals
Scarff's Nursery	Honey Creek	700	Wholesale nursery – trees, shrubs, perennials
Studebaker Wholesale Nurseries	Honey Creek	1300	Wholesale nursery – trees, shrubs, perennials

Comprehensive Planning and Zoning

Within the watershed, a number of jurisdictions have Comprehensive Plans (also called Master or Strategic Plans) to guide future land use, growth, and development related decisions. Such plans also aim to maintain healthy economies, minimize land use conflicts, stabilize neighborhoods, and protect vital natural resources. The content and focus of each plan varies according to local values and long-term goals. Table 18 lists the jurisdictions within the watershed and the dates of their current Comprehensive Plans. Such plans are typically based on long-term projections (10 to 20 years) and the predominant community values at the time they were developed. As a result, it is important that plans are periodically updated to reflect new information, revised projections, and changing community priorities. This is especially important with respect to the watershed protection, a relatively young concept that has gained acceptance in the last 10 years.

TABLE 18

ZONING AND COMPREHENSIVE PLANNING

IN THE HONEY CREEK / GREAT MIAMI RIVER WATERSHEDS

Jurisdiction	Zoning Administrator	Comprehensive Plan (Date)
Miami County		
City of Tipp City	City of Tipp City	Tipp City Plan (1993)
Elizabeth Twp.	Elizabeth Twp.	Miami Co. Plan (2006)
Lost Creek Twp.	Lost Creek Twp.	Miami Co. Plan (2006)
Bethel Twp.	Bethel Twp.	Miami Co. Plan (2006)
Monroe Twp.	Miami County	Miami Co. Plan (2006)
Montgomery County		
City of Vandalia	City of Vandalia	Vandalia Plan (11/1985)
City of Huber Heights	City of Huber Heights	Huber Heights Plan (1995)
City of Dayton	City of Dayton	Dayton Plan (1999)
Harrison Twp.	Harrison Twp.	Montgomery Co. Plan (1990)
Butler Twp.	Butler Twp.	Montgomery Co. Plan (1990)
Clark County		
City of New Carlisle	City of New Carlisle	New Carlisle Plan (2/1/82)
Bethel Twp.	Clark County	Clark Co. Plan (2/24/99)
Pike Twp.	Pike Twp.	Clark Co. Plan (2/24/99)
Champaign County		
Village of Christiansburg	No Zoning	None
Jackson Twp.	Jackson Twp.	Urbana /Champaign Co. Plan (1993)

Miami and Clark Counties and the Cities of Dayton and Huber Heights are using relatively current Comprehensive Plans that have been updated within the last

five years. Montgomery County, Champaign County, New Carlisle, and Vandalia have plans that are more dated. Most of the Comprehensive Plans that are within the watershed recommend strategies to protect surface and groundwater, farmland, greenways, and to establish added recreational opportunities.

The Miami County Comprehensive Plan[12] indicates that the majority of Elizabeth, Bethel, and Lost Creek Townships in the HC SWS are most suitable for future land uses of agriculture, open space, conservation and recreation. This is due to the predominance of prime farmland soils as well as development limitations on some

[12] Miami County Comprehensive Plan, 1998.

areas as a result of soils, drainage, floodplains, etc. The Miami County Comprehensive Plan recognizes the main east-west corridor of Honey Creek as particularly worthy of protection from development as a result of the unique wetlands present. The Miami County Green Space Plan[13] also notes the unique wetlands along the Honey Creek corridor in Bethel Township and recommends that large tracts be preserved. The Clark County Comprehensive Land Use Plan[14] indicates that the "preferred growth scenario" for the majority of HC SWS in the County is for agricultural and rural residential land uses.

The Miami Valley Open Space Inventory[15] identified a total of 100 open space facilities (sites and areas) located in Clark, Miami, and Montgomery Counties that fall within or intersect the Project Area boundaries. The Open Space Inventory did not include Champaign County. The Inventory included eleven separate classifications spanning a broad spectrum of open space categories including natural areas as well as man-made or altered sites such as schools, airports, golf courses, fairgrounds, cemeteries, quarries, etc. Of the open space classifications included in the 1993 Inventory, a total of seven sites, included in the classifications of "natural environment protection area" or "natural environment recreation area" are located in the watershed.

Most jurisdictions in the watershed use zoning as the tool to control development and land use and implement the goals of their comprehensive plans. Imbedded in local zoning codes are subdivision regulations that contain requirements and restrictions for land development including housing density, minimum lot size, frontage, lot coverage, set backs, road construction, and utilities. Zoning codes between jurisdictions can vary widely. Table 18 shows what entities administer the different zoning codes in the watershed. Nearly all of the townships and municipalities in the watershed administer their own zoning codes. Exceptions to this include Monroe Township where zoning is administered by Miami County. The Village of Christiansburg has no zoning in place.

Farmland Preservation

Many Ohio counties are currently in the process of developing farmland preservation plans that are intended to outline the status of farmland loss in each, identify appropriate strategies for reducing the loss, and make recommendations for the implementation of these strategies. In the watershed, Champaign[16], Clark[17], and

[13] Miami County Green Space Plan, 11/1991
[14] Clark County, Ohio Comprehensive Land Use Plan, adopted 2/24/99.
[15] Miami Valley Open Space Inventory, March 1993. Prepared for Miami Valley Open Space Council by the Miami Valley Regional Planning Commission.
[16] Pflum, Klausmeier & Gehrum Consultants, October 99. Farmland Preservation, Champaign County, Ohio.
[17] Pflum, Klausmeier & Gehrum Consultants, October 99. Clark County Farmland Preservation Report.

Miami[18] Counties have developed these types of plans. Montgomery County is not currently developing a plan.

In 2001, Governor Taft initiated the $400 million Clean Ohio Fund to preserve farmland and greenspace, develop recreational trails and clean up brownfield sites. The Ohio Department of Agriculture's Office of Farmland Preservation implements the $25 million portion of the fund for the purchase of agricultural easements on productive farmland from willing landowners. Currently, a total of 905.47 acres of farmland in the watershed are protected with a permanent agricultural easement through the Farmland and Ranch Preservation Program.

Watershed Resource Restoration Sponsor Program

Throughout the Honey Creek / Great Miami River subwatershed there are many acres of valuable wetlands and riparian areas that have been designed by nature to keep our water supplies clean, help prevent floods, provide wildlife habitat, nurture rare plants and animals, and add beauty to our landscape. The Honey Creek Watershed

Honey Creek / Great Miami River Watershed
WRRSP SUMMARY

Recipient	# of acres protected	14-digit Subwatershed	Protection Type
City of Tipp City	239*	Great Miami River	Fee Simple Purchase
Miami County Park District	7.7 26 23.6 15	Honey Creek	Permanent Conservation Easement
Miami County Park District	58.4	Great Miami River	Fee Simple Purchase
City of New Carlisle	23.8	Honey Creek	Fee Simple Purchase
Total Acres	393.5		

*These properties were purchased with a combination of WRRSP, Clean Ohio Grant Funds, Miami Conservancy District Funds, and Ohio Department of Transportation monies.

Association has worked closely with partners that are committed to preserve and restore these areas within the watershed. The Ohio EPA's innovative Water Resource Restoration Sponsor Program (WRRSP) has enabled the protection of nearly 469 acres of land, within the Honey Creek / Great Miami River Watershed that will ultimately be restored to native prairie, forest and/or wetlands.

The WRRSP works by reducing interest rates for publicly owned treatment works (POTW) seeking loans from the Ohio Water Pollution Control Loan Fund (WPCLF) while providing funds to finance planning and implementation of projects that protect

[18] Miami County Planning and Zoning Department, December 99. Miami County Farmland Preservation Task Force Report.

or restore water resources. In 2002, the Tri-Cities North Regional Wastewater Authority (program sponsor) applied for a loan to construct a new pump station at Ross Road (Great Miami River subwatershed, Miami County). Tri-Cities North Regional Wastewater Authority entered into a Joint Sponsorship Agreement with the Miami County Park District, the City of Tipp City, and the City of New Carlisle. The Honey Creek Watershed Steering Committee assisted partners in identifying critical areas for protection and contacting landowners.

Through this highly successful regional cooperative effort, a total of $1,403,809.17 in WRRSP funds was expended. Fee simple purchase of roughly 321 acres as well as the purchase of conservation easements on approximately 72 additional acres was completed during this two year effort. Some of these purchases were made possible with a combination of Clean Ohio Grant funds ($269,424.57), Miami Conservancy District funds ($11,000.00), and Ohio Department of Transportation monies ($32,585.43). Professional services for appraisals, surveying, deed preparation and recording, prairie seed restoration, and a state of the art ground water monitoring system was also provided through this program.

Chapter 3: Water Quality Data

Ohio Water Quality Standards (OEPA 2001)

Ohio EPA employs biological, chemical, and physical monitoring and assessment techniques in bio-surveys in order to meet three major objectives:

- determine the extent to which use designations assigned in the Ohio Water Quality Standards (WQS) are either attained or not attained
- determine if use designations assigned to a given water body are appropriate and attainable
- determine if any changes in key ambient biological, chemical, or physical indicators have taken place over time, particularly before and after the implementation of point source pollution controls or best management practices. The data gathered by a bio-survey is processed, evaluated, and synthesized in a biological and water quality report. Each biological and water quality study contains a summary of major findings and recommendations for revisions to WQS, future monitoring needs, or other actions which may be needed to resolve existing impairment of designated uses. While the principal focus of a bio-survey is on the status of aquatic life uses, the status of other uses such as recreation and water supply, as well as human health concerns are also addressed

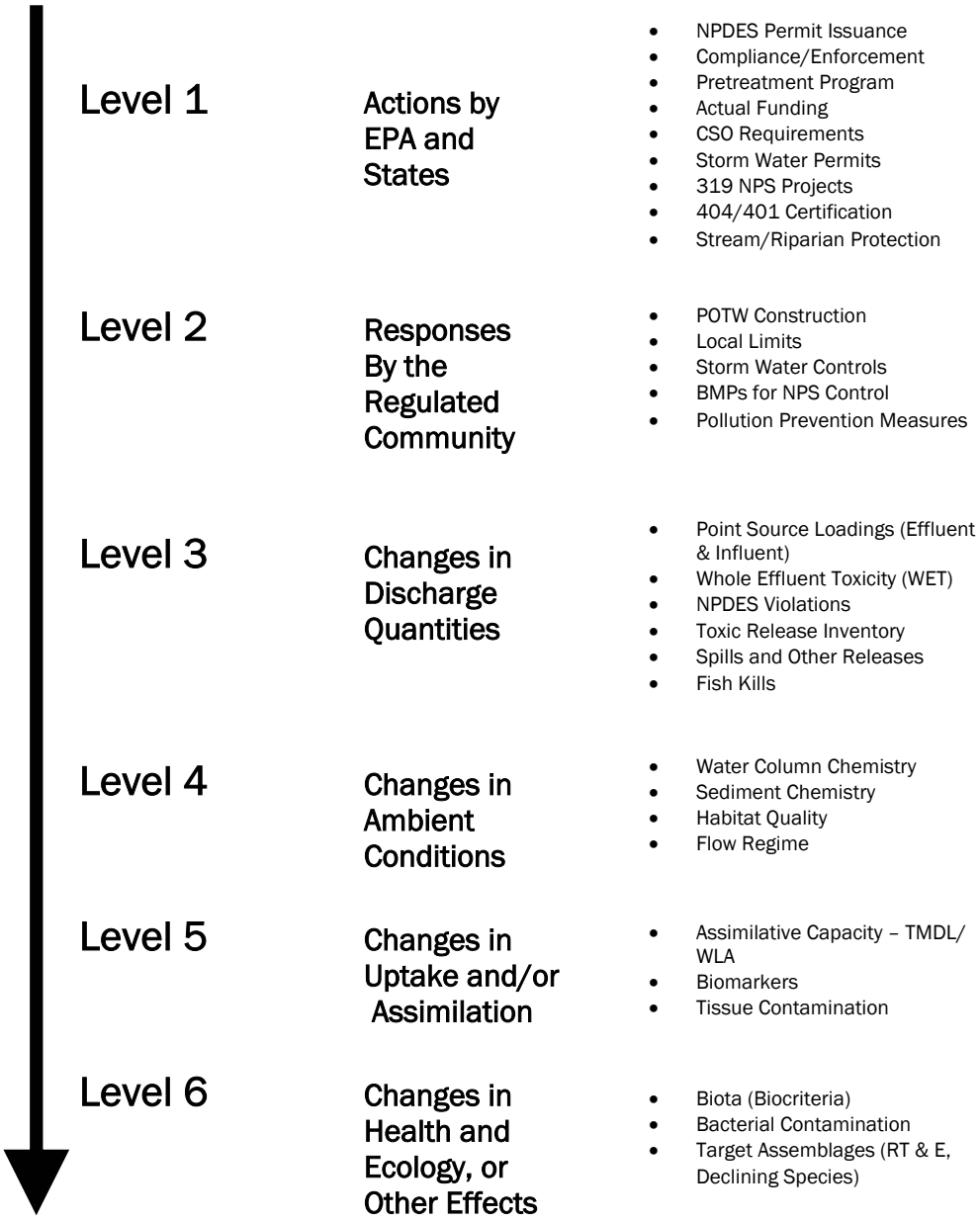
The findings and conclusions of a biological and water quality study may factor into regulatory actions taken by Ohio EPA (e.g., National Permit Discharge Elimination System (NPDES) permits, Water Quality Permit Support Documents (SWPSDs) Director's Orders, the Ohio Water Quality Standards (OAC 3745-1), and are eventually incorporated into Water Quality Permit Support Documents (WQPSDs), State Water Quality Management Plans, the Ohio Non-point Source Assessment, and the Ohio Water Resource Inventory (OEPA 2001).

Hierarchy of Indicators (OEPA 2001)

A carefully conceived ambient monitoring approach, using cost-effective indicators comprised of ecological, chemical, and toxicological measures, can ensure that all relevant pollution sources are judged objectively on the basis of environmental results. Ohio EPA relies on a tiered approach in attempting to link the results of administrative activities with true environmental measures. This integrated approach is outlined in **Figure 8** and includes a hierarchical continuum from administrative to true environmental indicators. The six "levels" of indicators include:

- actions taken by regulatory agencies (permitting, enforcement, grants)
- responses by the regulated community (treatment works, pollution prevention)
- changes in discharged quantities (pollutant loadings)
- changes in ambient conditions (water quality, habitat)
- changes in uptake and/or assimilation (tissue contamination, biomarkers, waste load allocation)
- changes in health, ecology, or other effects (ecological condition, pathogens)

Figure 8
Hierarchical continuum from administrative to environmental indicators
(OEPA 2001)



In this process the results of administrative activities (levels 1 & 2) can be linked to efforts to improve water quality (levels 3, 4, and 5), which should translate into the environmental "results:" (level 6). Thus, the aggregate effect of billions of dollars spent on water pollution control since the early 1970s can now be determined with quantifiable measures of environmental condition.

Superimposed on this hierarchy is the concept of stressor, exposure, and response indicators. Stressor indicators generally include activities which have the potential to degrade the aquatic environment such as pollutant discharges (permitted and not permitted), land use effects, and habitat modifications. Exposure indicators are those which measure the effects of stressors and can include whole effluent toxicity tests, tissue residues, and biomarkers, each of which provides evidence of biological exposure to a stressor or bio-accumulative agent. Response indicators are generally composite measures of the cumulative effects of stress and exposure and include the more direct measures of community and population response that are represented here by the biological indices which comprise Ohio's biological criteria. Other response indicators could include target assemblages (i.e., rare, threatened, endangered, special status, and declining species or bacterial levels which serve as surrogates for the recreational uses). These indicators represent the essential technical elements for watershed-based management approaches. The key, however, is to use the different indicators within the roles which are most appropriate for each.

Describing the causes and sources associated with observed impairments revealed by the biological criteria and linking this with pollution sources involves an interpretation of multiple lines of evidence including water chemistry data, sediment data, habitat data, effluent data, bio-monitoring results, land use data, and biological response signatures within the biological data itself. Thus the assignment of principal causes and sources of impairment represents the association of impairments (defined by response indicators) with stressor and exposure indicators. The principal reporting venue for this process on a watershed or sub-basin scale is a biological and water quality report. These reports then provide the foundation for aggregated assessments such as the Ohio Water Resource Inventory (305(b) report), the Ohio NPS Assessment, and technical bulletins.

Ohio Water Quality Standards: Designated Aquatic Life Uses (OEPA 2001)

The Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1) consist of designated uses and chemical, physical, and biological criteria designed to represent measurable properties of the environment that are consistent with the narrative goals specified by each use designation. Use designations consist of two broad groups, aquatic life and non-aquatic life uses. In applications of the Ohio WQS to the management of water resource issues in rivers and streams, the aquatic life use criteria frequently control the resulting protection and restoration requirements, hence their emphasis in biological and water quality reports. Also, an emphasis on protecting aquatic life generally results in water quality suitable for all uses. The five different aquatic life uses currently defined in the Ohio WQS with the general intent of each with respect to the role of biological criteria are described as follows:

- *Warmwater Habitat (WWH)* – this designation defines the "typical" warm water 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. Biological criteria are stratified across five ecoregions for the WWH use designation.

- *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 (i.e., declining species); this designation represents a protection goal for water resource management efforts dealing with Ohio's best water resources. Biological criteria for EWH apply uniformly across the state.
- *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 Ohio DNR, Division of Wildlife; this use should not be confused with the Seasonal Salmonid Habitat (SSH) use which applies to the Lake Erie tributaries which support periodic "runs" of salmonids during the spring, summer, and/or fall. No specific biological criteria have been developed for the CWH use although the WWH biocriteria are viewed as attainable for CWH designated streams.
- *Modified Warm water Habitat (MWH)* – this use applies to streams and rivers which have been subjected to extensive, maintained, and essentially permanent hydro modifications such that the biocriteria for the WWH use are not attainable and where the activities have been sanctioned and permitted by state or federal law; the representative aquatic assemblages are generally composed species which are tolerant to low dissolved oxygen, silt, nutrient, enrichment, and poor quality habitat. Biological criteria for MWH were derived from a separate set of habitat modified reference sites and are stratified across five ecoregions and three major modification types: channelization, run-of-river impoundments, and extensive sedimentation due to non-acidic mine drainage.
- *Limited Resource Water (LRW)* – this use applies to small steams (usually <3 mi. 2 drainage area) and other water courses which have been irretrievably altered to the extend 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 (i.e., true ephemeral streams), or other irretrievable altered waterways. No formal biological criteria have been established for the LRW use designation.

Chemical, physical, and/or biological criteria are generally assigned to each use designation in accordance with the broad goals defined by each. As such, the system of use designations employed in the Ohio WQS constitutes a "tiered" approach in that, varying and graduated levels, of protection are provided by each. This hierarchy is especially apparent for parameters such as dissolved oxygen, ammonia-nitrogen, temperature, and the biological criteria. For other parameters such as heavy metals, the technology to construct an equally graduated set of criteria has been lacking, thus the same water quality criteria may apply to two or three different use designations.

Ohio Water Quality Standards: Non-Aquatic Life Uses (OEPA 2001)

In addition to assessing the appropriateness and status of aquatic life uses, each biological and water quality survey also addresses non-aquatic life uses such as recreation, water supply, and human health concerns as appropriate. The recreation used most applicable to rivers and streams are Primary Contact Recreation (PCR) and Secondary Contact Recreation (SCR) uses. The criterion for designating the PCR use is simply having a water depth of at least one meter over an area of at least 100 square feet or where canoeing is a feasible activity. If a water body is too small and shallow to meet either criterion the SCR us applies. The attainment status of PCR and SCR is determined using bacterial indicators (e.g., fecal coliform bacteria, E. coli) and the criteria for each are specified in the Ohio WQS.

Water supply uses include Public Water Supply (RWS), Agricultural Water Supply (AWS), and Industrial Water Supply (IWS). Public Water Supplies are simply defined as segments within 500 yards of a potable water supply or food processing industry intake. The Agricultural Water Supply (AWS) and Industrial Water Supply ((IWS) use designations generally apply to all waters unless it can be clearly shown that they are not applicable. An example of this would be an urban area where livestock watering or pasturing does not take place, thus the AWS use would not apply. Chemical criteria are specified in the Ohio WQS for each use and attainment status is based primarily on chemical-specific indicators. Human health concerns are additionally addressed with fish tissue data, but any consumption advisories are issued by the Ohio Department of Health and are detailed in other documents (Ohio EPA, Boucher 2002)."

Aquatic Habitat (OEPA 2001)

The Ohio EPA must make a determination of the aquatic uses of Ohio's waterways. Several structural indices are used to assess the health of the biological community and measure habitat quality. Biological indicators are features of the aquatic ecosystem that demonstrate the health and vitality of that ecosystem. The indices used by the Ohio EPA are the *Index of Biological Integrity (IBI), the Invertebrate Community Index (ICI) and the Qualitative Habitat Evaluation Index (QHEI).*

The *Index of Biological Integrity (IBI)* is a measure of fish species diversity and species populations. This index gives a score which indicates how much a stream habitat is affected by pollutants, and which types of fish are present. Depending on the pollution tolerance of the species, the IBI indicates which species are likely to be found in the stream. The highest score attainable is 60, and higher scores indicate healthier streams (Ohio EPA, 2001). Scores ranging from 44-49 are considered warm water habitat in the Western Alleghany Plateau region of Ohio

The *Invertebrate Community Index (ICI)* is based on measurements of macro-invertebrate communities living in a stream. Macro-invertebrate studies are important to assess because many insect taxa are known to be either pollution tolerant or intolerant. The presence of certain species indicates the general water quality of an area. This index gives helpful clues about the amount of pollution stressing the stream environment (Ohio EPA, 2001).

The *Qualitative Habitat Evaluation Index (QHEI)* is a qualitative evaluation of stream habitat. Physical features that affect fish and invertebrate communities are evaluated. Some of the features evaluated include; type of substrate, amount and type of in-stream cover, channel width, sinuosity, and erosion. QHEI scores of 60 or above are considered conducive to the establishment of warm water fauna.

The *Headwater Habitat Evaluation Index (HHEI)* is a qualitative evaluation of primary headwater streams (PHWH) in Ohio. The evaluation protocol was developed in 1999 for the State of Ohio. There are three classes of primary headwater streams:

- Class I PHWH Streams – ephemeral flow, dry channel present annually, has a defined bed and bank, higher aquatic life forms such as fish are absent or present seasonally, low diversity.
- Class II PHWH Streams – warmwater adapted community, has a defined bed and bank, flow may be permanent, interstitial or intermittent, permanent pools present annually.
- Class III PHWH Streams – Perennial flow, has a defined bed and bank, presence of one or more of the following at all times: obligate aquatic salamanders, cold water or pioneering fish species, cool water adapted benthic macroinvertebrates.

The final HHEI is based on three metrics: Substrate Metric (40 points), Bankfull Width (30 points) and Maximum Pool Depth (30 points). The total HHEI score ranges from 0-100. The HHEI is a rapid screening method based on the above 3 simple physical habitat measures. This method tells classification only not the environmental state of the stream.

Honey Creek / Great Miami River Water Quality Standards

One of the most limiting factors of the Honey Creek Watershed Association is the lack of water quality data in this watershed. In Ohio Environmental Protection Agency's Ohio 2004 Integrated Report, Section 303 (d) List of Impaired Waters, they list the Honey Creek / Great Miami River (HUC 05080001 200) as a Category 3. A Category 3 listing means that there is insufficient data to determine whether any designated uses are met.

In 1994 and 1995, approximately 75 miles of the Upper Great Miami River mainstem were assessed. The study area included the Great Miami River mainstem from Indian Lake to Dayton and several tributaries including the Honey Creek. The main focus of the Honey Creek was to evaluate the influence of the New Carlisle WWTP. The following water quality information is taken from Ohio EPA reports entitled, "Biological and Water Quality Study of the Upper Great Miami River and Selected Tributaries, 1994" (1996) and "Biological and Water Quality Study of the Middle and Lower Great Miami River and Selected Tributaries, 1995" (1997).

Honey Creek Watershed

The Honey Creek Watershed was assessed by Ohio EPA in 1994. Honey Creek was assessed from confluence with Great Miami River upstream to past New Carlisle. The New Carlisle WWTP discharges directly to the Honey Creek at RM 8.7. Biological and chemical monitoring sites were situated to evaluate the influence of this facility, providing assessment coverage of 10.1 river miles. The stream attained the Exceptional Warmwater Habitat (EWH) aquatic life use designation above the New Carlisle WWTP outfall. Partial attainment was observed downstream of the outfall. The fish community achieved EWH levels in this segment, but the macroinvertebrate was only marginally good to good, not quite to the exceptional measure. More than 11,000 fish of 34 species were sampled. The fish assemblage was diverse and well organized with pollutant sensitive species present. No negative effect on the fish community by the New Carlisle WWTP was seen.

The macroinvertebrate community exhibited a moderate impact downstream from the New Carlisle WWTP. Macroinvertebrates were dominated by pollution tolerant species such as flatworms and blackflies, although environmentally sensitive taxa such as mayflies and caddisflies were present. The response suggested moderate organic enrichment, but no toxic effects were indicated. Additional evidence of organic enrichment included several violations of the EWH DO minimum criterion downstream from the WWTP. The community improved further downstream, but never fully recovered.

Great Miami River Subwatershed

Portions of the Great Miami River (GMR) Watershed were covered in each of the Ohio EPA assessments. The 1994 assessment includes the section from Honey Creek (approximately RM 100) to just downstream of the Tri-Cities North Regional WWTP (formerly the North Regional WWTP). The 1995 assessment includes the small

stretch upstream of Steele Dam near Needmore Rd., to just upstream of the confluence with the Stillwater River. The river attained the Warmwater Habitat (WWH) aquatic life use designation throughout the segments, with the exception of the Steel Dam impoundment, which only achieved partial attainment. The partial attainment in water impoundments is most often due to nutrient enrichment and marginal DO levels.

Based on strong indications by both the fish and macroinvertebrate communities, a major recommendation of the Ohio EPA is to redesignate from WWH to EWH the GMR mainstem upstream of the Steel Dam impoundment stretch. With the exception of a 1.6 mile stretch downstream of the Tri Cities North Regional WWTP, the EWH was fully attained in 1994. The small partial attainment stretch misses the EWH cut off for invertebrate strength by a very small margin that should be attainable by continued improvement in pollution reduction. In fact, when the same stretch was reassessed as part of the 1995 assessment of the Middle and Lower GMR, full EWH attainment was recorded.

Fish and macroinvertebrate communities exhibited exceptional performance in all free-flowing stretches downstream from the Quincy Dam in Logan County to Dayton. This includes the entire length of the GMR in the Project Area. The high quality environmental conditions were attributed to both exceptional water quality as well as a predominance of high quality habitat.

An important conclusion drawn from both reports is that the mainstem GMR showed a remarkable improvement in water quality from earlier reports. In all cases, the marked improvement of the water quality is mainly attributed to reduction in point-source loads due to improvements at WWTP's.

The following tables list the aquatic life use attainment for applicable use designations (existing and recommended) in the Upper Great Miami River study area. Attainment status is based on data collected between June and October 1994 (OEPA 1996). All of the streams evaluated as part of the 1994 sampling effort are designated agricultural and industrial water supply, and primary contact recreation.

Table 19
1994 Aquatic life use attainment for applicable use designations in the Upper Great Miami River (OEPA 1996).
(Eastern Corn Belt Plain – WWH / EWH Use Designation (Existing / Recommended))

River Mile Fish/Invert.	IBI	Modified Iwb	ICI	QHEI	Attainment Status	Comment
98.7 / 100.8	57	10.4	52	77.0	FULL / FULL	SR 571
95.9 / 95.7	57	10.5	52	88.0	FULL / FULL	Ross Rd.
93.8 / --	56	10.1	--	78.0	(FULL / FULL)	Old Vandalia WWTP
91.0 / 91.1	54	10.5	56	68.0	FULL / FULL	Little York Rd.
87.3 / 87.7	54	10.2	52	80.5	FULL / FULL	Needmore
86.6 / 86.6	47	9.0	22	--	N/A	MCD N Reg. Mixing Zone
85.0 / 85.9	56	10.1	38	72.0	FULL / PARTIAL	Dst. MCD N WWTP

Table 20
1994 Aquatic life use attainment for applicable use designations in the Honey Creek (OEPA 1996).
(Eastern Corn Belt Plain – EWH Use Designation (Existing))

River Mile Fish/Invert.	IBI	Modified Iwb	ICI	QHEI	Attainment Status	Comment
10.0 / 10.1	48^{ns}	9.1 ^{ns}	44	70.5	FULL	Ust. New Carlisle WWTP
8.0 / 8.1	48^{ns}	9.2 ^{ns}	MG *	85.0	PARTIAL	Dst. New Carlisle WWTP
3.2 / 3.2	48^{ns}	9.4	40 *	67.5	PARTIAL	Rudy Rd.

* Significant departure from applicable biological criterion (>4 IBI or ICI units, >0.5 MIwb units), poor and very poor results are underlined.
ns – Non-significant departure from biological criterion (≤IBI or ICI units, > 0.5 MIwb units).

Table 21
Use designations for water bodies in the Great Miami River drainage basin
(Ohio Water Quality Standards - OAC 3745-1)

Water Body Segment	*Aquatic Life Habitat*	*Water Supply*	*Recreation*
Great Miami River (GMR)– CSX RR bridge (RM 84.5) to the Taylorsville dam (RM 92.6) +	EWH	AWS ; IWS	PCR
GMR – Taylorsville dam to Ross Rd. (RM 95.7) (*State Resource Water)* +	EWH	AWS ; IWS	PCR
GMR – Ross Rd. to the Troy dam (RM 107.0) +	EWH	AWS ; IWS	PCR
Poplar Creek +	WWH	AWS ; IWS	PCR
Honey Creek +	EWH	AWS ; IWS	PCR
Indian Creek *	WWH	AWS ; IWS	PCR
Dry Creek *	WWH	AWS ; IWS	PCR
West Fork *	WWH	AWS ; IWS	PCR
East Fork *	WWH	AWS ; IWS	PCR

WWH = warmwater habitat; EWH = exceptional warmwater habitat; AWS = agricultural water supply; IWS = industrial water supply; PCR = primary contact recreation;
+ Designated use based on the results of a biological field assessment performed by the OEPA.
**** Designated use based on the 1978 water quality standards***

Rosgen Stream Channel Classification

The Rosgen system (Rosgen, 1996) uses six morphological measurements for classifying a stream reach. The following descriptions of the morphological measurements were taken from the interagency document, "Stream Corridor Restoration: Principles, Processes, and Practices" (Federal Interagency 1998). Rosgen uses the bankfull discharge to represent the stream-forming discharge or channel-forming flow. Bankfull discharge is needed to use this classification system because all of the morphological relationships are related to this flow condition.

1. Entrenchment – Entrenchment describes the relationship between a stream and its valley and is defined as the vertical containment of the stream and the

degree to which it is incised in the valley floor. The entrenchment ratio used in the Rosgen classification system is the flood-prone width of the valley divided by the bankfull width of the channel. Flood-prone width is determined by doubling the maximum depth in the bankfull channel and measuring the width of the valley at that elevation. A stream is classified as entrenched if its flood-prone width is less than 1.4 times the bankfull width.

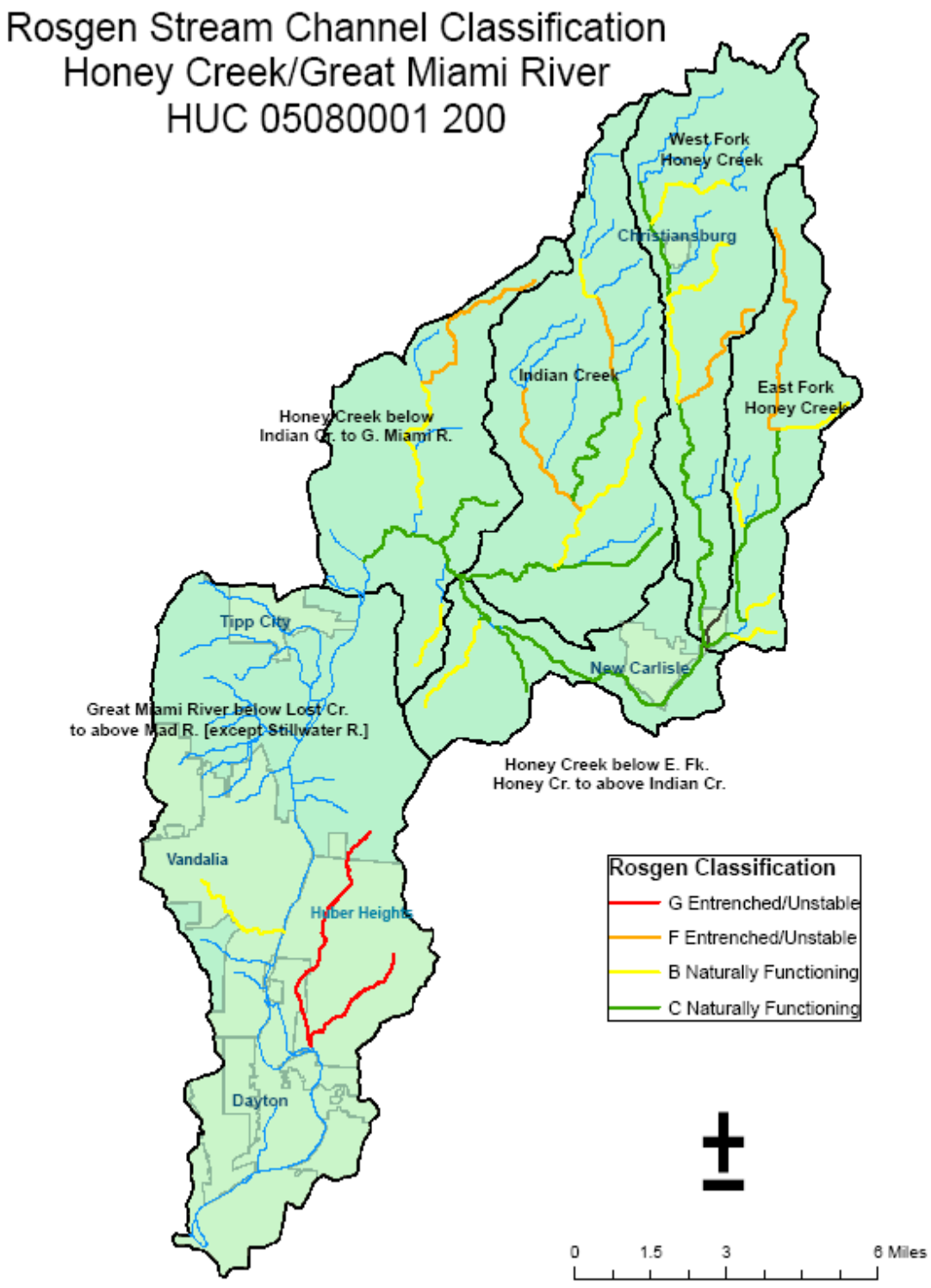
2. Width / Depth Ratio - The width/depth ratio is taken at bankfull stage and is the ratio of top width to mean depth for the bankfull channel.
3. Sinuosity – Sinuosity is the ration of stream length to valley length or, valley slope to stream slope.
4. Number of Channels
5. Slope – Stream slope is measured over a channel reach of at least 20 widths in length.
6. Bed Material Particle Size – The bed material particle size used in the classification is the dominant bed surface particle size, determined in the filed by a pebble-count procedure or as modified for sand and smaller sizes.

The Honey Creek / GMR Watershed was assessed using the Rosgen stream channel classification. **Map 9** illustrates those results. Of the streams assessed in the watershed, 142,770 linear feet are classified B (Naturally Functioning), 249,223 linear feet are classified C (Naturally Functioning), 84,527 linear feet are classified F (Entrenched / Unstable) and 40,108 linear feet are classified G (Entrenched / Unstable). One of the objectives of this Watershed Action Plan is to complete this assessment on all the streams in the watershed. Another objective of this Watershed Action Plan is to effectively evaluate the stream habitat within the watershed and create a map with Quality Habitat Evaluation (QHEI) and Headwater Habitat Evaluation (HHEI) Indices illustrated.

Rosgen Stream Channel Classification for Honey Creek / Great Miami River Watershed (Rosgen 1996)

Stream Type	Description	Total Length (linear feet)
B – Naturally Functioning	Moderately entrenched; > 12 width / depth ratio; moderate sinuosity, >1.2; riffle dominated channel, with infrequently spaced pools; stable banks	142,770
C – Naturally Functioning	Slightly entrenched; < 12 moderate to high width / depth ratio; high sinuosity > 1.5; meandering point-bar, riffle/pool, alluvial channels with broad, well defined floodplains	249,223
F – Entrenched / Unstable	Entrenched, moderate to high width / depth ratio - >12; moderate sinuosity > 1.2; meandering riffle/pool channel on low gradients; unstable with high bank erosion rates	84,527
G "Gully" – Entrenched / Unstable	Entrenched; narrow, and deep step/pool channel; low to moderate sinuosity >1.2; low width / depth ratio - <12; unstable, with grade control problems and high bank erosion rates	40,108

MAP 9


Rosgen Stream Channel Classification
Honey Creek/Great Miami River
HUC 05080001 200
West Fork
Honey Creek
Christiansburg
Indian Creek
East Fork
Honey Creek
Honey Creek below
Indian Cr. to G. Miami R.
Tipp City
New Carlisle
Great Miami River below Lost Cr.
to above Mad R. [except Stillwater R.]
Honey Creek below E. Fk.
Honey Cr. to above Indian Cr.
Vandalia
Huber Heights
Dayton
Rosgen Classification
G Entrenched/Unstable
F Entrenched/Unstable
B Naturally Functioning
C Naturally Functioning
0
1.5
3
6 Miles

CHAPTER 4: Potential Impacts to Water Resources

Topography and Slope

Soil erosion is most pronounced when a land use disturbs soil on a steep grade. Increased water runoff velocities over steep grades result in more soil disturbed and transported. The influence of slope on drainage, erosion, and provision of adequately sized flat areas is important to land use planning. Farming practices such as row crops require relatively flat land with either good natural drainage or the ability to provide relatively inexpensive artificial drainage. Undulating to rolling topography makes a good background for residential development. Large flat areas are needed for many modern industrial or commercial developments. Steep slopes are usually part of a high-quality recreation area or natural preservation site.

The soils were generalized into three general slope categories based on County Soil Survey properties. Gradual slopes are less than 6%, moderate slopes are 6%-12%, and steep slopes are greater than 12%. In the watershed, over 88% of the land area has gradual slope, approximately 8% is moderate, 3% is steep, and the small remainder is barren land with no slope category.

Tillage

One aspect of agricultural land use that can be a detriment to water quality is habitat siltation caused by excessive erosion. As previously mentioned, slope can be a factor that leads to severe erosion problems. In agricultural settings, the tillage method can help to reduce the sediment load to streams.

Conservation tillage includes any planting system that maintains at least 30 percent of the previous crop's residue on the soil surface after planting. Maintaining adequate residue helps reduce soil erosion by water or wind. This practice reduces soil erosion, detachment and sediment transport by providing soil cover during critical times in the cropping cycle. Surface residues reduce soil compaction from raindrops, preventing soil sealing and increasing infiltration.

County SWCD staffs collected data on cropland tillage systems in the watershed. Tillage data are collected by annual windshield surveys along transects through the counties. Due to limitations related to how the data was collected, it is difficult to give specific information on the proportions of tillage types in the watershed. However, SWCD staff considers the data is representative of the cropland in the watershed. In 1998, 65% of corn and all the soybean cropland along the Honey Creek transect in Miami County were in some form of conservation tillage. The majority of conservation tillage cropland for both crop types was no-till. In Champaign County, 99% of both the corn and soybean crops are under conservation tillage practices, but no-till is much more prevalent among the soybean crops. Estimates are lower for Clark County, with only about 40% of all crop types in no-till, with the remaining 60% in conventional tillage systems.

Erosion

Soil erosion is one of the leading causes of water pollution in the United States. The problems associated with soil erosion are the movement of sediment and associated pollutants by runoff into a waterbody. Excessive sedimentation clouds the water, which reduces the amount of sunlight reaching aquatic plants; covers fish spawning areas and food supplies; and clogs the gills of fish. In addition, other pollutants like phosphorus, pathogens, and heavy metals are often attached to the soil particles and end up in the water bodies with the sediment[19].

Soil erosion occurring in Indian Creek Subwatershed

Soil properties contribute to the erodibility of an area, and combined with topography, erodibility can be a hazard. Highly erodible land (HEL) determinations are made by the NRCS based on the potential erosion from a particular soil. The soil erodibility index is the measure selected to determine whether a soil map unit is HEL. The soil erodibility index is applied to specific soil mapping units without counting the benefit of vegetative cover or conservation practices. This procedure estimates the erosion that would occur if the land were left totally without protection, including cover and residue from a crop. Soils that would potentially erode at several times higher than the soil's tolerance rate are termed "highly erodible." The tolerance rate is the rate at which a given soil can erode annually and still maintain high productivity over time.

The distribution of HEL soils in the watershed is shown on **Map 5 and Table 22**. In the entire watershed, nearly three-quarters of the soils are not HEL, while 11.2% are HEL. Further explanation of HEL soils for each of the 14-digit HUC Subwatersheds, can be found in the ***Subwatershed Inventory Section***.

[19] US EPA. 1997. Nonpoint Source Pointer No. 6: Managing Nonpoint Source Pollution from Agriculture. Factsheets available for download from US EPA Office of Water Nonpoint Source Pollution website (http://www.epa.gov/owow/nps).

Table 22
Percent of Highly Erodible Land in the 14-digit Subwatersheds in the Honey Creek / Great Miami River Watershed.

14- digit Subwatershed	*% HEL in Subwatershed*
West Fork Honey Creek	10.1
East Fork Honey Creek	10.9
Honey Creek	17.6
Indian Creek	10.1
Pleasant Run	10.9
Great Miami River	9.3
Total % HEL in the Project Area	11.2

Municipal Wastewater Treatment Plants

There are two active wastewater treatment facilities within the watershed. (**Map 10**) The New Carlisle Wastewater Treatment Plant, located in the Honey Creek Subwatershed, serves New Carlisle, the Village of North Hampton, Honey Creek Village Mobile Home Park (MHP), Park Terrace MHP, Brookwood MHP, and Country Squire Estates. The plant operates under an NPDES permit and discharges to the Honey Creek. The Tri-Cities North Regional Wastewater Treatment Plant, which serves Huber Heights, Vandalia, and Tipp City, is located in the Great Miami River Subwatershed. The plant operates under an NPDES permit and discharges to the Great Miami River.

Sewer Service Areas

The availability of sanitary sewer service can have a direct influence on land development. In general, areas served by sanitary sewer or located in close proximity to sewer lines are more likely to be developed. As shown on **Map 10** approximately 27% of the entire watershed is currently served by sanitary sewer. The presence of sewer lines and undeveloped land within and adjacent to the watershed may lead to increased development, resulting in more effluent discharged to surface waters by wastewater treatment plants. Approximately 12% of the Honey Creek Watershed is currently served by sanitary sewer. The New Carlisle Wastewater Treatment Plant serves this area and the Village of North Hampton, which is outside of the subwatershed.

Sanitary sewer service in the Great Miami River Watershed is provided by Tri-Cities North Regional Wastewater Authority, Montgomery County, and the City of Dayton. Approximately 51% of the subwatershed is currently served by sanitary sewer.

NPDES Phase II Storm Water Communities

Under the National Pollutant Discharge Elimination System (NPDES) program, every

city, county, construction site, and industrial business is required to obtain a permit showing that they are not causing harm to nearby streams. Large urbanized areas are required to be permitted under NPDES Phase I. NPDES Phase I regulations cover discharges of storm water from large and medium municipal separate storm serving systems (MS4s), as well as discharging industrial operations. Large municipalities with a separate storm sewer systems serving a population greater than 250,000 and medium municipalities with a service population between 100,000 and 250,000 have to obtain NPDES permits and develop a storm water management program. The City of Dayton is the only NPDES Phase I community in the Honey Creek / Great Miami River Watershed.

Phase II Storm Water Communities are smaller urbanized areas serving populations less than 100,000 people, as well as, construction activities that disturb between one and five acres of land. These communities have to obtain NPDES permits and develop a storm water management program. Miami Conservancy District (MCD) has been contracted to administer the NPDES Phase II compliance in the following communities in the Honey Creek / Great Miami River Watershed:

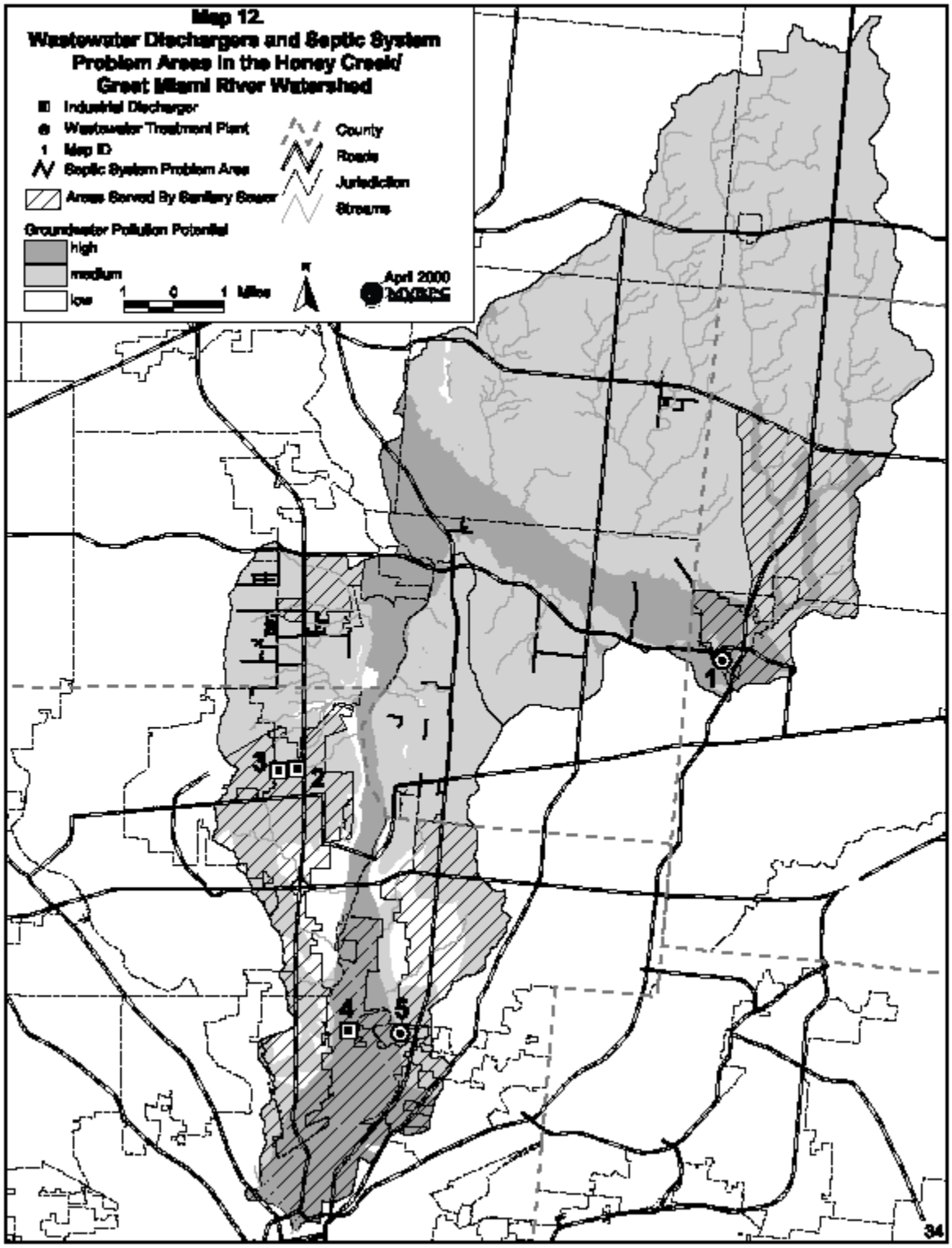
Clark County
Bethel Township
Miami County
Bethel Township
Monroe Township
City of Tipp City
Montgomery County
Butler Township
Harrison Township
Huber Heights
Vandalia

The Storm Water Management Program put in place by MCD outlines the six minimum control measures that are expected to result in significant reductions in pollutants discharged by MCD. The six minimum controls are:

1. Public education and outreach on storm water impacts
2. Public involvement/participation
3. Illicit discharge detection and elimination
4. Construction site storm water runoff control
5. post construction storm water management in new development and redevelopment
6. Pollution prevention / good housekeeping for municipal operations

You can obtain the following document, *Miami Conservancy District NPDES Phase II Storm Water Management Program* (MCD 2003), for more information on the above controls.

MAP 10


Map 12.
Wastewater Dischargers and Septic System Problem Areas in the Honey Creek/ Great Miami River Watershed
Industrial Discharger
Wastewater Treatment Plant
Map ID
Septic System Problem Area
Areas Served By Sanitary Sewer
Groundwater Pollution Potential
high
medium
low
1 0 1 Miles
County
Roads
Jurisdiction
Streams
April 2000
1
2
3
4
5
34

Household Sewage Treatment Systems (HSTS)

Household sewage treatment systems can be a significant source of non-point source pollution in a watershed. Improperly sited or malfunctioning HSTS can pose a threat to groundwater and in some cases surface water resources. Wastewater from HSTS can contain contaminants ranging from nitrates, harmful bacteria, viruses, or improperly disposed of chemicals such as pesticide, paint, thinners, and trace metals.

HSTS generally have a lifespan of 30 to 40 years. Numerous factors influence this lifespan, including installation procedures, type of system installed, number of individuals contributing wastewater, and others. The approach to system installation has changed significantly over the past 20 years in this region. In 1974, through the Ohio Revised Code and the Ohio Administrative Code, the first edition of the Ohio Sanitary Code became effective. This code (OAC – 3701-29) was the defining point in regulating HSTS. These state rules were revised in January 2007 incorporating more current and stricter requirements regarding siting, design, permitting, and periodic inspections of private HSTS.

Most impacts to groundwater and surface water from HSTS are related to age and/or improper siting of such systems. For example, older systems in the watershed may not have leach fields. In some cases such systems were granted permits to discharge effluent to drainage ditches or other surface water bodies. In other cases, unapproved discharge connections to drainage tiles or waterways may have been made. In 1999, the Miami County Health District adopted stricter regulations to prohibit any additional surface water discharges, in addition to applying higher standards for the design and siting of septic systems.

In 2004, the Miami County Health Department calculated the number of HSTS per township using population estimates. The percentage of area in each township was estimated and then calculated using population estimates for each 14-digit subwatershed in the county. For example, in Indian Creek Subwatershed it is estimated to occupy 45% of Elizabeth Township and 25% Lost Creek Township. 45% of the population of Elizabeth Township is 729 and 25% of Lost Creek Township is 408. The total population for each township was added together (729 + 408 = 1137) and then divided by three representing the average number of individuals per household. The average age per system is based solely on the permit information recorded by the Miami County Health Department (MCHD). These averages are not a true representation of the actual average since the HSTS without permits were not included. It is estimated that the MCHD does not have permits on file for 30-40% of the HSTS. Best professional judgment would assume that most HSTS installed without a permit were installed between 30-50 years ago. This would increase the average age between 10-15 years.

The estimated number of HSTS for Clark County within the Honey Creek / GMR Watershed was derived from the Clark County Health Department by counting the

occupied parcels on each road using Geographical Information System (GIS). The total number of confirmed HSTS and discharging systems was derived through record searches of each road. Areas that are served by New Carlisle sanitary sewer were not included. The estimated number of HSTS for Champaign County within the Honey Creek / GMR Watershed was derived by counting houses using aerial photographs. Table 23 lists the number of HSTS in the Honey Creek / Great Miami River Watershed. HSTS data for Montgomery County was unavailable. Further information on HSTS can be obtained in the ***Subwatershed Inventory Section*** of this document.

Table 23
Number of HSTS in the 14-digit subwatersheds in the Honey Creek / Great Miami River Watershed.

Name	14-digit HUC	Drainage Area (sq. miles)	Total # of HSTS	Average HSTS Age (yrs)	% of Watershed
West Fork HC	0508001 200 010	20.9	539 [1]	N/A[3]	14.57%
East Fork HC	0508001 200 020	12.9	170	N/A	9.00%
Honey Creek (HC)	0508001 200 030	11.6	391	21.5	8.09%
Indian Creek	0508001 200 040	25.6	379	24	17.87%
Pleasant Run	0508001 200 050	19	516	22	13.28%
Great Miami	0508001 200 060	53.3	1095[2]	24	37.20%
TOTAL			3,090		

1. 300 of the 539 HSTS's are located in Christiansburg, Jackson Township, Champaign Co.
2. The 1095 is only in Miami County. We are still trying to obtain the Montgomery Co. HSTS information.
3. N/A – age information was unavailable.

Most soils in the watershed have some limitations for treatment of effluent, such as, high water table, restricted permeability, poor natural drainage, flooding, and limited depth to bedrock or limiting clay layers. Many soils in the watershed have been rated severe because of moderately slow or slow permeability. Also, a severe limitation is imposed by a restrictive layer, such as dense glacial till and bedrock that interferes with adequate filtration and the movement of effluent. Listed below are wet, seasonally saturated (hydric) soils in the watershed that are not suited for HSTS.

Champaign County Soils

- Brookston
- Carlisle
- Edwards
- Linwood
- Lippincott
- Patton
- Sloan
- Wallkill

Clark County Soils

- Adrian
- Carlisle
- Drummer
- Edwards
- Kokomo
- Linwood
- Lippincott
- Milford
- Patton
- Sloan
- Wallkill
- Westland

Miami County Soils

- Brookston
- Edwards
- Linwood
- Montgomery
- Pewamo
- Shoals
- Wallkill
- Westland

Montgomery County Soils

- Brookston
- Millsdale
- Montgomery
- Shoals
- Westland

The Miami County Health Department received an Ohio EPA 319 grant to inventory the HSTS in 2002. This comprehensive inventory will eventually bring each household onto the operational permit maintenance program for monitoring and inspection on a routine basis. This inventory has also been extremely beneficial in identifying problem areas within the watershed. A $30.00 annual fee is required for all systems that require a mechanized component (such as lift stations, aerator, high water alarms, etc.). All other HSTS will be inspected every five years at a $50.00 charge/five years. The Miami County Health Department has adopted a county-wide HSTS Plan. The plan addresses HSTS problems and solutions and outlines an operation and maintenance plan. Over the next ten years, the Honey Creek Watershed Association will be working closely with the health departments in the watershed to promote the creation of county-wide HSTS Plans in Montgomery, Clark and Champaign Counties. Also, the Association will work with the local health departments identifying and mitigating older failing systems and implementing better maintenance.

Impervious Surfaces

Impervious surfaces prevent precipitation from infiltrating into the ground and increase runoff and flooding as water that would infiltrate can not and runs off to the nearest water body. As the water runs across impervious surfaces, particularly in urban settings, it picks up pollutants such as lawn chemicals, automotive fluids, road salt and carries the pollutants to the nearest water body. Cities install storm sewer systems that quickly channel this runoff from roads and other impervious surfaces. Large volumes of quickly flowing runoff erode streambanks, damage streamside vegetation, and widen stream channels. This results in lower water depths during non-storm periods, higher than normal water levels during wet weather periods, increased sediment loads, and higher water temperatures. Urbanization also increases the variety and amount of pollutants transported to receiving waters, including: sediment from development and new construction; oil, grease, and toxic chemicals from automobiles; nutrients and pesticides from turf management and gardening; viruses and bacteria from failing septic systems; road salts; and heavy metals. Sediments and solids constitute the largest volume of pollutant loads to receiving waters in urban areas. When runoff enters storm drains, it carries many of these pollutants with it. In older cities, this polluted runoff is released directly into the water without any treatment. Increased pollutant loads can harm fish and wildlife populations, kill native vegetation, foul drinking water supplies, and make recreational areas unsafe.

For the above reasons, impervious surfaces are considered to be a large contributor to non-point source pollution. High concentrations of impervious surfaces are found in urban settings. **Table 24** illustrates the number of acres / percentages of urban/residential/commercial land use in the Honey Creek / Great Miami River Watershed. More data is necessary to accurately determine the percent of impervious surfaces.

Table 24
Acres of Urban Land Use by 14-digit Subwatersheds in the Honey Creek / Great Miami River Watershed

Name	14-digit HUC	Acres	% Urban
West Fork HC	0508001 200 010	1,624	12%
East Fork HC	0508001 200 020	679	8%
Honey Creek (HC)	0508001 200 030	2,396	32%
Indian Creek	0508001 200 040	1,414	7%
Pleasant Run	0508001 200 050	621	5%
Great Miami	0508001 200 060	19,575	58%
TOTAL		**26,361**	

The HCWA will concentrate their efforts in the Honey Creek and Great Miami River 14-digit subwatersheds with proper best management practices; such as, storm water drain stenciling, storm water education materials, low impact development and proper lawn care.

Feedlots

The livestock industry is an important part of the economy in rural sections of the watershed. Waste output from large livestock operations can have a detrimental effect on water quality if not managed properly. Manure collected at animal feeding operations can be a source of excess nutrients in a watershed that can lead to eutrophication of surface water. Livestock manure can also contain bacteria and other contaminants that pose human health hazards. Comprehensive Manure Nutrient Management (CMNP) Plans need to be developed in cooperation with local SWCD officials to ensure the waste is stored properly to minimize the chance of surface or groundwater contamination. The management plan should also address proper disposal of waste products, such as spreading on fields, to ensure water quality degradation does not occur from excess nutrient loading. The livestock numbers for the Clark, Champaign, & Montgomery Counties are estimates. As of yet, a livestock inventory has not been conducted in their counties.

Table 25

Livestock Numbers by Subwatershed (not Animal Units)

14-Digit Subwatershed	Beef	Dairy	Chickens	Hogs	Horses	Turkey
East Fork Honey Creek*	0	50	0	2150	0	0
West Fork Honey Creek*	117	11	50	200	3	0
Honey Creek	121	4	100	8	33	0
Indian Creek	287	393	0	1070	135	0
Pleasant Run	380	359	0	55	82	0
Great Miami River *	12	0	0	0	11	0

* Estimates for Clark, Champaign and Montgomery Counties.

Surface water quality risks are high in the watershed, with 70% of the inventoried operations located within 2000 feet of a stream. The threat of groundwater contamination exists also, as 18% are in areas with high groundwater vulnerability, and 72% in medium vulnerability areas. Comprehensive Manure Nutrient Management plans are crucial to protect water quality in the most vulnerable areas near streams and high groundwater vulnerability areas.

The Ohio Department of Agriculture (ODA) regulates all livestock farms with at least:

- 700 mature dairy cows

- 1,000 beef cattle or heifers
- 2,500 swine weighing more than 55 lbs
- 10,000 swine weighing less than 55 lbs
- 30,000 ducks (other than liquid manure systems)
- 5,000 ducks (liquid manure handling systems)
- 30,000 chickens (liquid manure handling systems)
- 125,000 chickens except layers (other than a liquid manure system)
- 82,000 laying hens (other than liquid manure systems)
- 1,000 veal calves
- 500 horses
- 10,000 sheep or lambs
- 55,000 turkeys

All farms with the above numbers or more of livestock must apply to the ODA for a permit to install and permit to operate prior to constructing new or expanding livestock facilities, which would include livestock buildings, waste treatment, storage or disposal facilities even if they do not plan to discharge pollutants into a stream. Livestock operations covered under ODA permits will undergo regular inspections to ensure compliance with the goal of preventing problems from occurring. If the operation is discharging to a stream they must obtain a NPDES permit from OEPA. Currently, there are no permitted livestock operations in the Honey Creek / Great Miami River Watershed.

Industrial Point Source Dischargers (NPDES)

There are three industrial facilities within the GMR SWS that are permitted to discharge to surface waters under the National Pollutant Discharge Elimination System (NPDES). These facilities, listed in **Table 26**, discharge to the Great Miami River. The pollutants discharged by Delphi Automotive Systems and General Motors are oil and grease, pH, and flow in conduit or through treatment plant. Information on these dischargers was obtained from Ohio EPA and U.S. EPA[20]. Information was

TABLE 26

NPDES INDUSTRIAL DISCHARGERS IN THE HONEY CREEK/ GREAT MIAMI RIVER WATERSHED

Map ID	Facility	ID No.	Receiving Stream	Pollutants
2	Delphi Automotive Systems	OH0122751	Great Miami River	Oil and grease, pH, flow
3	General Motors - N. Dixie	OH0009466	Great Miami River	Oil and grease, pH, flow
4	A.E. Staley	OH0047368	Great Miami River	Information not available

[20] U.S. EPA Envirofacts website: (www.epa.gov/enviro/html/pcs/pcs_query_java.html).

not available for pollutants discharged by A.E. Staley.

Underground Storage Tanks (BUSTR)

According to the Ohio Bureau of Underground Storage Tank Regulations (BUSTR)[21] there are 8 locations with a total of 19 registered underground storage tanks (USTs) within the HC SWS, and 65 locations with a total of 189 registered USTs within the GMR SWS. These tanks store gasoline, diesel fuel, kerosene, jet fuel, and used oil.

In the entire watershed there are 101 USTs overlying the Sole Source Aquifer (SSA), 44 of which are located in areas with high pollution potential for groundwater. Nine of the 44 are greater than 20 years old, and one is of unknown age. Also, overlying the SSA in areas with low or medium groundwater pollution potential are nine tanks greater than 20 years old and three of unknown age. Finally, seven tanks greater than 20 years old and seven of unknown age are located in areas with low or medium groundwater pollution potential outside of the SSA boundaries.

All of the 19 USTs in the HC SWS overlie the SSA, six of which are located in areas with high groundwater pollution potential, and three of which are greater than 20 years old and located in areas with medium pollution potential for groundwater. In the GMR SWS, there are 82 USTs overlying the SSA. Forty-four of these tanks are located in areas with high groundwater pollution potential, with nine greater than 20 years old and one of unknown age. In addition, there are six tanks greater than 20 years and three of unknown age overlying the SSA in areas with low or medium groundwater pollution potential.

SARA Sites

SARA sites are those facilities subject to Title III of the Superfund Amendments and Reauthorization Act (SARA), which requires facilities to report information on hazardous chemicals they use, store, produce, or release. SARA Title III provides for the collection and availability of this information to local emergency responders and the public. SARA sites include industrial facilities, gasoline service stations, and warehouses that store or use more than 10,000 pounds of any one hazardous chemical or 1 to 500 pounds of an extremely hazardous substance, as defined in Ohio Revised Code Section 3750.02(B)(1)(a). SARA sites are included in the inventory only because of the presence of large quantities of hazardous substances. Some of these hazardous substances are in a gaseous state and do not pose a direct threat to water quality. Depending on a number of factors, SARA sites that store or use liquid chemicals could be a potential threat to water quality in the event of an accidental release.

There are 139 SARA sites located in the Honey Creek/Great Miami River Watershed, with five located in the HC SWS and 134 in the GMR SWS. Seventy-five of these sites

[21] Information on USTs was obtained from BUSTR in October 1999.

overlie the SSA, 51 of which are located in areas with high groundwater pollution potential. In the HC SWS, four SARA sites overlie the SSA, two of which are located in areas with high groundwater pollution potential. In the GMR SWS, 71 SARA sites overlie the SSA, 49 of which are found in areas with high groundwater pollution potential.

OEPA Master Sites List

Ohio EPA's Master Sites List (MSL) includes sites where there is evidence or suspicion of air, water, or soil contamination from waste management practices. These sites may be operating or abandoned industrial facilities contaminated or potentially contaminated public water supplies with the source of contamination undiscovered, or other locations where soil or water is contaminated.

As listed in **Table 27**, there are 12 MSL sites within the watershed, with two in the HC SWS and 10 in the GMR SWS[22]. Eight of these sites overlie the SSA in areas with high groundwater pollution potential. In the HC SWS, two MSL sites overlie the SSA in areas with high groundwater pollution potential. In the GMR SWS, six MSL sites overly the SSA in areas with high groundwater pollution potential. A detailed analysis of the level of risk and/or the status of investigations or enforcement activities at each of these sites was beyond the scope of this WAP.

TABLE 27

OHIO EPA MASTER SITES IN THE HONEY CREEK / GREAT MIAMI RIVER WATERSHED

Site Name	Ohio ID No.	County	Subwatershed
DAP, Inc.	557-1151	Montgomery	Great Miami River
GMC Inland Division – Vandalia	557-1375	Montgomery	Great Miami River
Gayston Corporation	557-1371	Montgomery	Great Miami River
Gem City Chemicals	557-1150	Montgomery	Great Miami River
McCauley Accessory	557-1396	Montgomery	Great Miami River
Mike Sells	557-1002	Montgomery	Great Miami River
Montgomery Co. Incinerator – North	557-0540	Montgomery	Great Miami River
Powell Road Landfill	557-0639	Montgomery	Great Miami River
Sherwin-Williams Warehouse	557-1000	Montgomery	Great Miami River
Wiley Industrial Park Wellfield	555-1417	Miami	Great Miami River
New Carlisle Wellfield	512-1453	Clark	Honey Creek
New Carlisle Landfill	512-0557	Clark	Honey Creek

[22] MSL sites within the watershed were identified by performing an on-line search by county of the Ohio EPA Department of Emergency Response and Remediation website (*www.epa.ohio.gov/derr/county/*)

Land Disposal Sites

Land disposal sites include active landfills and lagoons where municipal and industrial wastes, domestic wastes, demolition debris and hardfill are disposed of. Depending on the character of the wastes they contain, some of these, especially old landfills and wastewater lagoons may pose a threat to water resources in the watershed. Information on these sites was obtained from the Ohio EPA Division of Drinking and Ground Waters and from MVRPC's 1990 Groundwater Protection Strategy. As listed in **Table 28**, there are seven land disposal sites within the watershed all located in the GMR SWS. Six of the sites overly the SSA and five are located in areas with high pollution potential for groundwater. The Montgomery County Incinerator ash monofill site in north Dayton on the western edge of the GMR valley is also on Ohio EPA's Master Sites list. A detailed analysis of the level of risk and/or the status of investigations or enforcement activities at each of these sites was beyond the scope of this WAP.

TABLE 28

LAND DISPOSAL SITES IN THE HONEY CREEK / GREAT MIAMI RIVER WATERSHED

Site Name	Type	Waste Character
Dayton, City of	Landfill	Water treatment sludge, hardfill
Dayton – Miami Water Treatment Plant	Landfill	Waste treatment, backwash
Hotopp & Sons, Inc.	Landfill	No information available
Montgomery County Ash Monofill	Landfill	Incinerator residue
Taylorsville Road Hardfill	Landfill	Hardfill
Tip Top Canning	Lagoon	Tomato canning wastes
Webster Street Dump	Landfill	Hardfill, domestic, industrial waste

Miscellaneous Sites

Miscellaneous sites include other sites that may pose a threat to water resources in the watershed. These sites are listed in the Potential Pollutant Source Inventories (PPSIs) for the Tipp City[23] and New Carlisle[24] well field protection areas. The CD included with this report contains the complete site lists for each of these PPSI's that contain information on each site and the general level of risk posed by each. The general distribution and location of these sites are shown on Maps 7 and 8. An updated PPSI for Dayton's well field protection area was not available.

[23] MVRPC, 1994. City of Tipp City Well Field Protection Program, Component 4, Potential Pollutant Source Inventory.

[24] City of New Carlisle, City of New Carlisle Potential Pollutant Source Inventory, 1995.

In the HC SWS, 17 sites overly the SSA, eight of which are located in areas with high groundwater pollution potential. In the GMR SWS, seven sites overly the SSA, three of which are located in areas with high groundwater pollution potential. There is also one site in the GMR SWS located outside the SSA boundaries in an area with high pollution potential.

CHAPTER 5: Load Reductions and STEPL

To further define impairments, causes, and sources in each 14-digit subwatersheds of the Honey Creek / Great Miami River Watershed, two models were used to evaluate the pollutant loadings and reductions. The first model, Spreadsheet Tool for Estimating Pollutant Load (STEPL), employs simple algorithms to calculate nutrient and sediment loads from different land uses and the load reductions that would result from the implementation of various best management practices (BMPs). It computes watershed surface runoff; nutrient loads, including nitrogen, phosphorus, and 5-day biological oxygen demand (BOD5); and sediment delivery based on various land uses and management practices. For each subwatershed, the annual nutrient loading is calculated based on the runoff volume and the pollutant concentrations in the runoff water as influenced by factors such as the land use distribution and management practices. (Source: http://it.tetratech-ffx.com/stepl/default.htm).

The second model, US EPA, Region 5 Model, is an Excel workbook that provides a gross estimate of sediment and nutrient load reductions from the implementation of agricultural and urban BMPs. The algorithms for non-urban BMPs are based on the "Pollutants controlled: Calculation and documentation for Section 319 watersheds training manual" (Michigan Department of Environmental Quality, June 1999). The algorithms for urban BMPs are based on the data and calculations developed by Illinois EPA. The US EPA, Region 5 Model does not estimate pollutant load reductions for dissolved constituents (Source: http://it.tetratech-ffx.com/stepl/default.htm). Refer to **Appendix D** for assumptions made on best management practices using the US EPA Region 5 Model.

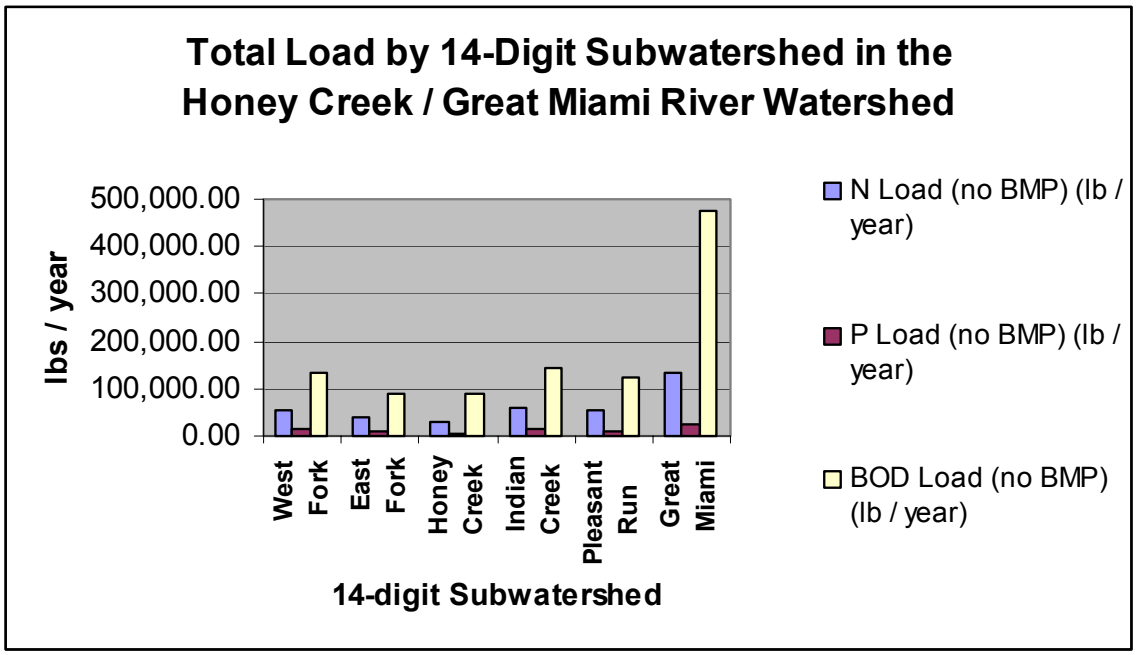
The measurements from both models will help the HCWA determine priority areas and also be used to help set measurable goals for attainment in each of the six 14-digit subwatersheds. See spreadsheets below.

Total Load by 14-Digit Subwatershed for the Honey Creek / Great Miami River Watershed

Subwatershed	N Load (no BMP) (lb / year)	P Load (no BMP) (lb / year)	BOD Load (no BMP) (lb / year)	Sediment Load (no BMP) (ton /year)
West Fork	54,840.1	12,392.9	133,199.7	5,471.3
East Fork	38,411.9	9,153.0	87,879.7	4,461.8
Honey Creek	31,345.7	6,476.3	90,285.6	2,511.2
Indian Creek	59,519.6	13,534.8	141,189.8	5,926.9
Pleasant Run	52,803.3	11,548.6	125,516.4	5,270.3
Great Miami River	135,793.8	23,361.0	472,966.1	5,222.1
Total	**372,714.4**	**76,466.6**	**1,051,037.3**	**28,863.7**

Total Load by Land Use for the Honey Creek / Great Miami River Watershed

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	141,429.6	21,764.6	543,734.9	3,247.8
Cropland	203,790.5	50,367.0	420,601.9	25,029.0
Pastureland	22,671.5	2,172.5	71,778.6	475.9
Forest	2,901.7	1,410.0	7,076.8	110.9
Septic	1,921.3	752.5	7,845.1	0.0
Total	**372,714.4**	**76,466.6**	**1,051,037.3**	**28,863.7**



14-Digit Subwatershed Sediment Load

14-Digit Subwatershed	Sediment Loading %
West Fork Honey Creek	19%
East Fork Honey Creek	15%
Honey Creek	09%
Indian Creek	21%
Pleasant Run	18%
Great Miami River	18%

All best management practices that have been installed within the last five years using USDA, NRCS funding have been accounted for and are summarized in this section. Any future best management practices installed within the watershed will be measured and accounted on an individual basis for its contribution to reducing loadings.

Best Management Practices in the Honey Creek / Great Miami River Watershed (Last 5 years)

Conservation Practice	Funding Source	14-Digit Subwatershed	# of Acres	County
Ag Containment	USDA, CRP	Great Miami River	1 unit	Miami
Agrichemical Handling Facility	USDA	East Fork HC		Champaign
Conservation Cover	USDA, WHIP	Honey Creek	22.8	Miami
Conservation Cover	USDA	West Fork HC	9.3	Champaign
Field Border	USDA, CRP	East Fork Honey Creek	0.8	Clark
Field Border	USDA, CRP	West Fork Honey Creek	7.2	Clark
Field Border	USDA, CRP	Honey Creek	13.4	Miami
Field Border	USDA, CRP	Indian Creek	3.1	Miami
Field Border	USDA, CRP	Indian Creek	4.3	Miami
Field Border	USDA, CRP	Indian Creek	2.7	Miami
Field Border	EQIP	Indian Creek	2.6	Miami
Field Border	USDA, CRP	Indian Creek	10.1	Miami
Field Border	USDA, CRP	Indian Creek	15	Miami
Field Border	USDA, CRP	Indian Creek	2.8	Miami
Field Border	USDA, CRP	Indian Creek	2.1	Miami
Field Border	USDA, CRP	Indian Creek	1.1	Miami
Field Border	USDA, CRP	Indian Creek	21.9	Miami
Field Border	USDA, CRP	Indian Creek	4.1	Miami
Field Border	USDA, CRP	Indian Creek	1.5	Miami
Field Border	USDA, CRP	Pleasant Run	4	Miami
Field Border	USDA, CRP	Pleasant Run	4.5	Miami
Field Border	USDA, CRP	Pleasant Run	6.3	Miami
Field Border	USDA, CRP	Great Miami River	5.3	Miami
Field Border	USDA, CRP	Great Miami River	13.2	Miami
Field Border	USDA, CRP	West Fork Honey Creek	5.3	Champaign
Filter Strip	USDA, CRP	East Fork Honey Creek	0.6	Clark
Filter Strip	USDA, CRP	West Fork Honey Creek	1.3	Clark
Filter Strip	USDA, CRP	Honey Creek	2.9	Clark
Filter Strip	USDA, CRP	Indian Creek	3.9	Miami

Filter Strip	USDA, CRP	Indian Creek	3.7	Miami
Filter Strip	USDA, CRP	Indian Creek	1.4	Miami
Grassed Waterway	USDA, CRP	East Fork Honey Creek	7.5	Clark
Grassed Waterway	USDA, CRP	West Fork Honey Creek	5	Clark
Grassed Waterway	USDA, CRP	Indian Creek	0.7	Miami
Grassed Waterway	USDA, CRP	Pleasant Run	0.8	Miami
Grassed Waterway	USDA, CRP	Great Miami River	0.8	Miami
Grassed Waterway	USDA, CRP	Great Miami River	3	Miami
Grassed Waterway	USDA, CRP	Great Miami River	0.8	Miami
Grassed Waterway	USDA, CRP	West Fork Honey Creek	6.7	Champaign
Heavy Use Pad	EQIP	Indian Creek	1 unit	Miami
Hog Composter	ODNR,DSWC	East Fork Honey Creek	1 unit	Clark
Livestock Fencing	EQIP	Indian Creek	1 unit	Miami
Manure Storage	EQIP	Indian Creek	1 unit	Miami
Prairie Grass Planting	USDA, CRP	Great Miami River	4	Miami
Subsurface Drain	USDA	West Fork HC		Champaign
Timber Stand Improvement	USDA, CRP	Great Miami River	2	Miami
Tree Planting	USDA, CRP	Indian Creek	1.3	Miami
Tree Planting	USDA, CRP	Great Miami River	4	Miami
Wetland Restoration	USDA, CRP	West Fork Honey Creek	7	Clark
Wetland Restoration	USDA, CRP	Honey Creek	4.7	Miami
Wetland Restoration	USDA, CRP	Great Miami River	1.5	Miami
Wetland Restoration	USDA, CRP	Great Miami River	0.4	Miami

Estimated Load Reduction through Grassed Waterways
Total Acres = 25.3

Sediment	1,561 tons/year
Phosphorus	1,561 lbs/year
Nitrogen	3,123 lbs / year

Estimated Load Reduction through
Field Borders
Total Acres = 131.3

Sediment	158 tons/year
Phosphorus	238 lbs/year
Nitrogen	476 lbs / year

Estimated Load Reduction through
Grass Filter Strips
Total Acres = 13.8

Sediment	22 tons/year
Phosphorus	31 lbs/year
Nitrogen	63 lbs / year

Estimated Load Reduction through
Conservation Cover
Total Acres = 32.1

Sediment	46 tons/year
Phosphorus	67 lbs/year
Nitrogen	134 lbs / year

CHAPTER 6: Subwatershed Inventory

The Honey Creek Watershed has been broken down into five 14-digit hydrologic unit codes for planning and implementation purposes to inventory physical, habitat, biological, and land use characteristics of the watershed on a subwatershed basis. We also include a portion of the Great Miami River Watershed (Tipp City to Dayton before the Stillwater River empties into the GMR) in our Project Area. With this additional subwatershed our project area includes six 14-digit hydrologic units totally 143 square miles.

Name	14-digit HUC	Drainage Area (sq. miles)	% of Watershed	Water Quality Restoration Potential
West Fork HC	0508001 200 010	20.9	14.57%	High
East Fork HC	0508001 200 020	12.9	9.00%	Medium
Honey Creek (HC)	0508001 200 030	11.6	8.09%	High
Indian Creek	0508001 200 040	25.6	17.87%	High
Pleasant Run	0508001 200 050	19	13.28%	Medium
Great Miami	0508001 200 060	53.3	37.20%	Low

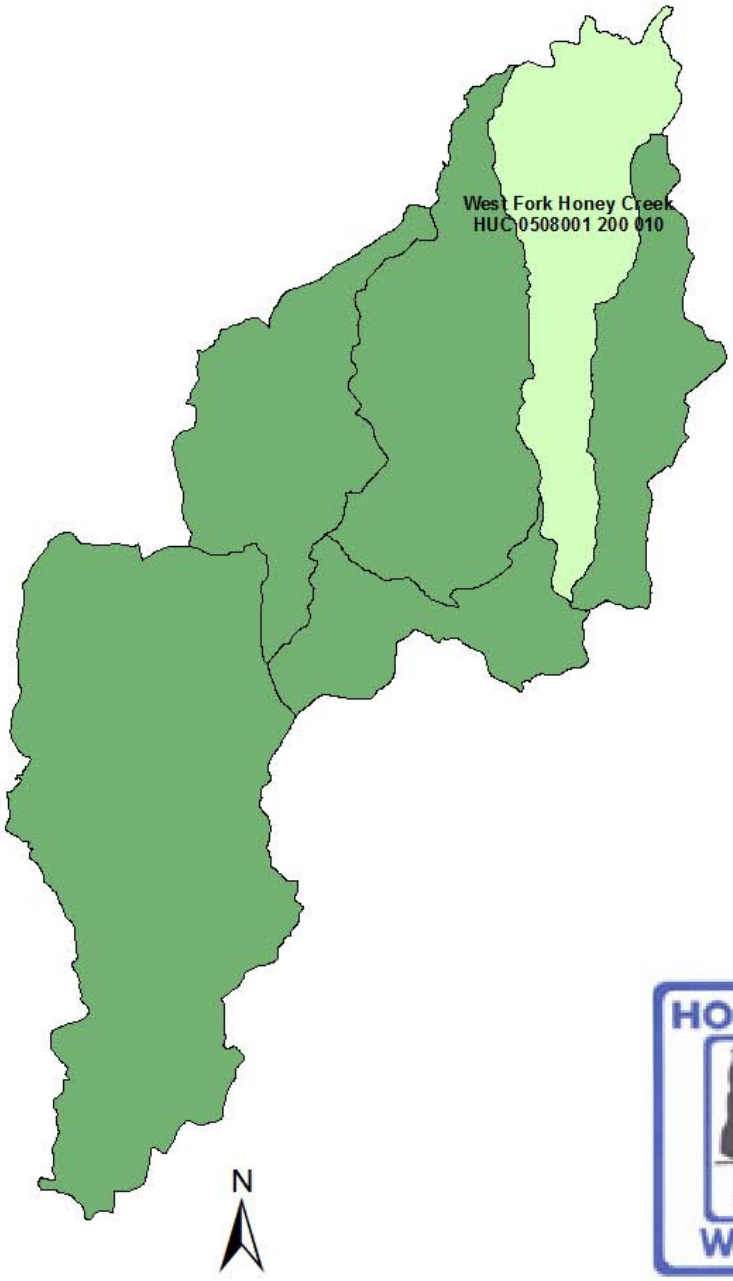
The following sections are a detailed inventory of each 14-digit subwatershed. Each section will outline specific pollution problems for that subwatershed and provide specific goals and implementation strategies. Please note that the pollution problems are based on best professional judgment because of the lack of Ohio EPA water quality data available for the Honey Creek Watershed. To maximize water quality restoration and protection, these 14-digit subwatersheds have been prioritized into three categories known as ***Water Quality Restoration Potential*** with levels of High, Medium and Low. The subwatersheds with a *High* rating will receive attention first. To establish these criteria, the HCWA Board of Directors met to discuss the overall potential pollution problems and evaluated the need for protection and conservation efforts in each subwatershed section. These sections will be extremely valuable for the HCWA to better plan and evaluate the areas being studied.

Each subwatershed section has an Excel spreadsheet that is a complete tributary-by-tributary inventory of the subwatershed. These inventory spreadsheets are specific summaries of the physical attributes of the stream segments and surrounding land use areas. The spreadsheets will continually be updated by the HCWA. The following information was gathered by HCWA Watershed Coordinator and Jeff Thomas with ODNR, DSWC: total length of the stream and tributaries was measured and broken down by footage of stream channelized, levied, dammed, maintained or unmaintained as petition ditches; length of stream that has an established riparian buffer area present (greater than 30 feet) and the length of riparian buffer that is

needed along the streambank; livestock inventory; total number of home sewage treatment systems; approximate number of bridges and culverts; and a water quality assessment table (only for Honey Creek and Great Miami River subwatersheds). Additional columns will be added as new information comes in. The livestock data was collected by Miami and Clark SWCDs, however, we are lacking information for Champaign and Montgomery Counties.

The overall goal of the watershed action plan is to move all the stream segments towards full water quality attainment. The goals listed in each subwatershed section are specific to that subwatershed and are based on measurable indicators to meet the water quality standards set forth by OEPA. Best management practices specific to the pollution problem will be recommended along with watershed education are the objectives that will be used to accomplish the goals of the watershed action plan.

West Fork Honey Creek
HUC 05080001 200 010




HONEY CREEK
WATERSHED
West Fork Honey Creek
HUC 05080001 200 010
CHAMPAIGN
MIAMI
SR-235
Christiansburg
PIKE
SR-55
CLARK
SR41
West Fork Honey Creek
SR-235
New Carlisle
Huc_010_state_roads
Huc_010_streams
Huc_010_cities
N
0 0.4 0.8 1.6 Miles

West Fork Honey Creek Subwatershed
HUC 050800001 200 010

The West Fork Honey Creek Subwatershed encompasses 13,367 acres in Miami (Lost Creek Township), Champaign (Jackson Township), and Clark (Pike and Bethel Townships) counties. The total drainage area is 20.9 square miles (15% of the total watershed project area). The main stem is 4.3 miles with an average fall of 25.1 feet/mile. The West Fork Honey Creek joins the East Fork Honey Creek on the southeast side of New Carlisle to form the main stem of the Honey Creek.

The West Fork Honey Creek Subwatershed contains approximately 23 miles of total stream length including the main stem and tributaries. There are 6.5 miles of that channelized and 17 miles (includes both sides of the stream) that has less that 30 linear feet of buffer between the present land use. Approximately, 7,455 linear feet of West Fork Honey Creek is under county ditch maintenance financed by the Village of Christiansburg from Bollinger Road to Addison-New Carlisle Road in Jackson Township, Champaign County.

The dominant land use is agriculture (65%). The main stem and unnamed tributaries are mainly channelized (23%) for agricultural reasons. Water quality in these channelized areas show drastic impacts from non-point source pollution. There are 13,373 acres of hydric soils (25% of the total subwatershed) and 1,350 acres of highly erodible land (10.1%). This subwatershed also has 241 animal units; however, this number does not include livestock numbers from Champaign County and has the second largest number of agriculture acres in the project area. Priorities of the HCWA will be increasing the riparian corridor, promotion of farmland preservation and implementation of agricultural best management practices, such as, waterways, conservation tillage, implementation of CMNPs, and filter strips.

West Fork Honey Creek at SR 41, Clark County

The Village of Christiansburg is located in this subwatershed. There is approximately 300 home sewage treatment systems (HSTS) located in and around the Village of Christiansburg. The majority of these systems are 50 years or older. Repairing faulty HSTS and educating landowners on the proper maintenance of HSTS are also priorities of the HCWA.

The OEPA use designation for the main stem is warmwater habitat (OAC 3745-1, Table 21-1); however, more OEPA data needs to be done to completely assess the

entire subwatershed. Below are strategies highlighted by the HCWA as the top implementation priorities and will be addressed first as funding becomes available. However, there are additional implementation strategies listed in the watershed action plan that will be addressed as well for each subwatershed, but are not top priorities of the HCWA.

HCWA Top Priorities for Local Implementation Actions in West Fork Honey Creek

Water Quality Restoration Potential = HIGH

- Gather surface water quality data to identify specific water quality pollution problems
- Reduce sedimentation and nutrient run off from agricultural fields through best management practices
- Reduce sedimentation and nutrient run off by implementing proper streambank restoration methods
- Locate 100% of HSTS and determine discharge status
- Inventory livestock and develop comprehensive manure nutrient management plans for 75% of livestock producers

Impairments in this subwatershed include:

- Channelization & lack of riparian buffer areas
- Sedimentation
- Pathogens

LAND USE

Land Use	Percent	Acres
Urban	12%	1,624
Forest	17%	2,269
Pasture	5%	733
Woody Wetlands	0.3%	34
Cropland	65%	8,707

Total Acres = 13,367 (Data provided by 1994 land use maps from ODNR)

Storm Drain from Village of Christiansburg

West Fork Honey Creek under County Ditch Maintenance

West Fork Honey Creek at SR 55 in Champaign County

West Fork Honey Creek Subwatershed
HUC 050800001 200 010

IMPAIRMENT: NUTRIENTS & SEDIMENT

Background

There has not been any biological / chemical sampling done in this subwatershed by Ohio EPA so the sources of impairment have been determined by best professional judgment from the HCWA advisory committee. Cropland production and pastureland have been identified as sources of impairment.

Problem Statement

According to land use calculations cropland makes up 65% or 8,707 acres of the total land use. Pastureland makes up 5.48% or 733 acres of land use. The source of sediment is land runoff and streambank erosion. According to the STEPL loading program, there is an estimated sediment loss of 6,189 tons/year from urban, cropland, pastureland, and forest. This is the 2nd highest sediment producing subwatershed in the Honey Creek / Great Miami River Watershed drainage area. The sediment amount in tons/year is 19% of all the sediment impairing the entire watershed.

The highest source of sediment and nutrients come from extensive row-crop agriculture (95%). This problem is intensified by a partial lack of riparian buffers. A slight amount comes from urban and pastureland. More data needs to be collected to see the impact of livestock in the subwatershed and whether or not they are contributing additional nutrients. Nutrients and sediment enter the stream from runoff events during heavy rain, leaching through the soil, and improper application of pesticides and fertilizer, including manure. The subwatershed currently has 90,002 linear feet (39%) of streambank with less than 30 feet of riparian buffer. A riparian buffer is extremely important in preventing excess nutrients such as nitrogen and phosphorus and sediment from entering the stream. Riparian buffer establishment and proper pesticide and fertilizer application will be implemented in this subwatershed.

Known pollutant loads within this segment of stream includes 57,135 lbs/year of nitrogen; 13,277 lbs/year of phosphorus and 137,790 lbs/year of biological oxygen demand.

SEDIMENT LOAD (TONS / YEAR)	
Land Use	Sediment Load
Urban	200.5
Cropland	5887.3
Pastureland	81.8
Forest	19.0
TOTAL SEDIMENT LOAD	6,188.6

** Calculations based on the STEPL load reduction program.*

Goals

1. Reduce sedimentation, pesticides, herbicides nutrients and other non-point source pollutants from agricultural & urban land areas at least by 50%.
2. Promote the establishment of riparian buffers. Restore at least 22,500 linear feet (25%) of streambank.
3. Create a livestock inventory for Champaign and Clark Counties within the subwatershed.
4. Promote education of proper pesticide and fertilizer, including manure applications to improve water quality.

Table 29
Action Plan for Nutrient and Sediment Reduction in
West Fork Honey Creek Subwatershed

Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce sedimentation and nutrient run off from agricultural fields through promoting conservation tillage, crop rotation and establishment of filter strips, grassed waterways, field borders & riparian buffers. Reduce nitrogen and phosphorus load at least by 25% (14,284 tons/ year for N; 3,319 tons/year for P)and sediment load at least by 50% (3,094 tons/year) Promote grid soil sampling and precision application	**USDA, NRCS** – CRP; CSP; EQIP **Miami Conservancy District (MCD)** – Water Quality Credit Trading Program **Miami County Pheasants Forever** – CSP **ODNR,DSWC** – Agricultural Pollution Abatement Cost-Share Program	Work in conjunction with Clark, Champaign and Miami SWCD/NRCS to promote streamside buffers through USDA and MCD programs on agricultural lands Submit newspaper and newsletter articles advertising the benefits of riparian buffers Target landowners and operators who farm HEL land	Acres of agricultural lands enrolled in conservation programs. Newsletters produced and number of articles appearing in local newspapers. Load reductions will be calculated using the Region 5 Model and STEPL program. Sediment reduction of approximately 3,094 tons/year; nitrogen reduction of approximately, 14,284 tons/year; and phosphorus	Jan 2008 – Dec 2017

of fertilizers, pesticides and herbicides.			reduction of approximately 3,319 tons/year.	
Reduce sedimentation from riparian land areas by promoting protection of riparian buffers and proper streambank restoration methods improving instream habitat. Restore at least 25% of streambank.	**Miami Conservancy District** – Water Quality Credit Trading Program **OEPA** – 401 mitigation list **OEPA –** 319 funding **ODNR,DSWC –** Agricultural Pollution Abatement Cost-Share Program	Work with Clark, Champaign, and Miami SWCD/NRCS to identify riparian landowners with eroded streambank issues. Establish one demonstration site along the West Fork Honey Creek utilizing bioengineering erosion control and natural channel design methods and natural stream channel design	Create mailing list targeting streamside landowners to receive educational materials. Linear feet of streambank restored and protected. Improved QHEI scores. Load reductions will be calculated using the Region 5 Model.	Jan 2008 – Dec 2017
Create a livestock inventory for Clark and Champaign Counties in watershed and update Miami County livestock inventory.	**ODNR, DSWC** – District Staff **HCWA –** Watershed Coordinator	Work with Clark, Champaign, and Miami SWCD/NRCS to gather livestock numbers, including horse numbers.	Livestock Inventory completed for Clark & Champaign counties and Miami Co. is updated.	Jan 2008 – Dec 2017
Develop comprehensive manure nutrient management plans for each livestock operation not permitted by Ohio EPA	**ODNR, DSWC** – District Staff **USDA, NRCS** - staff	CMNPs are required for farmers to participate in government programs.	75% of livestock producers has CMNPs.	Jan 2008 – Dec 2017
Target livestock producers in the subwatershed where livestock has been identified to have access to the stream. Work with the producer to install fencing and alternative drinking water sources.	**USDA, NRCS** – EQIP, CRP **OEPA –** 319 funding	Work with Clark, Champaign, and Miami SWCD/NRCS to identify livestock that has access to the stream.	Document miles of streambank fencing installed along with acreage of riparian area protected. Load reductions will be calculated using Region 5 Model.	Jan 2008 – Dec 2017
Continue to survey all the streams in the subwatershed by Rosgen Channel Type and QHEI / HHEI.	**HCWA** – Watershed Coordinator **ONDR,DSWC**	Drive watershed, stopping at each stream crossing to determine channel type	All streams are categorized by Rosgen Channel Type and QHEI / HHEI	Jan 2008 – Dec 2017

Educate the public and local officials on proper channel design and the advantages of natural channels with floodplains.	**HCWA** – Watershed Coordinator **ONDR,DSWC** – District Staff **ONDR,DSWC** - Watershed Awareness to Watershed Action (WAWA) mini-grants	Hold an education/informational workshop once a year on stream geomorphology.	One workshop held each year.	Jan 2008 – Dec 2017
Implement the use of proper storage and containment of farm chemicals.	**ONDR,DSWC** – District Staff **OSUE** – staff **USDA, NRCS** – EQIP	Farmers are encouraged to take advantage of EQIP funds for proper chemical storage	Three new chemical containment facilities built each year in the Honey Creek Watershed	Jan 2008 – Dec 2017
Implement the use of integrated pest management.	**ONDR,DSWC** – District Staff **OSUE** – staff **USDA, NRCS** – EQIP	Integrated pest management is discussed with farmers as part of their conservation planning	Integrated pest management is discussed as part of 100% of new conservation plans.	Jan 2008 – Dec 2017
Promote & educate watershed residents on farmland preservation.	**Clean Ohio Fund** – farmland preservation **Champaign Land Preservation ODNR, DSWC** - District Staff	Work in conjunction with Champaign, Clark, and Miami SWCD/NRCS & local townships to promote farmland preservation of agricultural lands.	Number of acres of farmland in the farmland preservation program.	Jan. 2008 – Dec 2017

Listed below are best management practices implemented within the last five years in the West Fork Honey Creek Subwatershed.

Conservation Practice	Funding Source	14-Digit Subwatershed	# of Acres	County
Field Border	USDA, CRP	West Fork Honey Creek	7.2	Clark
Filter Strip	USDA, CRP	West Fork Honey Creek	1.3	Clark
Grassed Waterway	USDA, CRP	West Fork Honey Creek	5	Clark
Wetland Restoration	USDA, CRP	West Fork Honey Creek	7	Clark
Whole Field CRP	USDA, CRP	West Fork Honey Creek	9.6	Clark
Grassed Waterway	USDA, CRP	West Fork Honey Creek	6.7	Champaign
Field Border	USDA, CRP	West Fork Honey Creek	5.3	Champaign
Subsurface Drain	USDA	West Fork HC		Champaign
Conservation Cover	USDA	West Fork HC	9.3	Champaign

West Fork Honey Creek Subwatershed
HUC 050800001 200 010

IMPAIRMENT: Pathogens

Background

There has not been any biological / chemical sampling done in this subwatershed by Ohio EPA so the sources of impairment have been determined by best professional judgment from the HCWA advisory committee. In the West Fork Honey Creek subwatershed malfunctioning household sewage treatment systems (HSTS) contribute to the elevated levels of pathogens in this subwatershed.

Problem Statement

According to land use calculations urban/residential makes up 12% or 1,624 acres of the total land use. There is an estimated 539 home sewage treatment systems (HSTS) in the subwatershed. The Village of Christiansburg is located in this subwatershed. There is approximately 300 HSTS located in and around Christiansburg. The majority of these systems are 50 years or older. HSTS are known to fail in this subwatershed because of a seasonally high water table, slow permeability, slope and high clay content in the soil. Elevated levels of e-coli and fecal coliform has been found outside the Village of Christiansburg through volunteer sampling and OEPA chemical analysis.

Livestock Numbers in West Fork Honey Creek Subwatershed

Livestock Animals	Number	Animal Units*
Beef Cattle	117	117
Dairy Cattle	11	15.4
Swine (Hogs)	200	80
Goats / Sheep	220	22
Horses	3	6
Chickens	50	0.5
TOTAL	**601**	**241**

*** Animal Units – The number of animals of various size and species which are equivalent to one slaughter or feeder beef with regard to daily waste production. Multiply the following to the actual number of animals: A) 1.0 slaughter and feeder cattle; b) 1.4 Mature dairy cattle; c) 0.4 swine weighing over 55lbs.; d) 0.01 laying hens or broilers; e) 2.0 Horses; f) 0.1 - sheep/goats
Source: Animal Waste Pollution Abatement Rules; ODNR

There are 9 livestock operations (only Clark County numbers) in this subwatershed totaling of 601 animals (not animal units). None of the operations have CNMPs. There are 732 acres of pastureland. The West Fork Honey Creek subwatershed has the fourth highest

Cattle in the West Fork Honey Creek

number of livestock, however; the data is incomplete without livestock numbers from Champaign County. Livestock manure contains several pollutants, including ammonia, nitrogen, phosphorus, bacteria and nitrate nitrogen. These pollutants can harm the aquatic environment, cause water quality problems in streams and ponds and contaminate drinking water supplies. By improving these operations there will be a reduction in nutrient loadings, pathogens and sediment runoff. This will be accomplished by restricting livestock access to the stream, improving pasture management, encouraging alternative drinking water sources, and reducing runoff from feedlots.

Below is the data collected from the HCWA Watershed Coordinator from November 2004 – July 2005. In 2004, the HCWA received funding in the amount of $20,694.50 from OEPA for water sampling and analysis. The analysis was conducted at the OEPA water quality analysis lab in Columbus, Ohio.

West Fork Honey Creek, **RM 1.30**						
	11/9/2004	12/14/2004	2/9/2005	3/23/2005	5/3/2005	7/27/2005
DO (mg/L)	7.48	12.54	12.54	13.85	11.89	8.23
pH	7.09	6.52	6.97	6.47	7.38	7.56
Temperature C	9.3	3.7	5.1	5.9	8.7	22.6
BOD5 (mg/L)	<2.0	<2.0	2.8	<2.0	<2.0	<2.0
TSS (mg/L)	<5	<5	110	<5	<5	<5
E.coli (#/100mL)	210	20	1900	<10	50	140
Fecal Coliform (#/100mL)	230	110	700	10	180	290
Ammonia (mg/L)	<0.05	<0.05	0.264	<0.05	<0.05	0.054
Nitrate+Nitrite (mg/L)	0.59	4.57	3.67	2.53	4.73	2.65
TKN (mg/L)	<0.2	0.29	1.05	0.39	0.48	<0.2
TP (mg/L)	0.06	<0.01	0.601	0.012	0.022	0.015
West Fork Honey Creek, **RM 7.18**						
	11/9/2004	12/14/2004	2/9/2005	3/23/2005	5/3/2005	7/27/2005
DO (mg/L)	13.46	14.05	11.2	12.1	10.26	4.54
pH	7.76	5.93	6.74	7.03	7.58	7.55

Temperature C	8.6	0.6	4.07	4.5	7.9	25.2
BOD5 (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0	2.4
TSS (mg/L)	<5	<5	10	11	<5	14
E.coli (#/100mL)	40	<10	1000	20	30	260
Fecal Coliform (#/100mL)	140	210	1700	600	140	520
Ammonia (mg/L)	<0.05	0.051	0.12	<0.05	<0.05	0.253
Nitrate+Nitrite (mg/L)	0.71	6.05	5.17	2.87	4.93	0.36
TKN (mg/L)	0.22	0.5	1	0.82	0.5	0.8
TP (mg/L)	0.098	0.483	0.053	0.039	0.027	0.136
West Fork Honey Creek, RM 9.52						
	11/9/2004	12/14/2004	2/9/2005	3/23/2005	5/3/2005	7/27/2005
DO (mg/L)	10.95	13.13	10.55	12.57	10.08	1.9
pH	6.84	6.26	6.34	6.56	7.46	7.47
Temperature C	6.4	1.4	3.6	4.5	7.9	23.3
BOD5 (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TSS (mg/L)	<5	<5	11	7	<5	5
E.coli (#/100mL)	520	170	7000	10	40	150
Fecal Coliform (#/100mL)	590	510	370	250	250	260
Ammonia (mg/L)	<0.05	0.14	0.09	<0.05	<0.05	0.205
Nitrate+Nitrite (mg/L)	0.82	6.74	5.43	4.24	5.18	1.04
TKN (mg/L)	0.54	0.44	0.59	0.46	0.49	0.56
TP (mg/L)	0.016	0.02	0.235	0.026	0.025	0.157
Standards						
DO (mg/L)	5	5	5	5	5	5

pH	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
E.coli (#/100mL)	126	126	126	126	126	126
Fecal Coliform (#/100mL)	1,000	1,000	1,000	1,000	1,000	1,000
Nitrate+Nitrite (mg/L)	10	10	10	10	10	10

Known pollutant loads within this segment of stream includes 57,135 lbs/year of nitrogen; 13,277 lbs/year of phosphorus and 137,790 lbs/year of biological oxygen demand.

Biological Oxygen Demand (BOD) LOAD (TONS / YEAR)

Land Use	BOD Load
Urban	33,534.9
Cropland	91,310.5
Pastureland	10,573.8
Forest	972.4
Septic	1,368.5
TOTAL BOD LOAD	137,790.1

** Calculations based on the STEPL load reduction program.*

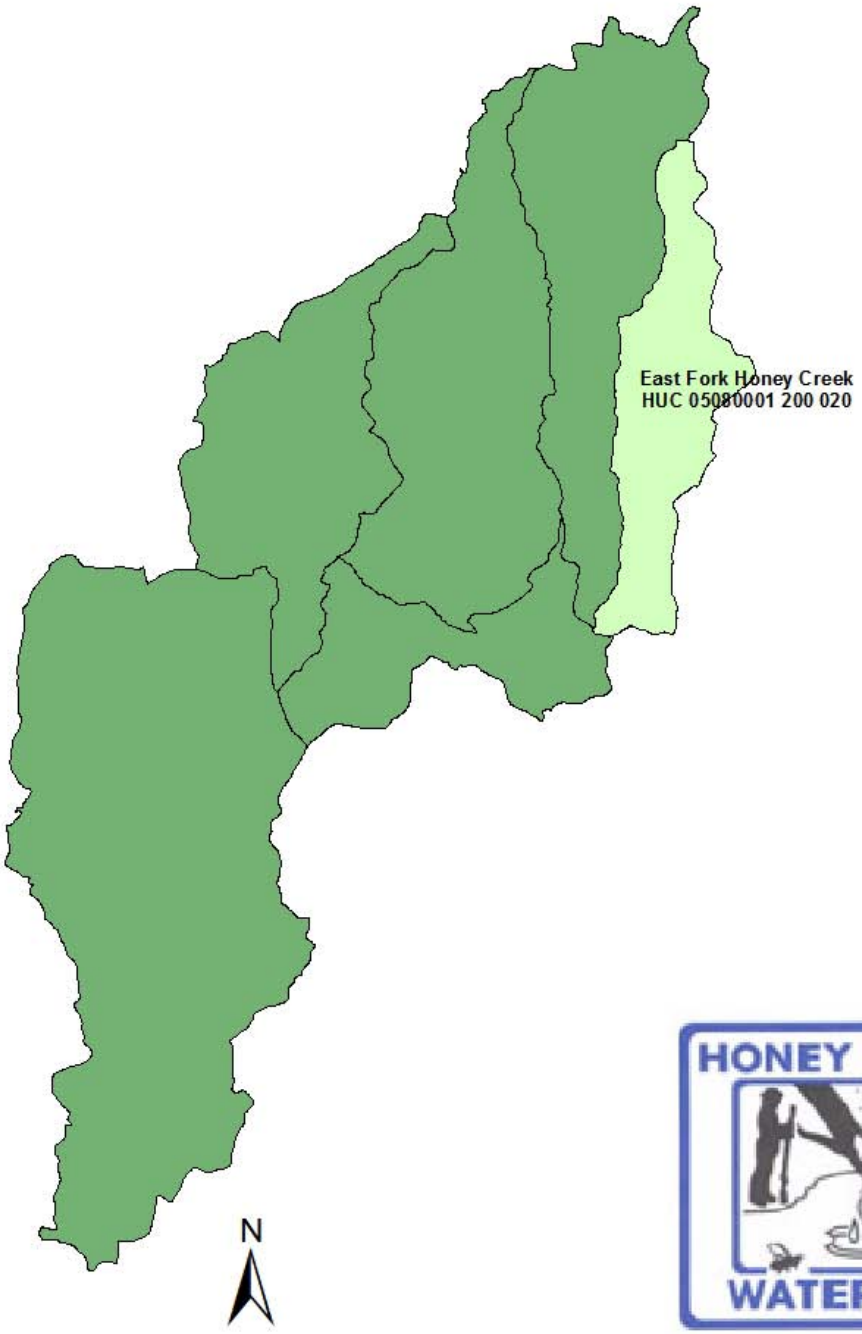
Goals

5. Complete and obtain approval of Champaign and Clark, Countywide HSTS plans to identify needed sewage treatment upgrades and their locations.
6. Upgrade at least 25% of those identified failing HSTS in the West Fork Honey Creek Subwatershed.
7. Livestock pathogen reductions (see previous section goals).
8. Educate watershed residents on the proper maintenance of HSTS.
9. Educate watershed residents on drinking water protection.

Table 30
Action Plan for Pathogen Reduction in West Fork Honey Creek Subwatershed

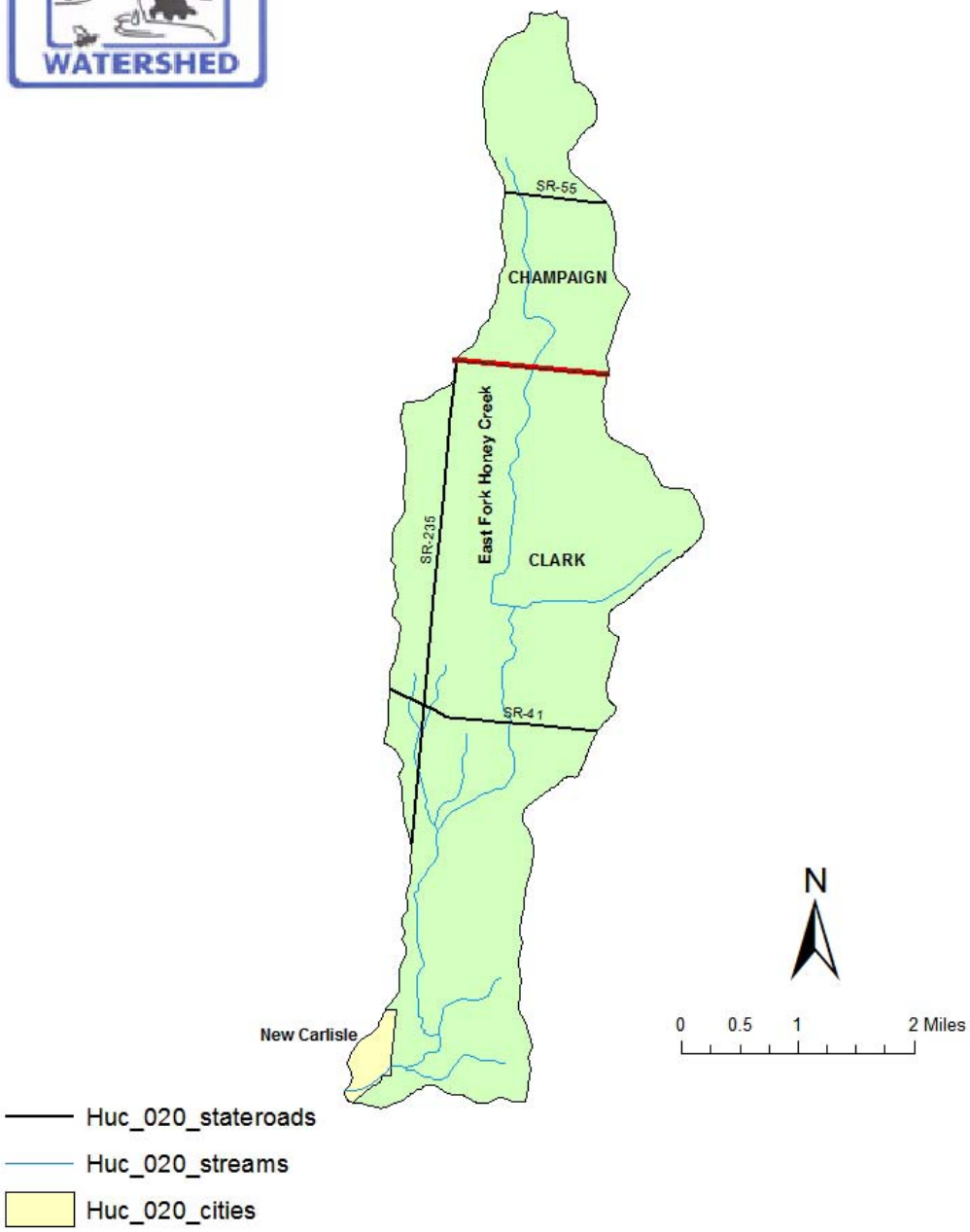
Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce organic enrichment & pathogen/bacterial sources of pollution from HSTS. Reduce BOD load at least by 25% (34,448 tons/year) Locate 100% of HSTS and determine discharge status. Upgrade at least 20 failing HSTS.	$10,000 for data gathering and completing the plan. **OEPA** – DEFA Program **Local Health Depts.** – funds for inventory & write plan	Work with the local health departments to complete the HSTS inventory, which identifies the failing systems in the subwatershed. The plan will also identify the needs and types of systems necessary to correct the problem sites. The county-wide plan will also include an operation and maintenance program for the counties.	Approved County-wide HSTS plan by OEPA & Champaign & Clark Health Board. Number of HSTS upgraded/replaced. Load reductions will be calculated using the Region 5 Model and STEPL program.	Jan 2008 – Dec 2017
Educate watershed residents on proper HSTS maintenance.	**Local Health Depts.** **HCWA** – watershed coordinator **ONDR,DSWC -** Watershed Awareness to Watershed Action (WAWA) mini-grants	Host workshop for watershed residents on proper HSTS maintenance. Create handouts promoting HSTS pumping and management. Implement two experimental HSTS locations	Number of workshop attendants. Number of handouts distributed. Two sites implemented	Jan 2008 – Dec 2017
Educate watershed residents on drinking water from wells	**Local Health Depts.** **HCWA** – watershed coordinator **ODNR,DSWC** - District staff **Various Grants**	Implement a "Test Your Well" program in Champaign, Clark, and Miami Counties annually	Number of program participants	Jan 2008 – Dec 2017

East Fork Honey Creek
HUC 05080001 200 020



HONEY CREEK WATERSHED

East Fork Honey Creek
HUC 05080001 200 020



East Fork Honey Creek Subwatershed
HUC 050800001 200 020

The East Fork Honey Creek Subwatershed encompasses 8,253 acres in Champaign (Jackson Township) and Clark (Pike and Bethel Townships) counties. The total drainage area is 13 square miles (9% of the total watershed project area). The main stem is 8 miles with an average fall of 32.1 feet/mile. The East Fork Honey Creek joins the West Fork Honey Creek on the southeast side of New Carlisle to form the main stem of the Honey Creek.

The East Fork Honey Creek Subwatershed contains approximately 17.1 miles of total stream length including the main stem and tributaries. There are 15.2 miles of that channelized and 23.3 miles (includes both sides of the stream) that has less that 30 linear feet of buffer between the present land use.

The dominant land use is agriculture (78%). The main stem and unnamed tributaries are mainly channelized (89%) for agricultural reasons. Water quality in these channelized areas show drastic impacts from non-point source pollution. There are 2,663 acres of hydric soils (32% of the total subwatershed) and 900 acres of highly erodible land (10.9%). This subwatershed also has the third largest number of animal units (930 A.U.); however, this number does not include animal units for Champaign County and has the fourth largest number of agriculture acres in the project area. Priorities of the HCWA will be to increase the riparian corridor, promotion of farmland preservation and implementation of agricultural best management practices, such as, waterways, conservation tillage, implementation of CMNP, and filter strips.

This subwatershed is also impacted by failing HSTS, especially in concentrated areas along State Route 235 and the surrounding New Carlisle area. There are 170 HSTS; however, this number is an estimate. The HSTS in Clark and Champaign counties have not been inventoried. The estimated number of HSTS for Clark County within the Honey Creek / GMR watershed was derived from the Clark County Health Department by counting the occupied parcels on each road using GIS. The total number of confirmed HSTS and discharging systems was derived through records searched of each road. Areas that are served by New Carlisle sanitary sewer were not included. The estimated number of HSTS for Champaign County within the Honey Creek / GMR watershed was derived by counting houses using aerial photographs. The OEPA use designation for the main stem is warmwater habitat (OAC 3745-1, Table 21-1), however, more OEPA data needs to be done to completely assess the entire subwatershed. Another priority of the HCWA is repairing faulty HSTS and educating landowners on the proper maintenance of HSTS.

Below are strategies highlighted by the HCWA as the top implementation priorities and will be addressed first as funding becomes available. However, there are additional implementation strategies listed in the watershed action plan that will be addressed as well for each subwatershed, but are not top priorities of the HCWA.

HCWA Top Priorities for Local Implementation Actions in East Fork Honey Creek

Water Quality Restoration Potential = *MEDIUM*

- Gather surface water quality data to identify specific water quality pollution problems
- Reduce sedimentation and nutrient run off from agricultural fields through best management practices
- Reduce sedimentation and nutrient run off by implementing proper streambank restoration methods
- Locate 100% of HSTS and determine discharge status
- Inventory livestock and develop comprehensive manure nutrient management plans for 75% of livestock producers

Impairments in this subwatershed include:

- Channelization & lack of riparian buffer areas
- Sedimentation
- Pathogens

LAND USE

Land Use	Percent	Acres
Urban	8%	679
Forest	8%	646
Pasture	5%	391
Woody Wetlands	1%	77
Cropland	78%	6,460

Total Acres = 8,253 (Data provided by 1994 land use maps from ODNR)

East Fork Honey Creek, Twin Creek Development. New Carlisle. Ohio

East Fork Honey Creek at SR 41 Clark County. Ohio

East Fork Honey Creek Subwatershed
HUC 050800001 200 020

IMPAIRMENT: NUTRIENTS & SEDIMENT

Background

There has not been any biological / chemical sampling done in this subwatershed by Ohio EPA so the sources of impairment have been determined by best professional judgment from the HCWA advisory committee. Cropland production and pastureland have been identified as sources of impairment.

Problem Statement

According to land use calculations cropland makes up 78% or 6,460 acres of the total land use. Pastureland makes up 5% or 391 acres of land use. The source of sediment is land runoff and streambank erosion. According to the STEPL loading program, the is an estimated sediment loss of 5,057 tons/year from urban, cropland, pastureland, and forest. The sediment amount in tons/year is 15% of all the sediment impairing the entire watershed.

The highest source of sediment and nutrients come from extensive row-crop agriculture (97%). This problem is intensified by a partial lack of riparian buffers. A slight amount comes from urban and pastureland. More data needs to be collected to see the impact of livestock in the subwatershed and whether or not they are contributing additional nutrients. Nutrients and sediment enter the stream from runoff events during heavy rain, leaching through the soil, and improper application of pesticides and fertilizer, including manure. The subwatershed currently has 122,848 linear feet (68%) of streambank with less than 30 feet of riparian buffer. A riparian buffer is extremely important in preventing excess nutrients such as nitrogen, phosphorus, and sediment from entering the stream. Riparian buffer establishment and proper pesticide and fertilizer application will be implemented in this subwatershed.

Known pollutant loads within this segment of stream includes 40,316 lbs/year of nitrogen; 9,886 lbs/year of phosphorus and 91,687 lbs/year of biological oxygen demand.

SEDIMENT LOAD (TONS / YEAR)

Land Use	Sediment Load
Urban	83.8
Cropland	4,917.6
Pastureland	49.2
Forest	6.1
TOTAL SEDIMENT LOAD	5,056.7

** Calculations based on the STEPL load reduction program.*

Goals

1. Reduce sedimentation, pesticides, herbicides nutrients and other non-point source pollutants from agricultural & urban land areas at least by 50%.
2. Promote the establishment of riparian buffers. Restore at least 30,712 linear feet (25%) of streambank.
3. Create a livestock inventory for Champaign and Clark Counties within the subwatershed.
4. Promote education of proper pesticide and fertilizer, including manure applications to improve water quality.

Table 31
Action Plan for Nutrient and Sediment Reduction in
East Fork Honey Creek Subwatershed

Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce sedimentation and nutrient run off from agricultural fields through promoting conservation tillage, crop rotation and establishment of filter strips, grassed waterways, field borders & riparian buffers. Reduce nitrogen and phosphorus load at least by 25% (10,079 tons/ year for N; 2,471 tons/year for P)and sediment load at least by 50% (2,528 tons/year) Promote grid soil sampling and precision application of fertilizers, pesticides and herbicides.	**USDA, NRCS** – CRP; CSP; EQIP **Miami Conservancy District (MCD)** – Water Quality Credit Trading Program **ODNR,DSWC** – Agricultural Pollution Abatement Cost-Share Program	Work in conjunction with Clark, and Champaign SWCD/NRCS to promote streamside buffers through USDA and MCD programs on agricultural lands Submit newspaper and newsletter articles advertising the benefits of riparian buffers Target landowners and operators who farm HEL land	Acres of agricultural lands enrolled in conservation programs. Newsletters produced and number of articles appearing in local newspapers. Load reductions will be calculated using the Region 5 Model and STEPL program. Sediment reduction of approximately 2,528 tons/year; nitrogen reduction of approximately, 10,079 tons/year; and phosphorus reduction of approximately 2,471 tons/year.	Jan 2008 – Dec 2017
Reduce sedimentation from riparian land areas by promoting protection of riparian buffers and proper streambank restoration methods improving instream	**Miami Conservancy District** – Water Quality Credit Trading Program **OEPA** – 401 mitigation list	Work with Clark, and Champaign SWCD/NRCS to identify riparian landowners with eroded streambank issues. Establish one demonstration site	Create mailing list targeting streamside landowners to receive educational materials. Linear feet of	Jan 2008 – Dec 2017

habitat. Restore at least 25% streambank.	**OEPA –** 319 funding **ODNR,DSWC –** Agricultural Pollution Abatement Cost-Share Program	along the East Fork Honey Creek utilizing bioengineering erosion control and natural channel design methods and natural stream channel design	streambank restored and protected. Improved QHEI scores. Load reductions will be calculated using the Region 5 Model.	
Create a livestock inventory for Clark and Champaign Counties.	**ODNR, DSWC** – District Staff **HCWA –** Watershed Coordinator	Work with Clark, and Champaign SWCD/NRCS to gather livestock numbers, including horse numbers.	Livestock Inventory completed for Clark & Champaign counties and Miami Co. is updated.	Jan 2008 – Dec 2017
Develop comprehensive manure nutrient management plans for each livestock operation not permitted by Ohio EPA	**ODNR, DSWC** – District Staff **USDA, NRCS** - staff	CMNPs are required for farmers to participate in government programs.	75% of livestock producers has CMNPs.	Jan 2008 – Dec 2017
Target livestock producers in the subwatershed where livestock has been identified to have access to the stream. Work with the producer to install fencing and alternative drinking water sources.	**USDA, NRCS** – EQIP, CRP **OEPA –** 319 funding	Work with Clark, and Champaign SWCD/NRCS to identify livestock that has access to the stream.	Document miles of streambank fencing installed along with acreage of riparian area protected. Load reductions will be calculated using Region 5 Model.	Jan 2008 – Dec 2017
Continue to survey all the streams in the subwatershed by Rosgen Channel Type and QHEI / HHEI.	**HCWA** – Watershed Coordinator **ONDR,DSWC**	Drive watershed, stopping at each stream crossing to determine channel type	All streams are categorized by Rosgen Channel Type and QHEI / HHEI	Jan 2008 – Dec 2017
Educate the public and local officials on proper channel design and the advantages of natural channels with floodplains.	**HCWA** – Watershed Coordinator **ONDR,DSWC** – District Staff **ONDR,DSWC -** Watershed Awareness to Watershed Action (WAWA) mini-grants	Hold an education/informational workshop once a year on stream geomorphology.	One workshop held each year.	Jan 2008 – Dec 2017
Implement the use of	**ONDR,DSWC**	Farmers are	Three new	Jan 2008 –

proper storage and containment of farm chemicals.	– District Staff **OSUE** – staff **USDA, NRCS** – EQIP	encouraged to take advantage of EQIP funds for proper chemical storage	chemical containment facilities built each year in the Honey Creek Watershed	Dec 2017
Implement the use of integrated pest management.	**ONDR,DSWC** – District Staff **OSUE** – staff **USDA, NRCS** – EQIP	Integrated pest management is discussed with farmers as part of their conservation planning	Integrated pest management is discussed as part of 100% of new conservation plans.	Jan 2008 – Dec 2017
Promote & educate watershed residents on farmland preservation.	**Clean Ohio Fund** – farmland preservation **Champaign Land Preservation ODNR, DSWC** - District Staff	Work in conjunction with Champaign, Clark, and Miami SWCD/NRCS & local townships to promote farmland preservation of agricultural lands.	Number of acres of farmland in the farmland preservation program.	Jan. 2008 – Dec 2017

Listed below are best management practices implemented within the last five years in the East Fork Honey Creek Subwatershed.

Conservation Practice	Funding Source	14-Digit Subwatershed	# of Acres	County
Field Border	USDA, CRP	East Fork Honey Creek	0.8	Clark
Filter Strip	USDA, CRP	East Fork Honey Creek	0.6	Clark
Grassed Waterway	USDA, CRP	East Fork Honey Creek	7.5	Clark
Hog Composter	ODNR,DSWC	East Fork Honey Creek	1 unit	Clark
Whole Field CRP	USDA, CRP	East Fork Honey Creek	18.6	Clark
Agrichemical Handling Facility	USDA	East Fork HC		Champaign

East Fork Honey Creek Subwatershed
HUC 050800001 200 020

IMPAIRMENT: Pathogens

Background

There has not been any biological / chemical sampling done in this subwatershed by Ohio EPA so the sources of impairment have been determined by best professional judgment from the HCWA advisory committee. In the East Fork Honey Creek Subwatershed malfunctioning household sewage treatment systems (HSTS) contribute to the elevated levels of pathogens in this subwatershed.

Problem Statement

According to land use calculations urban/residential makes up 8% or 679 acres of the total land use. There is an estimated 170 home sewage treatment systems (HSTS) in the subwatershed. HSTS are known to fail in this subwatershed because of a slow permeability, slope and high clay content in the soil. Elevated levels of e-coli and fecal coliform has been found at Sigler Road through volunteer sampling and OEPA chemical analysis. There is also development pressure from New Carlisle occurring in this subwatershed. Twin Creek Development along New Carlisle Pike is occurring along the East Fork Honey Creek.

There are 3 livestock operations (only Clark County numbers) in this subwatershed totaling 2200 animals (not animal units). The 2000 head hog farm has a CNMP. There are 391 acres of pastureland. The East Fork Honey Creek subwatershed has the third highest number of livestock, however; the data is incomplete without livestock numbers from Champaign County. Livestock manure contains several pollutants, including ammonia, nitrogen, phosphorus, bacteria and nitrate nitrogen. These pollutants can harm the aquatic environment, cause water quality problems in streams and ponds and contaminate drinking water supplies. By improving these operations there will be a reduction in nutrient loadings, pathogens and sediment runoff. This will be accomplished by restricting livestock access to the stream, improving pasture management, encouraging alternative drinking water sources, and reducing runoff from feedlots.

Livestock Numbers in East Fork Honey Creek Subwatershed

Livestock Animals	Number	Animal Units*
Beef Cattle	0	0
Dairy Cattle	50	70
Swine (Hogs)	2150	860
Goats / Sheep	0	0
Horses	0	0
Chickens	0	0
TOTAL	2200	930

*** Animal Units – The number of animals of various size and species which are equivalent to one slaughter or feeder beef with regard to daily waste production. Multiply the following to the actual number of animals: A) 1.0 slaughter and feeder cattle; b) 1.4 Mature dairy cattle; c) 0.4 swine weighing over 55lbs.; d) 0.01 laying hens or broilers; e) 2.0 Horses; f) 0.1 - sheep/goats
Source: Animal Waste Pollution Abatement Rules; ODNR

Below is the data collected from the HCWA Watershed Coordinator from November 2004 - July 2005. In 2004, the HCWA received funding in the amount of $20,694.50 from OEPA for water sampling and analysis. The analysis was conducted at the OEPA water quality analysis lab in Columbus, Ohio.

East Fork Honey Creek, **RM 1.58**						
	11/9/2004	12/14/2004	2/9/2005	3/23/2005	5/3/2005	7/27/2005
DO (mg/L)	9.94	18.8	12.52	14.73	14.33	8.47
pH	7.32	6.48	6.92	6.99	7.73	7.88
Temperature C	8.9	2.6	5.2	7.7	9.5	29.1
BOD5 (mg/L)	<2.0	<2.0	2.2	<2.0	<2.0	<2.0
TSS (mg/L)	<5	<5	79	<5	<5	5
E.coli (#/100mL)	145	25	315	<10	65	700
Fecal Coliform (#/100mL)	105	145	795	15	195	950
Ammonia (mg/L)	<0.05	<0.05	0.108	<0.05	<0.05	0.085
Nitrate+Nitrite (mg/L)	3.6	7.02	4.7	5.42	7.67	3.29
TKN (mg/L)	<0.2	0.46	1.3	0.61	0.41	0.49
TP (mg/L)	0.013	0.014	0.322	0.011	0.017	0.035
Standards						
DO (mg/L)	5	5	5	5	5	5
pH	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
E.coli (#/100mL)	126	126	126	126	126	126
Fecal Coliform (#/100mL)	1,000	1,000	1,000	1,000	1,000	1,000
Ammonia (mg/L)						
Nitrate+Nitrite (mg/L)	10	10	10	10	10	10

Known pollutant loads within this segment of stream includes 40,316 lbs/year of nitrogen; 9,886 lbs/year of phosphorus and 91,687 lbs/year of biological oxygen demand.

Biological Oxygen Demand (BOD) LOAD (TONS / YEAR)

Land Use	BOD Load
Urban	14,033.6
Cropland	71,257.3
Pastureland	5,683.2
Forest	281.2
Septic	431.6
TOTAL BOD LOAD	91,687.0

** Calculations based on the STEPL load reduction program.*

Goals

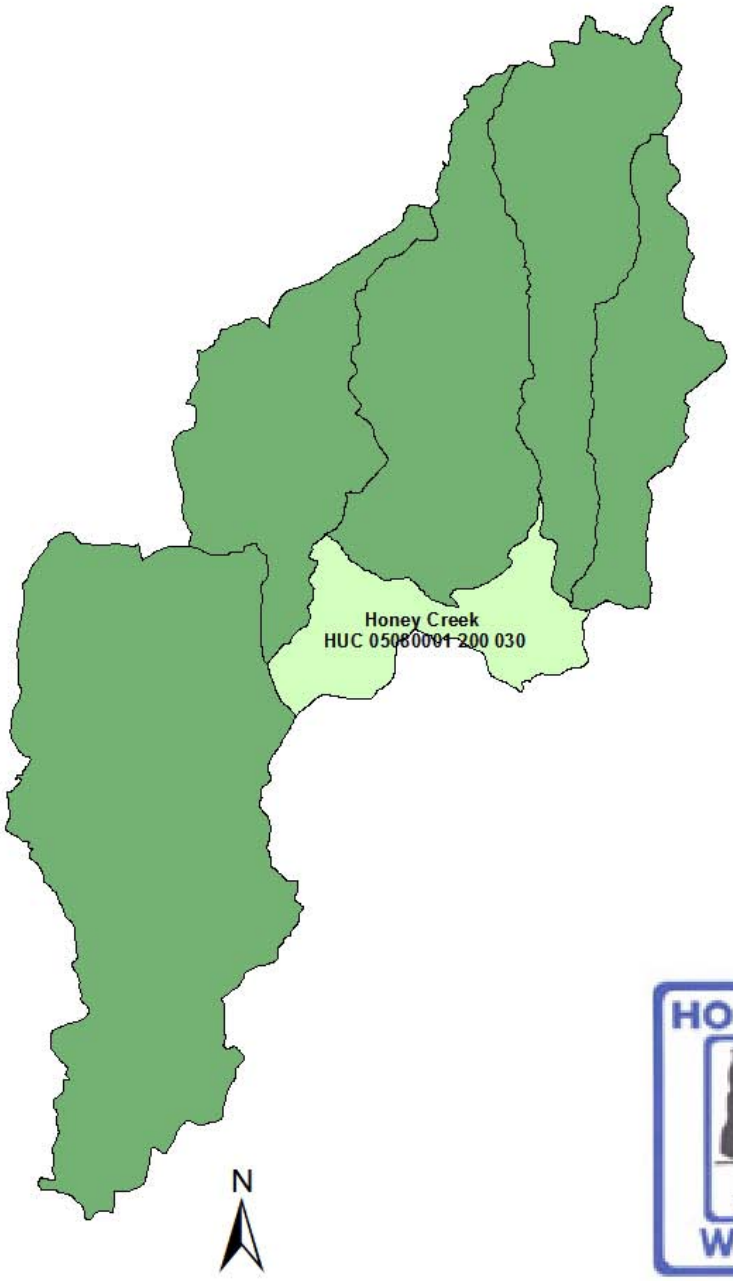
5. Complete and obtain approval of Champaign, and Clark Countywide HSTS plans to identify needed sewage treatment upgrades and their locations.
6. Upgrade at least 25% of those identified failing HSTS in the East Fork Honey Creek Subwatershed.
7. Livestock pathogen reductions (see previous section goals).
8. Educate watershed residents on the proper maintenance of HSTS.
9. Educate watershed residents on drinking water protection.

Table 32
Action Plan for Pathogen Reduction in
East Fork Honey Creek Subwatershed

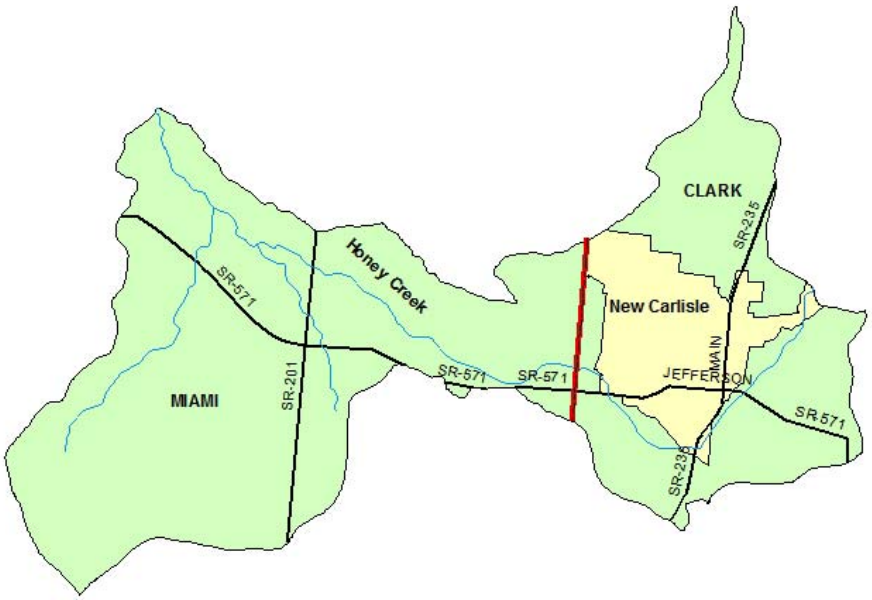
Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce organic enrichment & pathogen/bacterial sources of pollution from HSTS. Reduce BOD load at least by 25% (34,448 tons/year) Locate 100% of HSTS and determine discharge status. Upgrade at least 10 failing HSTS.	$10,000 for data gathering and completing the plan. **OEPA** – DEFA Program **Local Health Depts.** – funds for inventory & write plan	Work with the local health departments to complete the HSTS inventory, which identifies the failing systems in the subwatershed. The plan will also identify the needs and types of systems necessary to correct the problem sites. The county-wide plan will also include an operation and maintenance program for the counties.	Approved County-wide HSTS plan by OEPA & Champaign & Clark Health Board. Number of HSTS upgraded/replaced. Load reductions will be calculated using the Region 5 Model and STEPL program.	Jan. 2008 – 2017.

Educate watershed residents on proper HSTS maintenance.	**Local Health Depts.** **HCWA** – watershed coordinator **ONDR,DSWC** - Watershed Awareness to Watershed Action (WAWA) mini-grants	Host workshop for watershed residents on proper HSTS maintenance. Create handouts promoting HSTS pumping and management. Implement two experimental HSTS locations	Number of workshop attendants. Number of handouts distributed. Two sites implemented	Jan. 2008 – 2017.
Educate watershed residents on drinking water from wells	**Local Health Depts.** **HCWA** – watershed coordinator **ODNR,DSWC** - District staff **Various Grants**	Implement a "Test Your Well" program in Champaign, and Clark, Counties annually	Number of program participants	Jan 2008 – Dec 2017

Honey Creek
HUC 05080001 200 030



Honey Creek
HUC 05080001 200 030



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0 0.45 0.9 1.8 Miles

Honey Creek Subwatershed
HUC 050800001 200 030

The Honey Creek Subwatershed encompasses 7,424 acres in Clark (Bethel Township) and Miami (Bethel Township) counties. The total drainage area is 11.6 square miles (8% of the total watershed project area). The main stem is 7.4 miles with an average fall of 19.6 feet/mile. The Honey Creek Subwatershed is the smallest subwatershed in the HCWA project area.

The Honey Creek Subwatershed contains approximately 11.3 miles of total stream length including the main stem and tributaries. There are 1.7miles of that channelized and 4.5 miles (includes both sides of the stream) that has less that 30 linear feet of buffer between the present land use.

Studebaker Nursery

The dominant land use is agriculture (42%). However, unlike the other five subwatersheds, the main stem and unnamed tributaries are not excessively channelized (17%) for agricultural reasons. There are 1,267 acres of hydric soils (17% of the total subwatershed) and 1,307 acres of highly erodible land (HEL) (17.6%) in this subwatershed. The Honey Creek Subwatershed has the largest amount of HEL ground then any other subwatershed in the Project Area. This subwatershed also has two large nurseries, Scarff and Studebaker nurseries, totally 1,600 acres southeast of New Carlisle. The HCWA will work with them to ensure that they are implementing the proper erosion control, pesticide and herbicide measures.

There is a well established riparian corridor along the main stem, which is one of the reasons why the Honey Creek Subwatershed has a use designation of exceptional warmwater habitat by the OEPA (OAC 3745-1, Table 21-1). Also, this subwatershed has abundant functioning wetlands (222 acres/3% of the total subwatershed), which help filter out excess nutrients and aid in flood control, as well, as provide habitat for a large variety of flora and fauna.

The Honey Creek Subwatershed has the highest urban/residential land use (32%) in the Honey Creek Watershed. This subwatershed includes the City of New Carlisle (2006 estimated population: 5,616). New Carlisle has a wastewater treatment plant that serves New Carlisle, the Village of North Hampton (which is located outside the watershed), Honey Creek Village Mobile Home Park (MHP), Park Terrace MHP, Brookwood MHP, and Country Squire Estates. The only sewer service area in the

Honey Creek Watershed is located within this subwatershed (12% of the entire Honey Creek Watershed). The Miami County Comprehensive Plan (2006, MVRPC) discourages major development within this subwatershed due to unsuitable soils and limited resources to develop water and sewer lines. The HCWA will focus efforts on storm water education, such as storm water drain stenciling, and low impact development within this subwatershed.

This subwatershed is also impacted by failing HSTS, especially in concentrated areas along Pigah, Rudy, Studebaker and Agenbroad Roads in Miami County. There are 391 HSTS; however, this number is an estimate. The HSTS in Clark County has not been inventoried. The estimated number of HSTS for Clark County within the Honey Creek / GMR watershed was derived from the Clark County Health Department by counting the occupied parcels on each road using GIS. The total number of confirmed HSTS and discharging systems was derived through records searched of each road. Areas that are served by New Carlisle sanitary sewer were not included. The number of HSTS in Miami County was determined from a detailed inventory and GIS.

The OEPA use designation for the main stem is exceptional warmwater habitat (OAC 3745-1, Table 21-1), however, more OEPA data needs to be done to completely assess the entire subwatershed. The only OEPA surface water quality assessments were made surrounding the New Carlisle Wastewater Treatment Plant in 1994. The impairments identified from the 2000 Ohio EPA 305 (b) list are organic enrichment (cause) and minor municipal point source (source). Preserving and restoring the existing wetlands and riparian corridor, promoting low impact development, storm water education, and repairing faulty HSTS are priorities for the HCWA in this subwatershed.

1994 Aquatic life use attainment for applicable use designations in the Honey Creek (OEPA 1996).
(Eastern Corn Belt Plain – EWH Use Designation (Existing))

River Mile Fish/Invert.	IBI	Modified Iwb	ICI	QHEI	Attainment Status	Comment
10.0 / 10.1	48^{ns}	9.1 ^{ns}	44	70.5	FULL	Ust. New Carlisle WWTP
8.0 / 8.1	48^{ns}	9.2 ^{ns}	MG *	85.0	PARTIAL	Dst. New Carlisle WWTP
3.2 / 3.2	48^{ns}	9.4	40 *	67.5	PARTIAL	Rudy Rd.

* Significant departure from applicable biological criterion (>4 IBI or ICI units, >0.5 MIwb units), poor and very poor results are underlined.
ns – Non-significant departure from biological criterion (≤IBI or ICI units, > 0.5 MIwb units).

Below are strategies highlighted by the HCWA as the top implementation priorities and will be addressed first as funding becomes available. However, there are additional implementation strategies listed in the watershed action plan that will be addressed as well for each subwatershed, but are not top priorities of the HCWA.

HCWA Top Priorities for Local Implementation Actions in Honey Creek

Water Quality Restoration Potential = ***HIGH***

- Gather surface water quality data to identify specific water quality pollution problems
- Preserve and restore existing wetlands
- Reduce sedimentation and nutrient run off from agricultural fields through best management practices
- Reduce sedimentation and nutrient run off by implementing proper streambank restoration methods
- Locate 100% of HSTS and determine discharge status

Impairments in this subwatershed include:

- Nutrients
- Sedimentation
- Pathogens

LAND USE

Land Use	Percent	Acres
Urban	32%	2,396
Forest	17%	223
Pasture	6%	431
Woody Wetlands	3%	222
Cropland	42%	3,120

Total Acres = 7,391 (Data provided by 1994 land use maps from ODNR)

Wetland off of Dayton-Brandt Road, Miami County

Honey Creek at New Carlisle Pike, Clark County

Honey Creek Subwatershed
HUC 050800001 200 030

IMPAIRMENT: NUTRIENTS & SEDIMENT

Background

There has not been any biological / chemical sampling done in this subwatershed by Ohio EPA, except on the main stem around the New Carlisle Wastewater Treatment Plant, so the sources of impairment have been determined by best professional judgment from the HCWA advisory committee. Cropland production and pastureland have been identified as sources of impairment.

Problem Statement

According to land use calculations cropland makes up 42% or 3,120 acres of the total land use. Pastureland makes up 6% or 431 acres of land use. The source of sediment is land runoff and livestock in the stream. According to the STEPL loading program, there is an estimated sediment loss of 2,813 tons/year from urban, cropland, pastureland, and forest. The sediment amount in tons/year is 8% of all the sediment impairing the entire watershed.

The highest source of sediment and nutrients come from extensive row-crop agriculture and plant nurseries (87%). This problem is intensified by a partial lack of riparian buffers. A slight amount comes from urban and pastureland. More data needs to be collected to see the impact of livestock in the subwatershed and whether or not they are contributing additional nutrients. Nutrients and sediment enter the stream from runoff events during heavy rain, leaching through the soil, and improper application of pesticides and fertilizer, including manure. The subwatershed currently has 23,940 linear feet (20%) of streambank with less than 30 feet of riparian buffer. A riparian buffer is extremely important in preventing excess nutrients such as nitrogen and phosphorus and sediment from entering the stream. Riparian buffer establishment and proper pesticide and fertilizer application will be implemented in this subwatershed.

Known pollutant loads within this segment of stream includes 32,313 lbs/year of nitrogen; 6,849 lbs/year of phosphorus and 92,220 lbs/year of biological oxygen demand.

SEDIMENT LOAD (TONS / YEAR)	
Land Use	Sediment Load
Urban	295.8
Cropland	2,449.8
Pastureland	55.9
Forest	11.9
TOTAL SEDIMENT LOAD	2,813.4

** Calculations based on the STEPL load reduction program.*

Goals

1. Reduce sedimentation, pesticides, herbicides nutrients and other non-point source pollutants from agricultural & urban land areas at least by 50%.
2. Promote the establishment of riparian buffers. Restore at least 5,985 linear feet (25%) of streambank.
3. Preserve / Restore existing wetlands within the subwatershed.
4. Educate watershed residents about storm water management and how it affects water quality.
5. Promote and educate watershed residents and developers about low impact development and how it improves water quality.
6. Create a livestock inventory for Clark County and update Miami County's livestock inventory within the subwatershed.
7. Promote education of proper pesticide and fertilizer, including manure applications to improve water quality.

Table 33
Action Plan for Nutrient and Sediment Reduction in
Honey Creek Subwatershed

Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce sedimentation and nutrient run off from agricultural fields through promoting conservation tillage, crop rotation and establishment of filter strips, grassed waterways, field borders & riparian buffers. Reduce nitrogen and phosphorus load at least by 25% (8,078 tons/ year for N;	**USDA, NRCS** – CRP; CSP; EQIP **Miami Conservancy District (MCD)** – Water Quality Credit Trading Program **Miami County Pheasants Forever** – CSP	Work in conjunction with Clark, and Miami SWCD/NRCS to promote streamside buffers through USDA and MCD programs on agricultural lands Submit newspaper and newsletter articles advertising the benefits of riparian buffers Target landowners and operators who farm HEL land	Acres of agricultural lands enrolled in conservation programs. Newsletters produced and number of articles appearing in local newspapers. Load reductions will be calculated using the Region 5 Model and STEPL	Jan. 2008 – Dec 2017

1,712 tons/year for P)and sediment load at least by 50% (1,407 tons/year) Promote grid soil sampling and precision application of fertilizers, pesticides and herbicides.	**ODNR,DSWC** – Agricultural Pollution Abatement Cost-Share Program	Educate watershed residents on proper lawn care.	program. Sediment reduction of approximately 8,078 tons/year; nitrogen reduction of approximately, 1,712 tons/year; and phosphorus reduction of approximately 1,407 tons/year.	
Reduce sedimentation from riparian land areas by promoting protection of riparian buffers and proper streambank restoration methods improving instream habitat. Restore at least 25% of streambank.	**Miami Conservancy District** – Water Quality Credit Trading Program **OEPA** – 401 mitigation list **OEPA –** 319 funding **ODNR,DSWC** – Agricultural Pollution Abatement Cost-Share Program	Work with Clark, and Miami SWCD/NRCS to identify riparian landowners with eroded streambank issues. Establish one demonstration site along the Honey Creek utilizing bioengineering erosion control and natural channel design methods and natural stream channel design	Create mailing list targeting streamside landowners to receive educational materials. Linear feet of streambank restored and protected. Improved QHEI scores. Load reductions will be calculated using the Region 5 Model.	Jan. 2008 – Dec 2017.
Promote the conservation and restoration of wetlands. Restore and preserve at least 25% of the existing wetlands in the Honey Creek Subwatershed.	**HCWA** – Watershed Coordinator **WH Greenways** - Volunteers **BW Greenways** – Volunteers **MCPD** – Director **USDA,NRCS** – WRP **US Fish & Wildlife** – grants **OEPA** – 401 mitigation	Determine willing sellers of significant Honey Creek wetlands Establish an educational workshop about the importance of wetlands. Submit newspaper and newsletter articles advertising the benefits of wetlands	Database created of landowners with significant Honey Creek wetlands. Number of workshop attendants. Newsletters produced and number of articles appearing in local newspapers. Number of wetland acres preserved / restored.	Jan 2008 – Jan 2009 Jan 2008 – Dec 2017 Jan 2008 – Dec 2017

	clearing house			
Create a livestock inventory for Clark County and update Miami County's Livestock Inventory.	**ODNR, DSWC** – District Staff **HCWA –** Watershed Coordinator	Work with Clark, and Miami SWCD/NRCS to gather livestock numbers, including horse numbers.	Livestock Inventory completed for Clark County and Miami Co. is updated.	Jan 2008 – Dec 2017 .
Develop comprehensive manure nutrient management plans for each livestock operation not permitted by Ohio EPA	**ODNR, DSWC** – District Staff **USDA, NRCS** - staff	CMNPs are required for farmers to participate in government programs.	75% of livestock producers has CMNPs.	Jan 2008 – Dec 2017
Target livestock producers in the subwatershed where livestock has been identified to have access to the stream. Work with the producer to install fencing and alternative drinking water sources.	**USDA, NRCS** – EQIP, CRP **OEPA –** 319 funding	Work with Clark, and Miami SWCD/NRCS to identify livestock that has access to the stream.	Document miles of streambank fencing installed along with acreage of riparian area protected. Load reductions will be calculated using Region 5 Model.	Jan 2008 – Dec 2017
Continue to survey all the streams in the subwatershed by Rosgen Channel Type and QHEI / HHEI.	**HCWA** – Watershed Coordinator **ONDR,DSWC**	Drive watershed, stopping at each stream crossing to determine channel type	All streams are categorized by Rosgen Channel Type and QHEI / HHEI	Jan 2008 – Dec 2017
Educate the public and local officials on proper channel design and the advantages of natural channels with floodplains.	**HCWA** – Watershed Coordinator **ONDR,DSWC** – District Staff **ONDR,DSWC** - Watershed Awareness to Watershed Action (WAWA) mini-grants	Hold an education/informational workshop once a year on stream geomorphology.	One workshop held each year.	Jan 2008 – Dec 2017
Implement the use of proper storage and containment of farm chemicals.	**ONDR,DSWC** – District Staff **OSUE** – staff **USDA, NRCS** – EQIP	Farmers are encouraged to take advantage of EQIP funds for proper chemical storage	Three new chemical containment facilities built each year in the Honey Creek Watershed	Jan 2008 – Dec 2017
Implement the use of integrated pest management.	**ONDR,DSWC** – District Staff **OSUE** – staff **USDA, NRCS** – EQIP	Integrated pest management is discussed with farmers as part of their conservation planning	Integrated pest management is discussed as part of 100% of new conservation plans.	Jan 2008 – Dec 2017

Reduce NPS pollutants associated with storm water by implementing BMP's and education of watershed residents on storm water management.	**Clark County, Bethel Twp. and New Carlisle** – Work with entities involved in Phase II areas. **OEPA**- DEFA Program **HCWA** – Watershed Coordinator	Storm drain labeling in areas with curb and gutter storm water systems. Create and submit articles to local newspapers on storm water and stream health. Participate in the Phase II educational program.	Number of storm water drains labeled. Number of articles submitted & published. Water quality activities reported to OEPA for Phase II as required.	Jan 2008 – Dec 2017
Educate watershed residents on low impact development BMPs.	**Clark County, Bethel Twp. and New Carlisle** – Work with administrators to implement low impact development BMPs. **Miami County, Bethel Twp** - Work with administrators to implement low impact development BMPs. **HCWA** – Watershed Coordinator **Clark & Miami SWCDs** – Staff **OEPA** – 319 grant program / OEEF Grant **ONDR,DSWC** - Watershed Awareness to Watershed Action (WAWA) mini-grants	Implement 5 low impact development educational demonstration sites in the Honey Creek Subwatershed. Create and submit articles to local newspapers on low impact development and stream health. Conduct Better Site Design / Low Impact Development workshop for developers and local zoning commissions.	5 sites completed Number of articles submitted & published. Number of workshop participants.	Jan 2008 – Dec 2017

Listed below are best management practices implemented within the last five years in the Honey Creek Subwatershed.

Conservation Practice	Funding Source	14-Digit Subwatershed	# of Acres	County
Conservation Cover	USDA, WHIP	Honey Creek	22.8	Miami
Field Border	USDA, CRP	Honey Creek	13.4	Miami
Filter Strip	USDA, CRP	Honey Creek	2.9	Clark
Wetland Restoration	USDA, CRP	Honey Creek	4.7	Miami
Wetland Permanent Easement	WRRSP	Honey Creek	7.6	Miami
Wetland Permanent Easement	WRRSP	Honey Creek	26.7	Miami
Wetland Permanent Easement	WRRSP	Honey Creek	25	Miami
Wetland Permanent Easement	WRRSP	Honey Creek	15	Miami

Honey Creek Subwatershed
HUC 050800001 200 030

IMPAIRMENT: Pathogens

Background

There has not been any biological / chemical sampling done in this subwatershed by Ohio EPA, except on the main stem around the New Carlisle Wastewater Treatment Plant, as a result the sources of impairment have been determined by best professional judgment from the HCWA advisory committee. In the Honey Creek Subwatershed malfunctioning household sewage treatment systems (HSTS) contribute to the elevated levels of pathogens in this subwatershed.

Problem Statement

According to land use calculations urban makes up 32% or 2,396 acres of the total land use. There is an estimated 391 home sewage treatment systems (HSTS) in the subwatershed. HSTS are known to fail in this subwatershed because of a slow permeability, slope and high clay content in the soil. Elevated levels of e-coli and fecal coliform has been found at State Route 202, State Route 571, and Rudy Road through volunteer sampling and OEPA chemical analysis. There is also development pressure from New Carlisle occurring in this subwatershed. This subwatershed is dominated by over 200 five acre or less plots, especially along Pigah, Rudy, Studabaker and Agenbroad Roads in Miami County. According to the Miami County Health Department, 328 of the 391 HSTS are located in Miami County. The average age of the systems is 21.5 years. Problem areas include: Heilman Road – 17 HSTS and Newbury Road / Winterhill Court – 22 HSTS.

There are 18 livestock operations (only Miami County numbers) in this subwatershed totaling 266 animals (not animal units). None of the operations have CNMPs. There are 431 acres of pastureland. The Honey Creek subwatershed has the fifth highest number of livestock, however; the data is incomplete without livestock numbers from Clark County. Livestock manure contains several pollutants, including ammonia, nitrogen, phosphorus, bacteria and nitrate nitrogen. These pollutants can harm the aquatic environment, cause water quality problems in streams and ponds and contaminate drinking water supplies. By improving these operations there will be a reduction in nutrient loadings, pathogens and sediment runoff. This will be accomplished by restricting livestock access to the stream, improving pasture management, encouraging alternative drinking water sources, and reducing runoff from feedlots.

Livestock Numbers in Honey Creek Subwatershed

Livestock Animals	Number	Animal Units*
Beef Cattle	121	121
Dairy Cattle	4	5.6
Swine (Hogs)	8	3.2
Goats / Sheep	0	0
Horses	33	66
Chickens	100	1
TOTAL	**266**	**196**

*** Animal Units – The number of animals of various size and species which are equivalent to one slaughter or feeder beef with regard to daily waste production. Multiply the following to the actual number of animals: A) 1.0 slaughter and feeder cattle; b) 1.4 Mature dairy cattle; c) 0.4 swine weighing over 55lbs.; d) 0.01 laying hens or broilers; e) 2.0 Horses; f) 0.1 - sheep/goats
Source: Animal Waste Pollution Abatement Rules; ODNR

Below is the data collected from the HCWA Watershed Coordinator from November 2004 - July 2005. In 2004, the HCWA received funding in the amount of $20,694.50 from OEPA for water sampling and analysis. The analysis was conducted at the OEPA water quality analysis lab in Columbus, Ohio.

Honey Creek, **RM 0.84**						
	11/9/2004	12/14/2004	2/9/2005	3/23/2005	5/3/2005	7/27/2005
DO (mg/L)	11.8	11.34	10.95	10.5	7.96	5.53
pH	7.49	6.64	7.72	7.54	7.25	7.7
Temperature C	6.9	2.1	4.9	6.2	8.4	23.1
BOD5 (mg/L)	<2.0	<2.0	<2.0		<2.0	<2.0
TSS (mg/L)	<5	<5	34		<5	7
E.coli (#/100mL)	80	20	4200		30	360
Fecal Coliform (#/100mL)	60	70	900		380	560
Ammonia (mg/L)	<0.05	<0.05	0.092		<0.05	0.062
Nitrate+Nitrite (mg/L)	1.68	3.53	4.51		4.16	1.98
TKN (mg/L)	<0.2	0.45	2.34		0.44	0.28
TP (mg/L)	0.048	0.164	0.214		0.038	0.068
Honey Creek, **RM 3.18**						
	11/9/2004	12/14/2004	2/9/2005	3/23/2005	5/3/2005	7/27/2005
DO (mg/L)	12.5	12.75	10.84	10.87	8.61	6.88
pH	7.28	7.22	7.06	7.24	7.36	7.75
Temperature C	7.5	2.4	5	6	8.3	23.1
BOD5 (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TSS (mg/L)	<5	<5	22	12	<5	17
E.coli (#/100mL)	260	40	1900	80	20	190

Fecal Coliform (#/100mL)	210	210	600	410	200	390
Ammonia (mg/L)	<0.05	<0.05	0.093	<0.05	<0.05	<0.05
Nitrate+Nitrite (mg/L)	2.35	4.5	4.53	6.55	4.25	2.24
TKN (mg/L)	<0.2	0.41	1.31	0.45	0.47	0.31
TP (mg/L)	0.129	0.093	<0.01	0.031	0.036	0.085
Honey Creek, RM 8.08						
	11/9/2004	12/14/2004	2/9/2005	3/23/2005	5/3/2005	7/27/2005
DO (mg/L)	5.39	11.35	12.75	14.4	10.53	4.4
pH	6.51	6.54	7.26	7.51	7.3	7.54
Temperature C	10.2	4	5.2	6.1	8.9	20.1
BOD5 (mg/L)	<2.0	<2.0	2.9	<2.0	<2.0	<2.0
TSS (mg/L)	<5	<5	157	<5	<5	<5
E.coli (#/100mL)	230	40	2100	9	60	410
Fecal Coliform (#/100mL)	190	170	900	110	50	750
Ammonia (mg/L)	<0.05	<0.05	0.168	<0.05	<0.05	0.058
Nitrate+Nitrite (mg/L)	4.66	5.34	4.02	3.99	5.63	7.96
TKN (mg/L)	0.57	0.44	1.02	<0.2	0.54	0.73
TP (mg/L)	0.831	0.099	0.191	0.143	0.142	0.905
Honey Creek, RM 9.96						
	11/9/2004	12/14/2004	2/9/2005	3/23/2005	5/3/2005	7/27/2005
DO (mg/L)	7.71	14.68	12.63	14.64	11.82	6.4
pH	7.11	6.48	7.06	6.87	7.38	7.8
Temperature C	8.6	3.5	4.9	5.6	8.5	24
BOD5 (mg/L)	<2.0	<2.0	2.6	<2.0	<2.0	<2.0
TSS (mg/L)	<5	<5	131	<5	<5	<5
E.coli (#/100mL)	140	9	9090	9	10	100
Fecal Coliform (#/100mL)	140	190	718	9	160	160
Ammonia (mg/L)	<0.05	<0.05	0.187	<0.05	<0.05	0.057
Nitrate+Nitrite (mg/L)	1.22	5.02	3.99	3.41	5.6	2.65
TKN (mg/L)	<0.2	0.41	1.1	0.36	0.42	<0.2
TP (mg/L)	0.056	0.01	0.579	<0.01	<0.10	0.037
Standards						
DO (mg/L)	6	6	6	6	6	6
pH	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
E.coli (#/100mL)	126	126	126	126	126	126
Fecal Coliform (#/100mL)	1,000	1,000	1,000	1,000	1,000	1,000
Nitrate+Nitrite (mg/L)	10	10	10	10	10	10

Known pollutant loads within this segment of stream includes 32,313 lbs/year of nitrogen; 6,849 lbs/year of phosphorus and 92,220 lbs/year of biological oxygen demand.

Biological Oxygen Demand (BOD) LOAD (TONS / YEAR)	
Land Use	BOD Load
Urban	49,520.6
Cropland	34,896.8
Pastureland	6,275.5
Forest	534.3
Septic	992.7
TOTAL BOD LOAD	92,219.9

** Calculations based on the STEPL load reduction program.*

Goals

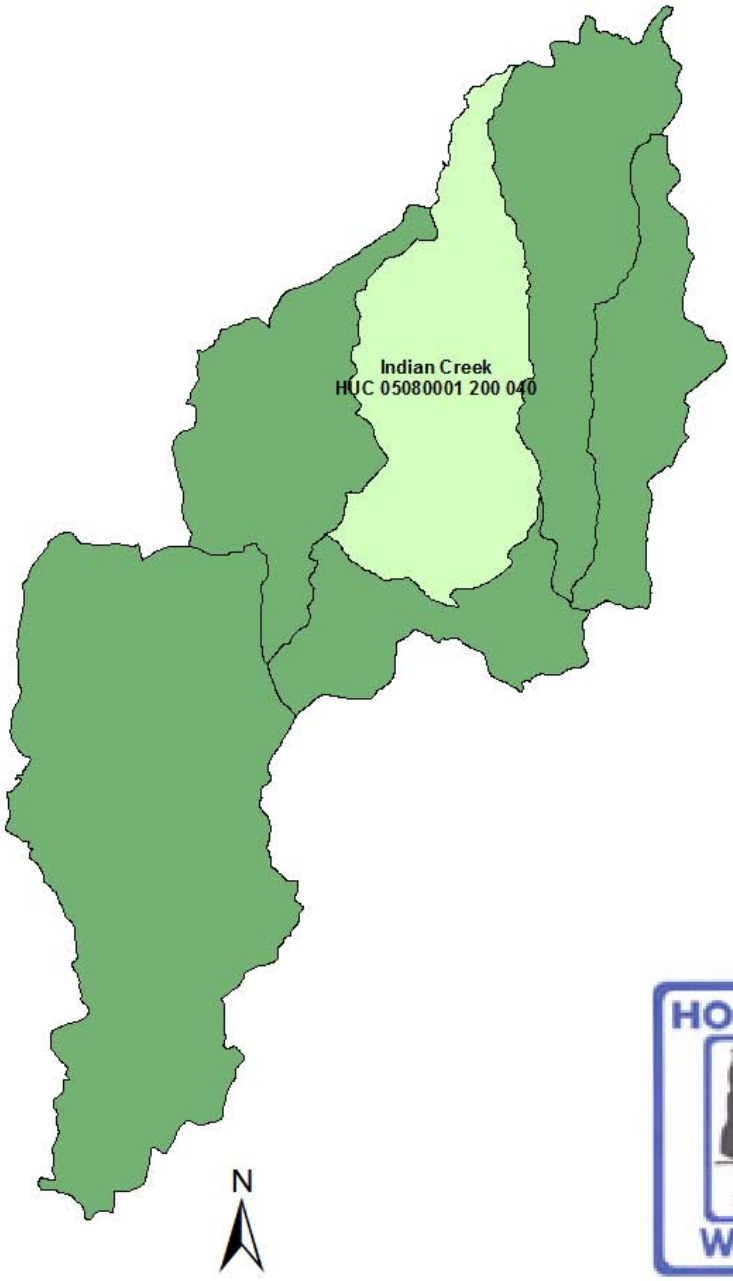
10. Complete and obtain approval of Clark Countywide HSTS plans to identify needed sewage treatment upgrades and their locations.
11. Upgrade at least 25% of those identified failing HSTS in the Honey Creek Subwatershed.
12. Livestock pathogen reductions (see previous section goals).
13. Educate watershed residents on the proper maintenance of HSTS
14. Educate watershed residents on drinking water protection.

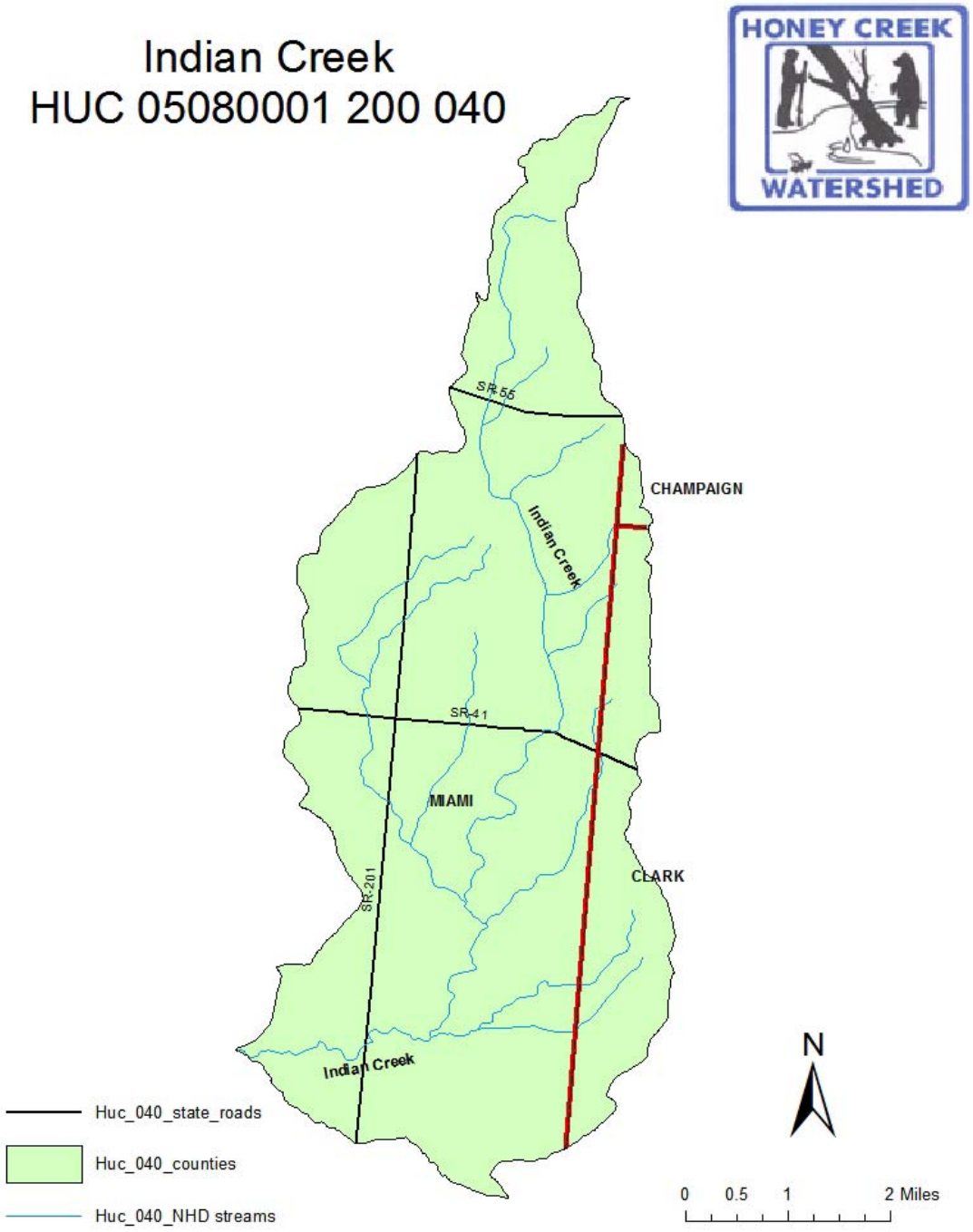
Table 34
Action Plan for Pathogen Reduction in
Honey Creek Subwatershed

Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce organic enrichment & pathogen/bacterial sources of pollution from HSTS. Reduce BOD load at least by 25% (34,448 tons/year) Locate 100% of HSTS and determine discharge status. Upgrade at least 20 failing HSTS.	$10,000 for data gathering and completing the plan. **OEPA** – DEFA Program **Local Health Depts.** – funds for inventory & write plan	Work with the local health departments to complete the HSTS inventory, which identifies the failing systems in the subwatershed. The plan will also identify the needs and types of systems necessary to correct the problem sites. The county-wide plan will also include an operation and maintenance program for the counties. Work with the Miami County Health Department in establishing a low interest loan program for HSTS upgrades through OEPA-DEFA.	Approved County-wide HSTS plan by OEPA & Champaign & Clark Health Board. Number of on site septic systems upgraded/replaced. Load reductions will be calculated using the Region 5 Model and STEPL program.	Jan. 2008 – 2017.

Educate watershed residents on proper on site septic system maintenance.	**Local Health Depts.** **HCWA** – watershed coordinator **ONDR,DSWC -** Watershed Awareness to Watershed Action (WAWA) mini-grants	Host workshop for watershed residents on proper on site septic system maintenance. Create handouts promoting HSTS pumping and management. Implement two experimental HSTS locations	Number of workshop attendants. Number of handouts distributed. Two sites implemented	Jan. 2008 – 2017.
Educate watershed residents on drinking water from wells	**Local Health Depts.** **HCWA** – watershed coordinator **ODNR,DSWC** - District staff **Various Grants**	Implement a "Test Your Well" program in Clark, and Miami Counties annually	Number of program participants	Jan 2008 – Dec 2017

Indian Creek
HUC 05080001 200 040




Indian Creek
HUC 05080001 200 040
HONEY CREEK
WATERSHED
SR-55
CHAMPAIGN
Indian Creek
SR-41
MIAMI
CLARK
SR-201
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Indian Creek Subwatershed
HUC 050800001 200 040

The Indian Creek Subwatershed encompasses 16,399 acres in Champaign (Jackson Township), Clark (Pike Township), and Miami (Bethel, Elizabeth, Lost Creek Townships) counties. The total drainage area is 25.6 square miles (18% of the total watershed project area). The main stem is 5.5 miles with an average fall of 26.4 feet/mile. The Indian Creek subwatershed is the largest subwatershed in the HCWA project area (excluding the GMR subwatershed).

The Indian Creek Subwatershed contains approximately 32 miles of total stream length including the main stem and tributaries. There are 23 miles of that channelized and 41 miles (includes both sides of the stream) that has less that 30 linear feet of buffer between the present land use. The only named tributaries are Dry Creek located in the western part of the subwatershed and McNeal Ditch located in the southeastern part of the subwatershed. The main stem of Dry Creek is 1.7 miles and drains 7.78 square miles. The average fall is 21.7 feet/mile.

Indian Creek at Walnut Grove-Clark County Road, Miami County

The dominant land use is agriculture (61%). The main stem and unnamed tributaries are mainly channelized (72%) for agricultural reasons. There is one county maintained ditch, Harwood Ditch, on Indian Creek that is approximately 2400 feet. This ditch is located in Lost Creek Township, Miami County. Water quality in these channelized areas show drastic impacts from non-point source pollution. There are 2,474 acres of hydric soils (15% of the total subwatershed) and 1,656 acres of Highly Erodible Land (10.1%). This subwatershed also has the largest number of animal units (1,535 A.U.) and has the largest number of agriculture acres in the project area. The largest portion of this subwatershed is located in the Rural Historical District, Elizabeth Township. One of the goals of Elizabeth Township Trustees is preserving the rich farmland within their township. Elizabeth Township was the first Rural Historical District in the State of Ohio.

This subwatershed is also impacted by failing HSTS, especially in concentrated areas along State Route 41, Alcony, Ohio, Alcony Conover Road within Alcony, Ohio, Mill, Marshall, Lehman, Adams, and Sanders Roads in Miami County. There are 379 HSTS; however, this number is an estimate. The HSTS in Champaign and Clark Counties have not been inventoried. The estimated number of HSTS for Clark County within the Honey Creek / GMR watershed was derived from the Clark County Health

Department by counting the occupied parcels on each road using GIS. The total number of confirmed HSTS and discharging systems was derived through records searched of each road. Areas that are served by New Carlisle sanitary sewer were not included. The number of HSTS in Miami County was determined from a detailed inventory and GIS.

Also, this subwatershed has abundant functioning wetlands (523 acres/3% of the total subwatershed), which help filter out excess nutrients and aid in flood control, as well, as provide habitat for a large variety of flora and fauna. Silver Lake Beach Club is located in the southeastern portion of the subwatershed on South Scarff Road, New Carlisle. This recreation center has been serving the community for the last 42 years. Their recreational facilities offer picnic grounds, 20 acre spring fed lake, swimming beach and many other recreational activities ideal for family reunions, church groups, company picnics, and any large groups. They are also open to the general public. The facilities are also surrounded by exceptional quality wetlands.

The OEPA use designation for the main stem is warmwater habitat (OAC 3745-1, Table 21-1); however, more OEPA data needs to be done to completely assess the entire subwatershed. Priorities of the HCWA in this subwatershed include: Increasing the amount of riparian corridor, preserving farmland, preserving / restoring wetlands, repairing faulty HSTS and reducing sedimentation, organic enrichment, and pathogen levels from unrestricted livestock and feedlots.

Below are strategies highlighted by the HCWA as the top implementation priorities and will be addressed first as funding becomes available. However, there are additional implementation strategies listed in the watershed action plan that will be addressed as well for each subwatershed, but are not top priorities of the HCWA.

HCWA Top Priorities for Local Implementation Actions in Indian Creek

Water Quality Restoration Potential = ***HIGH***

- Gather surface water quality data to identify specific water quality pollution problems
- Reduce sedimentation and nutrient run off from agricultural fields through best management practices
- Reduce sedimentation and nutrient run off by implementing proper streambank restoration methods
- Locate 100% of HSTS and determine discharge status
- Inventory livestock and develop comprehensive manure nutrient management plans for 75% of livestock producers

Impairments in this subwatershed include:

- Channelization & lack of riparian buffer areas
- Sedimentation
- Pathogens

LAND USE

Land Use	Percent	Acres
Urban	9%	1,414
Forest	22%	3,647
Pasture	5%	806
Woody Wetlands	3%	523
Cropland	61%	9,997

Total Acres = 16,387 (Data provided by 1994 land use maps from ODNR)

Indian Creek Subwatershed
HUC 050800001 200 040

IMPAIRMENT: NUTRIENTS & SEDIMENT

Background

There has not been any biological / chemical sampling done in this subwatershed by Ohio EPA so the sources of impairment have been determined by best professional judgment from the HCWA advisory committee. Cropland production and pastureland have been identified as sources of impairment.

Problem Statement

According to land use calculations cropland makes up 61% or 9,997 acres of the total land use. Pastureland makes up 5% or 806 acres of land use. The source of sediment is land runoff and livestock in the stream. According to the STEPL loading program, there is an estimated sediment loss of 6,710 tons/year from urban, cropland, pastureland, and forest. The sediment amount in tons/year is 21% of all the sediment impairing the entire watershed. This is the highest sediment load of all the subwatersheds in the project area.

The highest source of sediment and nutrients come from extensive row-crop agriculture (96%). This problem is intensified by a partial lack of riparian buffers. A slight amount comes from urban and pastureland. More data needs to be collected to see the impact of livestock in the subwatershed and whether or not they are contributing additional nutrients. Nutrients and sediment enter the stream from runoff events during heavy rain, leaching through the soil, and improper application of pesticides and fertilizer, including manure. The subwatershed currently has 216,188 linear feet (63%) of streambank with less than 30 feet of riparian buffer. A riparian buffer is extremely important in preventing excess nutrients such as nitrogen and phosphorus and sediment from entering the stream. Riparian buffer establishment and proper pesticide and fertilizer application will be implemented in this subwatershed.

Known pollutant loads within this segment of stream includes 62,025 lbs/year of nitrogen; 14,500 lbs/year of phosphorus and 146,201 lbs/year of biological oxygen demand.

SEDIMENT LOAD (TONS / YEAR)

Land Use	Sediment Load
Urban	174.4
Cropland	6,416.9
Pastureland	85.5
Forest	33.2
TOTAL SEDIMENT LOAD	6,710

** Calculations based on the STEPL load reduction program.*

Goals

1. Reduce sedimentation, pesticides, herbicides nutrients and other non-point source pollutants from agricultural & urban land areas by at least by 50%.
2. Promote the establishment of riparian buffers. Restore at least 54,047 linear feet (25%) of streambank.
3. Create a livestock inventory for Champaign & Clark County and update Miami County's livestock inventory within the subwatershed.
4. Preserve / Restore existing wetlands within the subwatershed.
5. Promote farmland preservation within the subwatershed.
6. Promote education of proper pesticide and fertilizer, including manure applications to improve water quality.

Table 35
Action Plan for Nutrient and Sediment Reduction in
Indian Creek Subwatershed

Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce sedimentation and nutrient run off from agricultural fields through promoting conservation tillage, crop rotation and establishment of filter strips, grassed waterways, field borders & riparian buffers. Reduce nitrogen and phosphorus load at least by 25% (15,506 tons/ year for N; 3,625 tons/year for P)and sediment load at least by 50% (3,355 tons/year) Promote grid soil sampling and precision application of fertilizers, pesticides and herbicides.	**USDA, NRCS** – CRP; CSP; EQIP **Miami Conservancy District (MCD)** – Water Quality Credit Trading Program **Miami County Pheasants Forever** – CSP **ODNR,DSWC** – Agricultural Pollution Abatement Cost-Share Program	Work in conjunction with Champaign, Clark, and Miami SWCD/NRCS to promote streamside buffers through USDA and MCD programs on agricultural lands Submit newspaper and newsletter articles advertising the benefits of riparian buffers Target landowners and operators who farm HEL land Educate watershed residents on proper lawn care.	Acres of agricultural lands enrolled in conservation programs. Newsletters produced and number of articles appearing in local newspapers. Load reductions will be calculated using the Region 5 Model and STEPL program. Sediment reduction of approximately 15,506 tons/year; nitrogen reduction of approximately, 3,625 tons/year; and phosphorus reduction of approximately 3,355 tons/year.	Jan. 2008 – Dec 2017
Promote & educate watershed residents on farmland preservation.	**Clean Ohio Fund** – farmland preservation	Work in conjunction with Champaign, Clark, and Miami SWCD/NRCS & local townships to promote farmland preservation of	Number of acres of farmland in the farmland preservation program.	Jan. 2008 – Dec 2017

		agricultural lands.		
Reduce sedimentation from riparian land areas by promoting protection of riparian buffers and proper streambank restoration methods improving instream habitat. Restore at least 25% of streambank.	**Miami Conservancy District** – Water Quality Credit Trading Program **OEPA** – 401 mitigation list **OEPA –** 319 funding **ODNR,DSWC –** Agricultural Pollution Abatement Cost-Share Program	Work with Clark, Champaign and Miami SWCD/NRCS to identify riparian landowners with eroded streambank issues. Establish one demonstration site along Indian Creek utilizing bioengineering erosion control and natural channel design methods and natural stream channel design	Create mailing list targeting streamside landowners to receive educational materials. Linear feet of streambank restored and protected. Improved QHEI scores. Load reductions will be calculated using the Region 5 Model.	Jan. 2008 – Dec 2017.
Promote the conservation and restoration of wetlands. Restore and preserve at least 25% of the existing wetlands in the Indian Creek subwatershed.	**HCWA** – Watershed Coordinator **WH Greenways** - Volunteers **BW Greenways** – Volunteers **MCPD** – Director **USDA,NRCS** – WRP **US Fish & Wildlife** – grants **OEPA** – 401 mitigation clearing house	Determine willing sellers of significant wetlands. Establish an educational workshop about the importance of wetlands. Submit newspaper and newsletter articles advertising the benefits of wetlands.	Database created of landowners with significant Honey Creek wetlands. Number of workshop attendants. Newsletters produced and number of articles appearing in local newspapers. Number of wetland acres preserved / restored.	Jan 2008 – Jan 2009 Jan 2008 – Dec 2017 Jan 2008 – Dec 2017
Create a livestock inventory for Champaign & Clark County and update Miami County's Livestock Inventory.	**ODNR, DSWC** – District Staff **HCWA –** Watershed Coordinator	Work with Champaign, Clark, and Miami SWCD/NRCS to gather livestock numbers, including horse numbers.	Livestock Inventory completed for Clark County and Miami Co. is updated.	Jan 2008 – Dec 2017 .
Develop comprehensive	**ODNR, DSWC** – District Staff	CMNPs are required for farmers to participate in	75% of livestock producers has	Jan 2008 – Dec 2017

manure nutrient management plans for each livestock operation not permitted by Ohio EPA	**USDA, NRCS** - staff	government programs.	CMNPs.	
Target livestock producers in the subwatershed where livestock has been identified to have access to the stream. Work with the producer to install fencing and alternative drinking water sources.	**USDA, NRCS** – EQIP, CRP **OEPA –** 319 funding	Work with Champaign, Clark, and Miami SWCD/NRCS to identify livestock that has access to the stream.	Document miles of streambank fencing installed along with acreage of riparian area protected. Load reductions will be calculated using Region 5 Model.	Jan 2008 – Dec 2017
Continue to survey all the streams in the subwatershed by Rosgen Channel Type and QHEI / HHEI.	**HCWA** – Watershed Coordinator **ONDR,DSWC** - staff	Drive watershed, stopping at each stream crossing to determine channel type	All streams are categorized by Rosgen Channel Type and QHEI / HHEI	Jan 2008 – Dec 2017
Educate the public and local officials on proper channel design and the advantages of natural channels with floodplains.	**HCWA** – Watershed Coordinator **ONDR,DSWC** – District Staff **ONDR,DSWC** - Watershed Awareness to Watershed Action (WAWA) mini-grants	Hold an education/informational workshop once a year on stream geomorphology.	One workshop held each year.	Jan 2008 – Dec 2017
Implement the use of proper storage and containment of farm chemicals.	**ONDR,DSWC** – District Staff **OSUE** – staff **USDA, NRCS** – EQIP	Farmers are encouraged to take advantage of EQIP funds for proper chemical storage	Three new chemical containment facilities built each year in the Honey Creek Watershed	Jan 2008 – Dec 2017
Implement the use of integrated pest management.	**ONDR,DSWC** – District Staff **OSUE** – staff **USDA, NRCS** – EQIP	Integrated pest management is discussed with farmers as part of their conservation planning	Integrated pest management is discussed as part of 100% of new conservation plans.	Jan 2008 – Dec 2017

Listed below are best management practices implemented within the last five years in the Indian Creek Subwatershed.

Conservation Practice	Funding Source	14-Digit Subwatershed	# of Acres	County
Field Border	USDA, CRP	Indian Creek	3.1	Miami
Field Border	USDA, CRP	Indian Creek	4.3	Miami
Field Border	USDA, CRP	Indian Creek	2.7	Miami
Field Border	EQIP	Indian Creek	2.6	Miami
Field Border	USDA, CRP	Indian Creek	10.1	Miami
Field Border	USDA, CRP	Indian Creek	15	Miami
Field Border	USDA, CRP	Indian Creek	2.8	Miami
Field Border	USDA, CRP	Indian Creek	2.1	Miami
Field Border	USDA, CRP	Indian Creek	1.1	Miami
Field Border	USDA, CRP	Indian Creek	21.9	Miami
Field Border	USDA, CRP	Indian Creek	4.1	Miami
Field Border	USDA, CRP	Indian Creek	1.5	Miami
Filter Strip	USDA, CRP	Indian Creek	3.9	Miami
Filter Strip	USDA, CRP	Indian Creek	3.7	Miami
Filter Strip	USDA, CRP	Indian Creek	1.4	Miami
Grassed Waterway	USDA, CRP	Indian Creek	0.7	Miami
Heavy Use Pad	EQIP	Indian Creek	1 unit	Miami
Livestock Fencing	EQIP	Indian Creek	1 unit	Miami
Manure Storage	EQIP	Indian Creek	1 unit	Miami
Tree Planting	USDA, CRP	Indian Creek	1.3	Miami
Whole Field CRP	USDA, CRP	Indian Creek	13.9	Miami
Windbreak	USDA, CRP	Indian Creek	0.4	Miami

Indian Creek Subwatershed
HUC 050800001 200 040

IMPAIRMENT: Pathogens

Background

There has not been any biological / chemical sampling done in this subwatershed by Ohio EPA so the sources of impairment have been determined by best professional judgment from the HCWA advisory committee. In the Indian Creek Subwatershed malfunctioning household sewage treatment systems (HSTS) and unrestricted livestock in the streams contribute to the elevated levels of pathogens in this subwatershed.

Problem Statement

According to land use calculations urban/residential makes up 9% or 1,414 acres of the total land use. There is an estimated 393 home sewage treatment systems (HSTS) in the subwatershed. HSTS are known to fail in this subwatershed because of a slow permeability, slope and high clay content in the soil. Elevated levels of e-coli and fecal coliform has been found at Staley Road and Walnut Grove-Clark County Road through volunteer sampling and OEPA chemical analysis. This subwatershed is dominated by over 300 five acre or less plots, especially along Dayton- Brandt, Scarff, Walnut Grove-Clark County, Mill, Sanders, and New Carlisle Roads in Miami County. According to the Miami County Health Department, 379 of the 393 HSTS are located in Miami County. The average age of the systems is 24 years. Problem areas include: Mill Road / Marshall Road / Lehman Road/ Adams Road/ Sanders Road – 57 HSTS and Alcony – 41 HSTS.

There are 50 livestock operations (only Miami County numbers) in this subwatershed totaling of 1,885 animals (not animal units). Only two of the operations have CNMPs. There are 806 acres of pastureland. The Indian Creek subwatershed has the highest number of livestock, however; the data is incomplete without livestock numbers from Champaign and Clark Counties. Livestock manure contains several pollutants, including ammonia, nitrogen, phosphorus, bacteria and nitrate nitrogen. These pollutants can harm the aquatic environment, cause water quality problems in streams and ponds and contaminate drinking water supplies. By improving these operations there will be a reduction in nutrient loadings, pathogens and sediment runoff. This will be accomplished by restricting livestock access to the stream, improving pasture management, encouraging alternative drinking water sources, and reducing runoff from feedlots.

Livestock Numbers in Indian Creek Subwatershed

Livestock Animals	Number	Animal Units*
Beef Cattle	287	287
Dairy Cattle	393	550
Swine (Hogs)	1,070	428
Goats / Sheep	0	0
Horses	135	270
Chickens	0	0
TOTAL	**1,885**	**1,535**

*** Animal Units – The number of animals of various size and species which are equivalent to one slaughter or feeder beef with regard to daily waste production. Multiply the following to the actual number of animals: A) 1.0 slaughter and feeder cattle; b) 1.4 Mature dairy cattle; c) 0.4 swine weighing over 55lbs.; d) 0.01 laying hens or broilers; e) 2.0 Horses; f) 0.1 - sheep/goats
Source: Animal Waste Pollution Abatement Rules; ODNR

Below is the data collected from the HCWA Watershed Coordinator from November 2004 - July 2005. In 2004, the HCWA received funding in the amount of $20,694.50 from OEPA for water sampling and analysis. The analysis was conducted at the OEPA water quality analysis lab in Columbus, Ohio.

Indian Creek, RM 1.41						
	11/9/2004	12/14/2004	2/9/2005	3/23/2005	5/3/2005	7/27/2005
DO (mg/L)	7.38	10.46	12.34	14.82	11.19	7.35
pH	7.28	6.54	7.75	7.54	7.45	7.81
Temperature C	9.1	4.6	5.6	6.3	8.5	20.9
BOD5 (mg/L)	<2.0	<2.0	2.8	<2.0	<2.0	<2.0
TSS (mg/L)	<5	<5	124	<5	<5	<5
E.coli (#/100mL)	70	50	9000	10	160	180
Fecal Coliform (#/100mL)	10	240	782	<10	360	420
Ammonia (mg/L)	<0.05	<0.05	0.112	<0.05	0.057	<0.05
Nitrate+Nitrite (mg/L)	3.78	4.86	3.73	4.04	5.02	4.77
TKN (mg/L)	<0.2	0.29	2.33	<0.2	0.26	0.38
TP (mg/L)	0.012	<0.01	0.398	<0.01	0.016	0.019
Dry Creek, RM 1.18						
	11/9/2004	12/14/2004	2/9/2005	3/23/2005	5/3/2005	7/27/2005
DO (mg/L)	14.13	16.75	10.33	12.52	13.72	3.89
pH	7.12	6.48	6.1	7.03	7.67	7.51
Temperature C	6.7	1.1	4.9	5	8.3	23.4
BOD5 (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0	2.2

TSS (mg/L)	<5	<5	12	7	<5	6
E.coli (#/100mL)	3300		6000	9	60	180
Fecal Coliform (#/100mL)	3300		800	440	330	260
Ammonia (mg/L)	<0.05	<0.05	0.185	0.072	<0.05	0.057
Nitrate+Nitrite (mg/L)	1.76	6.24	6.52	5.35	6.6	9
TKN (mg/L)	0.2	0.44	1.42	0.48	0.41	0.75
TP (mg/L)	0.061	0.043	0.248	0.028	0.019	0.274
Standards						
DO (mg/L)	5	5	5	5	5	5
pH	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
E.coli (#/100mL)	126	126	126	126	126	126
Fecal Coliform (#/100mL)	1,000	1,000	1,000	1,000	1,000	1,000
Nitrate+Nitrite (mg/L)	10	10	10	10	10	10

Known pollutant loads within this segment of stream includes 62,025 lbs/year of nitrogen; 14,500 lbs/year of phosphorus and 146,201 lbs/year of biological oxygen demand.

Biological Oxygen Demand (BOD) LOAD (TONS / YEAR)

Land Use	BOD Load
Urban	29,203.9
Cropland	102,645.8
Pastureland	11,613.5
Forest	1,775.8
Septic	962.2
TOTAL BOD LOAD	146,201.3

** Calculations based on the STEPL load reduction program.*

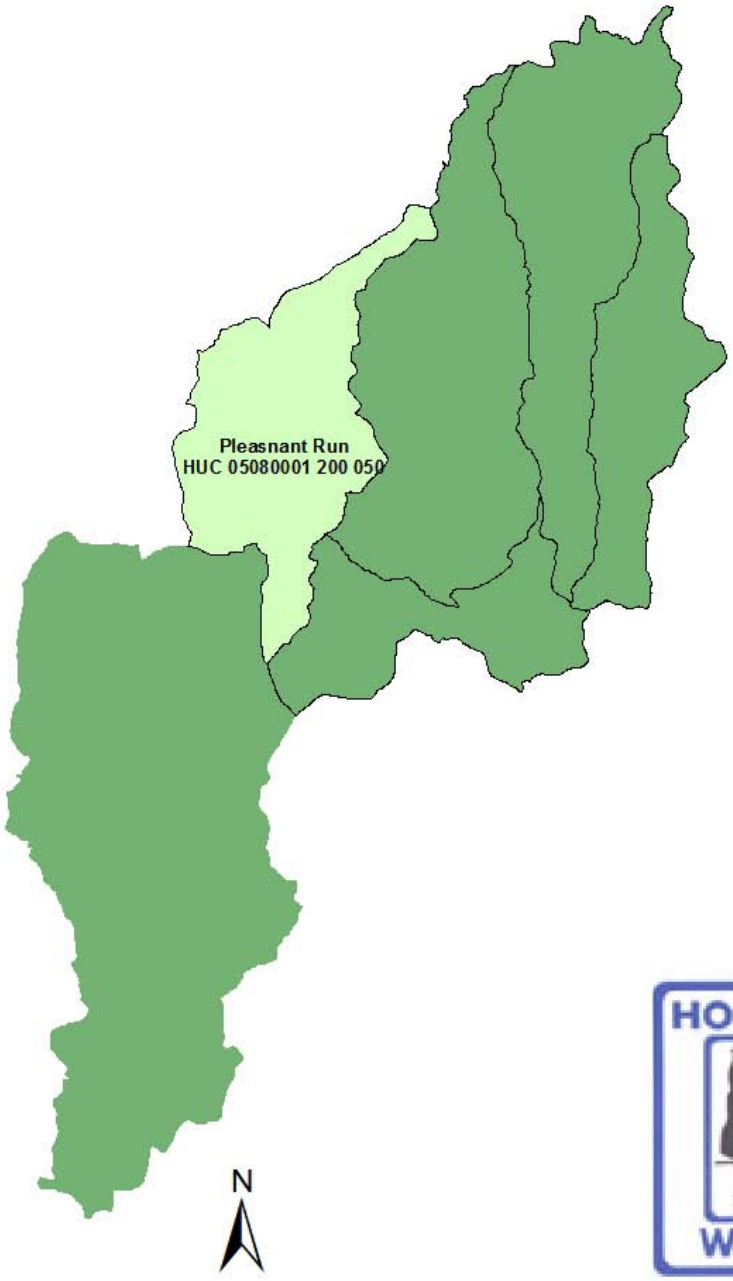
Goals

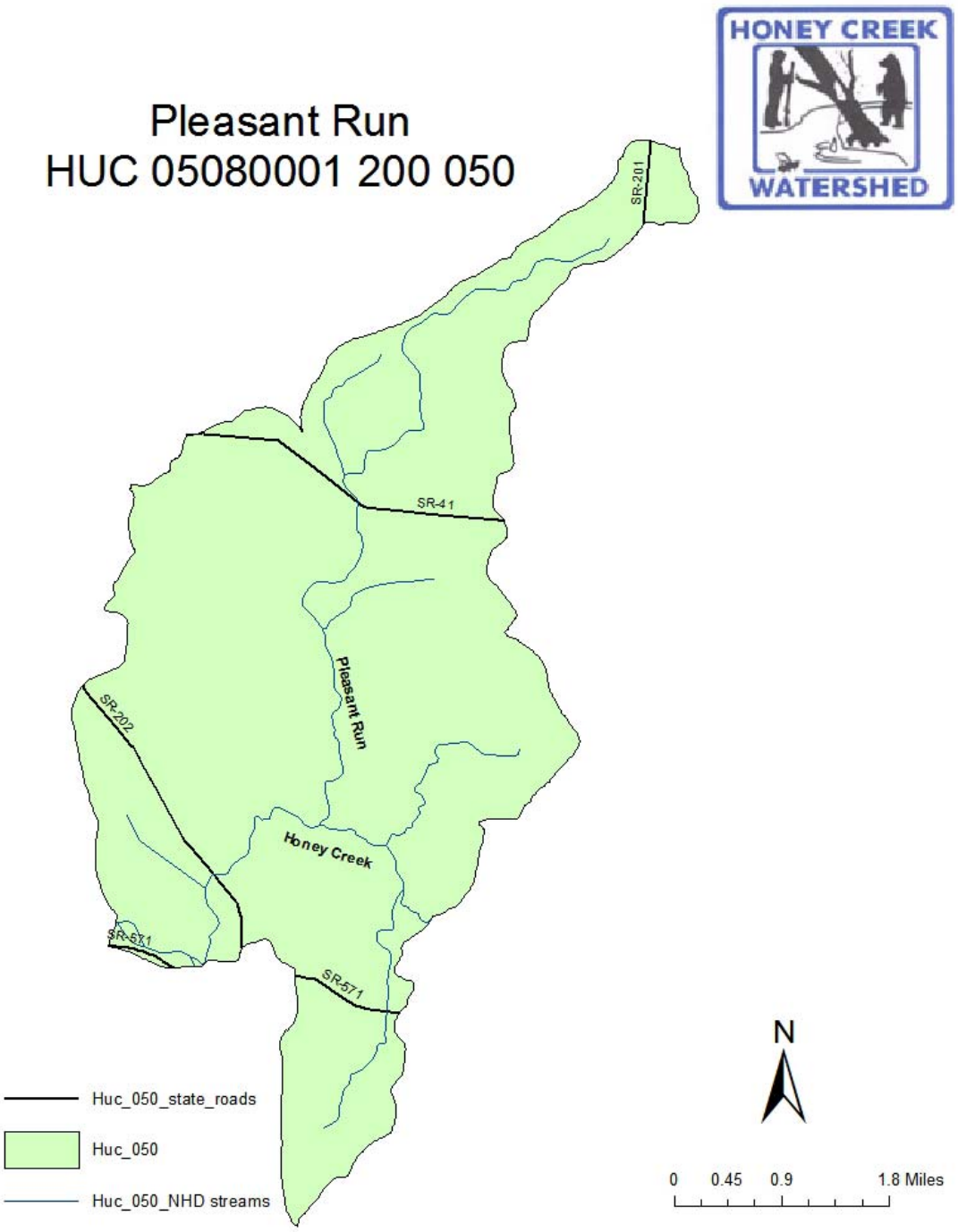
7. Complete and obtain approval of Champaign & Clark Countywide HSTS plans to identify needed sewage treatment upgrades and their locations.
8. Upgrade at least 25% of those identified failing HSTS in the Indian Creek Subwatershed.
9. Livestock pathogen reductions (see previous section goals).
10. Educate watershed residents on the proper maintenance of HSTS.
11. Educate watershed residents on drinking water protection.

Table 36
Action Plan for Pathogen Reduction in Indian Creek Subwatershed

Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce organic enrichment & pathogen/bacterial sources of pollution from HSTS. Reduce BOD load at least by 25% (36,550 tons/year) Locate 100% of HSTS and determine discharge status. Upgrade at least 20 failing HSTS.	$10,000 for data gathering and completing the plan. **OEPA** – DEFA Program **Local Health Depts.** – funds for inventory & write plan	Work with the local health departments to complete the HSTS inventory, which identifies the failing systems in the subwatershed. The plan will also identify the needs and types of systems necessary to correct the problem sites. The county-wide plan will also include an operation and maintenance program for the counties. Work with the Miami County Health Department in establishing a low interest loan program for HSTS upgrades through OEPA-DEFA.	Approved County-wide HSTS plan by OEPA & Champaign & Clark Health Board. Number of on site septic systems upgraded/replaced. Load reductions will be calculated using the Region 5 Model and STEPL program.	Jan. 2008 – 2017.
Educate watershed residents on proper on site septic system maintenance.	**Local Health Depts.** **HCWA** – watershed coordinator **ONDR,DSWC** - Watershed Awareness to Watershed Action (WAWA) mini-grants	Host workshop for watershed residents on proper on site septic system maintenance. Create handouts promoting HSTS pumping and management. Implement two experimental HSTS locations	Number of workshop attendants. Number of handouts distributed. Two sites implemented	Jan. 2008 – 2017.
Educate watershed residents on drinking water from wells	**Local Health Depts.** **HCWA** – watershed coordinator **ODNR,DSWC** - District staff **Various grants**	Implement a "Test Your Well" program in Clark, and Miami Counties annually	Number of program participants	Jan 2008 – Dec 2017

Pleasant Run
HUC 05080001 200 050




Pleasant Run
HUC 05080001 200 050
HONEY CREEK
WATERSHED
SR-201
SR-41
SR-202
Pleasant Run
Honey Creek
SR-571
SR-571
N
Huc_050_state_roads
Huc_050
Huc_050_NHD streams
0 0.45 0.9 1.8 Miles

Pleasant Run Subwatershed
HUC 050800001 200 050

The Pleasant Run Subwatershed encompasses 12,183 acres all in Miami (Bethel & Elizabeth, Townships) county. The total drainage area is 19 square miles (13% of the total watershed project area). The main stem of Pleasant Run is 5.3 miles with an average fall of 30.2 feet/mile. This subwatershed also includes part of the Honey Creek (RM 0.0-3.68).

The Pleasant Run Subwatershed contains approximately 15 miles of total stream length including the main stem and tributaries. There are 9 miles of that channelized and 17 miles (includes both sides of the stream) that has less that 30 linear feet of buffer between the present land use. There are two county maintained ditches, Cottingham Ditch (6,000 linear feet) and Wauger Branch Ditch (2,400 linear feet), that enter the Honey Creek mainstem on the east side of State Route 202 in Bethel Township, Miami County.

The dominant land use is agriculture (67%). The main stem and unnamed tributaries are mainly channelized (62%) for agricultural reasons. Water quality in these channelized areas show drastic impacts from non-point source pollution. There are 1,467 acres of hydric soils (12% of the total subwatershed) and 1,437 acres of highly erodible land (10.9%). This subwatershed also has the second largest number of animal units (1,069 A.U.) and has the third largest number of agriculture acres in the project area.

This subwatershed is also impacted by failing HSTS, especially in concentrated areas along Shaggybark Road, Hickory Hollow Road, and Cedar Cove in Miami County. This subwatershed has the second highest number of HSTS. There are 516 HSTS located in this subwatershed. The number of HSTS in Miami County was determined from a detailed inventory and GIS.

There is not a use designation for Pleasant Run. Priorities of the HCWA in this subwatershed include: Increasing the amount of riparian corridor, preserving farmland, repairing faulty HSTS and reducing sedimentation, organic enrichment, and pathogen levels from unrestricted livestock and feedlots.

Below are strategies highlighted by the HCWA as the top implementation priorities and will be addressed first as funding becomes available. However, there are additional implementation strategies listed in the watershed action plan that will be addressed as well for each subwatershed, but are not top priorities of the HCWA.

HCWA Top Priorities for Local Implementation Actions in Pleasant Run

Water Quality Restoration Potential = *MEDIUM*

- Gather surface water quality data to identify specific water quality pollution problems
- Reduce sedimentation and nutrient run off from agricultural fields through best management practices
- Reduce sedimentation and nutrient run off by implementing proper streambank restoration methods
- Locate 100% of HSTS and determine discharge status
- Inventory livestock and develop comprehensive manure nutrient management plans for 75% of livestock producers

Impairments in this subwatershed include:

- Channelization & lack of riparian buffer areas
- Sedimentation
- Pathogens

LAND USE

Land Use	Percent	Acres
Urban	9%	1,414
Forest	22%	3,647
Pasture	5%	806
Woody Wetlands	3%	523
Cropland	61%	9,997

Total Acres = 16,387 (Data provided by 1994 land use maps from ODNR)

Historic old barn along Pleasant Run at Walnut Grove – Clark County Road, Miami County

Pleasant Run at Rudy Road, Miami County

Pleasant Run Subwatershed
HUC 050800001 200 050

IMPAIRMENT: NUTRIENTS & SEDIMENT

Background

There has not been any biological / chemical sampling done in this subwatershed by Ohio EPA so the sources of impairment have been determined by best professional judgment from the HCWA advisory committee. Cropland production and pastureland have been identified as sources of impairment.

Problem Statement

According to land use calculations cropland makes up 67% or 8,187 acres of the total land use. Pastureland makes up 16% or 1,981 acres of land use. The source of sediment is land runoff and livestock in the stream. According to the STEPL loading program, there is an estimated sediment loss of 5,981 tons/year from urban, cropland, pastureland, and forest. The sediment amount in tons/year is 18% of all the sediment impairing the entire watershed.

The highest source of sediment and nutrients come from extensive row-crop agriculture (95%). This problem is intensified by a partial lack of riparian buffers. A slight amount comes from urban and pastureland. More data needs to be collected to see the impact of livestock in the subwatershed and whether or not they are contributing additional nutrients. Nutrients and sediment enter the stream from runoff events during heavy rain, leaching through the soil, and improper application of pesticides and fertilizer, including manure. The subwatershed currently has 90,649 linear feet (55%) of streambank with less than 30 feet of riparian buffer. A riparian buffer is extremely important in preventing excess nutrients such as nitrogen and phosphorus and sediment from entering the stream. Riparian buffer establishment and proper pesticide and fertilizer application will be promoted in this subwatershed.

Known pollutant loads within this segment of stream includes 55,078.2 lbs/year of nitrogen; 12,424.5 lbs/year of phosphorus and 130,066.3 lbs/year of biological oxygen demand.

SEDIMENT LOAD (TONS / YEAR)

Land Use	Sediment Load
Urban	76.7
Cropland	5,666.5
Pastureland	226.5
Forest	11.5
TOTAL SEDIMENT LOAD	5,981.3

** Calculations based on the STEPL load reduction program.*

Goals

1. Reduce sedimentation, pesticides, herbicides nutrients and other non-point source pollutants from agricultural & urban land areas at least by 50%.
2. Promote the establishment of riparian buffers. Restore at least 22,662 linear feet (25%) of streambank.
3. Update Miami County's livestock inventory within the subwatershed.
4. Promote farmland preservation within the subwatershed.
5. Promote education of proper pesticide and fertilizer, including manure applications to improve water quality.

Table 37
Action Plan for Nutrient and Sediment Reduction in Pleasant Run Subwatershed

Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce sedimentation and nutrient run off from agricultural fields through promoting conservation tillage, crop rotation and establishment of filter strips, grassed waterways, field borders & riparian buffers. Reduce nitrogen and phosphorus load at least by 25% (13,770 tons/ year for N; 3,106 tons/year for P)and sediment load at least by 50% (2,991 tons/year) Promote grid soil sampling and precision application of fertilizers, pesticides and herbicides.	**USDA, NRCS** – CRP; CSP; EQIP **Miami Conservancy District (MCD)** – Water Quality Credit Trading Program **Miami County Pheasants Forever** – CSP **ODNR,DSWC** – Agricultural Pollution Abatement Cost-Share Program	Work in conjunction with Miami SWCD/NRCS to promote streamside buffers through USDA and MCD programs on agricultural lands Submit newspaper and newsletter articles advertising the benefits of riparian buffers Target landowners and operators who farm HEL land Educate watershed residents on proper lawn care.	Acres of agricultural lands enrolled in conservation programs. Newsletters produced and number of articles appearing in local newspapers. Load reductions will be calculated using the Region 5 Model and STEPL program. Sediment reduction of approximately 13,770 tons/year; nitrogen reduction of approximately, 3,106 tons/year; and phosphorus reduction of approximately 2,991 tons/year.	Jan. 2008 – Dec 2017
Promote & educate watershed residents on farmland preservation.	**Clean Ohio Fund** – farmland preservation	Work with Miami SWCD/NRCS & local townships to promote farmland preservation of agricultural lands.	Number of acres of farmland in the farmland preservation program.	Jan. 2008 – Dec 2017
Reduce sedimentation from riparian land areas by	**Miami Conservancy District** –	Work Miami SWCD/NRCS to identify riparian landowners	Create mailing list targeting streamside	Jan. 2008 – Dec 2017.

promoting protection of riparian buffers and proper streambank restoration methods improving instream habitat. Restore at least 25% of streambank.	Water Quality Credit Trading Program **OEPA** – 401 mitigation list **OEPA –** 319 funding **ODNR,DSWC –** Agricultural Pollution Abatement Cost-Share Program	with eroded streambank issues. Establish one demonstration site along the Pleasant Run utilizing bioengineering erosion control and natural channel design methods and natural stream channel design	landowners to receive educational materials. Linear feet of streambank restored and protected. Improved QHEI scores. Load reductions will be calculated using the Region 5 Model.	
Update Miami County's Livestock Inventory.	**ODNR, DSWC** – District Staff **HCWA –** Watershed Coordinator	Work Miami SWCD/NRCS to gather livestock numbers, including horse numbers.	Livestock Inventory completed for Miami County.	Jan 2008 – Dec 2017 .
Develop comprehensive manure nutrient management plans for each livestock operation not permitted by Ohio EPA	**ODNR, DSWC** – District Staff **USDA, NRCS** - staff	CMNPs are required for farmers to participate in government programs.	75% of livestock producers has CMNPs.	Jan 2008 – Dec 2017
Target livestock producers in the subwatershed where livestock has been identified to have access to the stream. Work with the producer to install fencing and alternative drinking water sources.	**USDA, NRCS** – EQIP, CRP **OEPA –** 319 funding	Work Miami SWCD/NRCS to identify livestock that has access to the stream.	Document miles of streambank fencing installed along with acreage of riparian area protected. Load reductions will be calculated using Region 5 Model.	Jan 2008 – Dec 2017
Continue to survey all the streams in the subwatershed by Rosgen Channel Type and QHEI / HHEI.	**HCWA** – Watershed Coordinator **ONDR,DSWC** - staff	Drive watershed, stopping at each stream crossing to determine channel type	All streams are categorized by Rosgen Channel Type and QHEI / HHEI	Jan 2008 – Dec 2017
Educate the public and local officials on proper channel design and the advantages of natural channels with floodplains.	**HCWA** – Watershed Coordinator **ONDR,DSWC** – District Staff **ONDR,DSWC -** Watershed Awareness to Watershed	Hold an education/informational workshop once a year on stream geomorphology.	One workshop held each year.	Jan 2008 – Dec 2017

	Action (WAWA) mini-grants			
Implement the use of proper storage and containment of farm chemicals.	**ONDR,DSWC** – District Staff **OSUE** – staff **USDA, NRCS** – EQIP	Farmers are encouraged to take advantage of EQIP funds for proper chemical storage	Three new chemical containment facilities built each year in the Honey Creek Watershed	Jan 2008 – Dec 2017
Implement the use of integrated pest management.	**ONDR,DSWC** – District Staff **OSUE** – staff **USDA, NRCS** – EQIP	Integrated pest management is discussed with farmers as part of their conservation planning	Integrated pest management is discussed as part of 100% of new conservation plans.	Jan 2008 – Dec 2017

Listed below are best management practices implemented within the last five years in the Pleasant Run Subwatershed.

Conservation Practice	Funding Source	14-Digit Subwatershed	# of Acres	County
Field Border	USDA, CRP	Pleasant Run	4	Miami
Field Border	USDA, CRP	Pleasant Run	4.5	Miami
Field Border	USDA, CRP	Pleasant Run	6.3	Miami
Grassed Waterway	USDA, CRP	Pleasant Run	0.8	Miami

Pleasant Run Subwatershed
HUC 050800001 200 050

IMPAIRMENT: Pathogens

Background

There has not been any biological / chemical sampling done in this subwatershed by Ohio EPA so the sources of impairment have been determined by best professional judgment from the HCWA advisory committee. In the Pleasant Run Subwatershed malfunctioning household sewage treatment systems (HSTS) and unrestricted livestock in the streams contribute to the elevated levels of pathogens in this subwatershed.

Problem Statement

According to land use calculations urban/residential makes up 5% or 621 acres of the total land use. There is an estimated 516 home sewage treatment systems (HSTS) in the subwatershed. The average age of the systems is 22 years. Problem areas include: Shaggybark Road / Hickory Hollow Road / Cedar Cove – 49 total HSTS. HSTS are known to fail in this subwatershed because of a slow permeability, slope and high clay content in the soil. There were elevated levels of e-coli found at Rudy Road through volunteer sampling and OEPA chemical analysis.

There are 37 livestock operations in this subwatershed totaling of 876 animals (not animal units). None of the operations have CNMPs. There are 1,981 acres of pastureland. The Pleasant Run Subwatershed has the second highest number of livestock. Livestock manure contains several pollutants, including ammonia, nitrogen, phosphorus, bacteria and nitrate nitrogen. These pollutants can harm the aquatic environment, cause water quality problems in streams and ponds and contaminate drinking water supplies. By improving these operations there will be a reduction in nutrient loadings, pathogens and sediment runoff. This will be accomplished by restricting livestock access to the stream, improving pasture management, encouraging alternative drinking water sources, and reducing runoff from feedlots.

Livestock Numbers in Pleasant Run Subwatershed

Livestock Animals	Number	Animal Units*
Beef Cattle	380	380
Dairy Cattle	359	503
Swine (Hogs)	55	22
Goats / Sheep	0	0
Horses	82	164
Chickens	0	0
TOTAL	**876**	**1,069**

*** Animal Units – The number of animals of various size and species which are equivalent to one slaughter or feeder beef with regard to daily waste production. Multiply the following to the actual number of animals: A) 1.0 slaughter and feeder cattle; b) 1.4 Mature dairy cattle; c) 0.4 swine weighing over 55lbs.; d) 0.01 laying hens or broilers; e) 2.0 Horses; f) 0.1 - sheep/goats
Source: Animal Waste Pollution Abatement Rules; ODNR

Below is the data collected from the HCWA Watershed Coordinator from November 2004 - July 2005. In 2004, the HCWA received funding in the amount of $20,694.50 from OEPA for water sampling and analysis. The analysis was conducted at the OEPA water quality analysis lab in Columbus, Ohio.

Pleasant Run, **RM 0.50**						
	11/9/2004	12/14/2004	2/9/2005	3/23/2005	5/3/2005	7/27/2005
DO (mg/L)	14.73	13.35	11.04	12.31	10.84	8.88
pH	7.17	6.75	6.84	7.22	7.38	7.98
Temperature C	6.4	1.1	5.2	5.2	7.7	22.2
BOD5 (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
TSS (mg/L)	<5	<5	5	6	<5	<5
E.coli (#/100mL)	250	60	230	20		180
Fecal Coliform (#/100mL)	310	210	130	260		420
Ammonia (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate+Nitrite (mg/L)	4.57	9.24	6.24	3.14	6.63	4.85
TKN (mg/L)	<0.2	0.54	1.01	0.36	0.26	<0.2
TP (mg/L)	<0.01	0.024	0.103	0.047	0.019	0.011
Standards						
DO (mg/L)	5	5	5	5	5	5
pH	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
E.coli (#/100mL)	126	126	126	126	126	126
Fecal Coliform (#/100mL)	1,000	1,000	1,000	1,000	1,000	1,000
Ammonia (mg/L)						
Nitrate+Nitrite (mg/L)	10	10	10	10	10	10

Known pollutant loads within this segment of stream includes 55,078.2 lbs/year of nitrogen; 12,424.5 lbs/year of phosphorus and 130,066.3 lbs/year of biological oxygen demand.

Biological Oxygen Demand (BOD) LOAD (TONS / YEAR)

Land Use	BOD Load
Urban	12,834.9
Cropland	86,694.6
Pastureland	28,649.1
Forest	577.7
Septic	1,310.1
TOTAL BOD LOAD	130,066.3

** Calculations based on the STEPL load reduction program.*

Goals

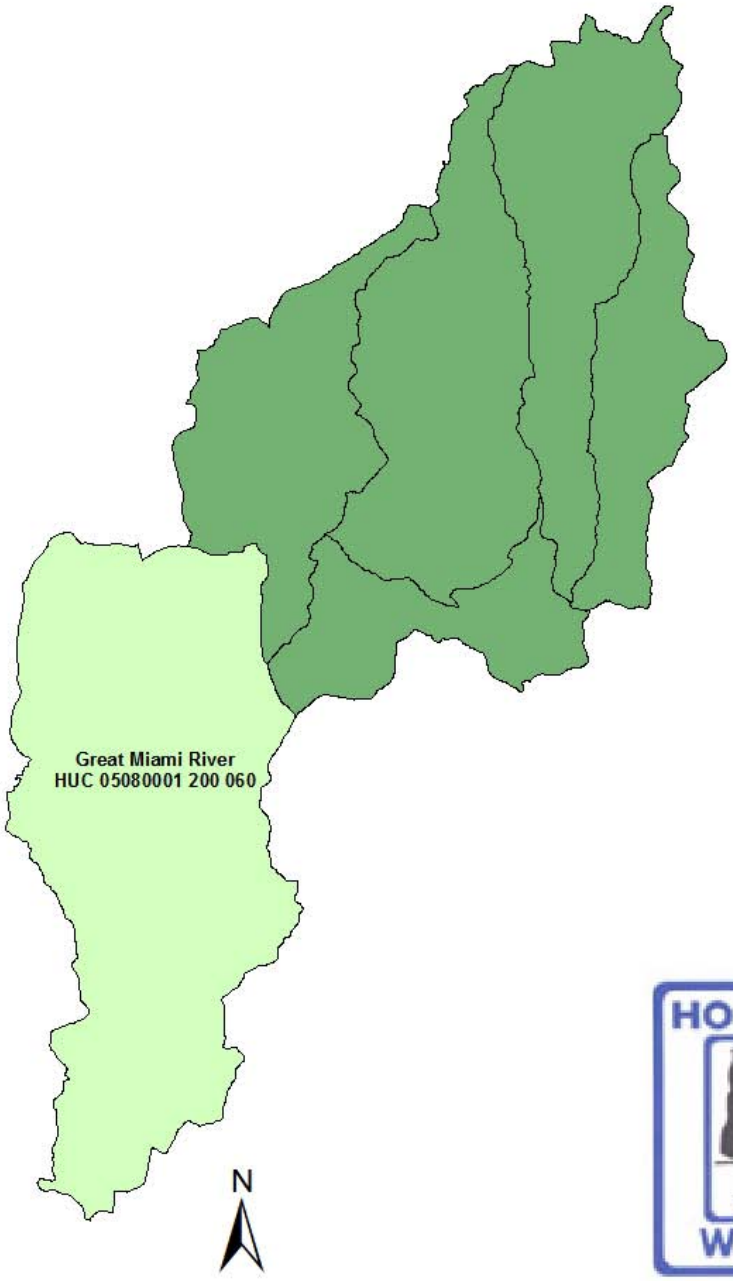
6. Upgrade at least 25% of those identified failing HSTS in the Pleasant Run Subwatershed.
7. Livestock pathogen reductions (see previous section goals).
8. Educate watershed residents on the proper maintenance of HSTS.
9. Educate watershed residents on drinking water protection.

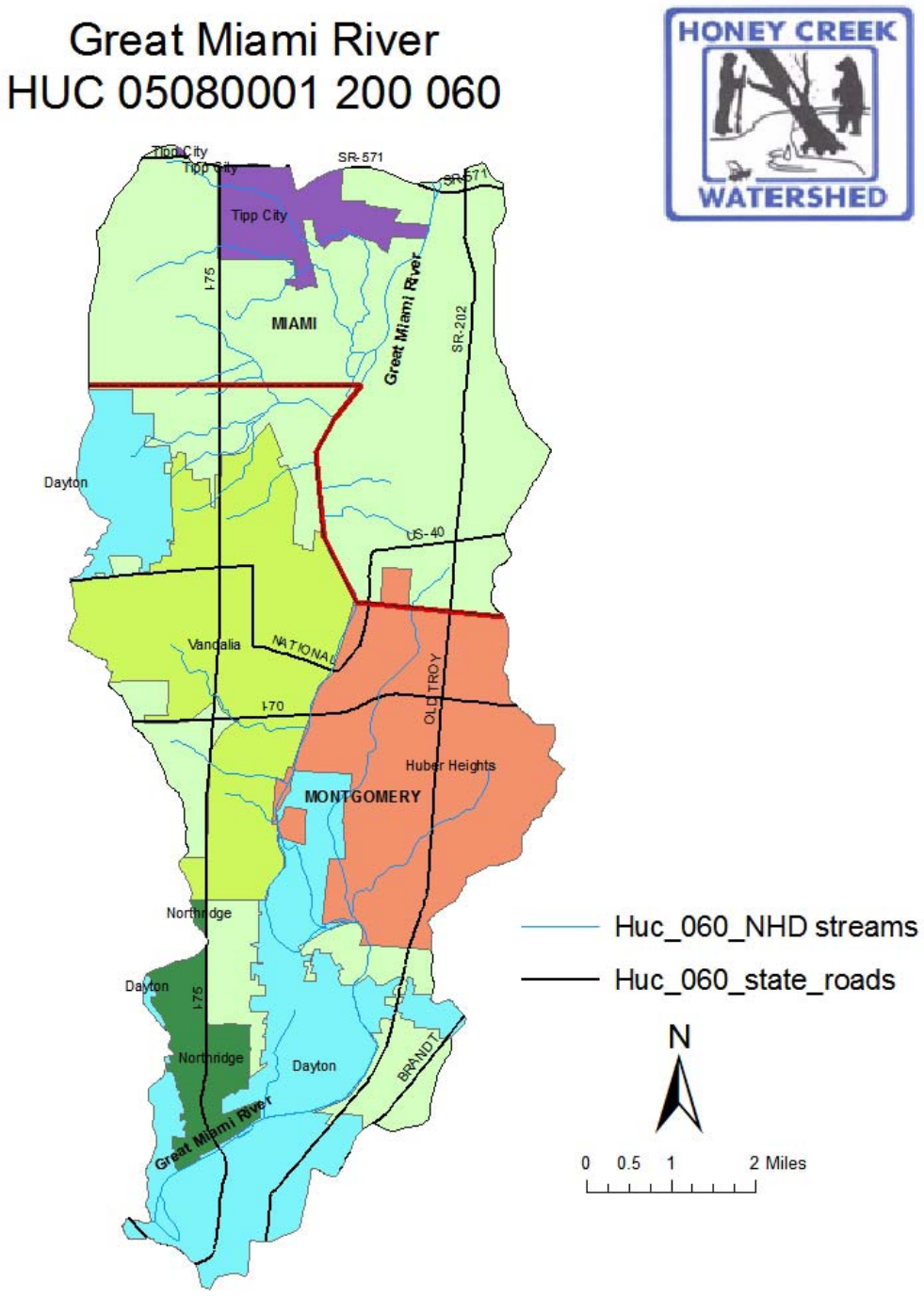
Table 38
Action Plan for Pathogen Reduction in
Pleasant Run Subwatershed

Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce organic enrichment & pathogen/bacterial sources of pollution from HSTS. Reduce BOD load at least by 25% (32,517 tons/year) Locate 100% of HSTS and determine discharge status. Upgrade at least 20 failing HSTS.	$10,000 for data gathering and completing the plan. **OEPA** – DEFA Program **Local Health Depts.** – funds for inventory & write plan	Work with the Miami County Health Department on locating failing HSTS and create an inventory. Work with the Miami County Health Department in establishing a low interest loan program for HSTS upgrades through OEPA-DEFA.	Number of on site septic systems upgraded/replaced. Load reductions will be calculated using the Region 5 Model and STEPL program.	Jan. 2008 – 2017.
Educate watershed residents on proper on site septic system	**Local Health Depts.**	Host workshop for watershed residents on proper on site septic	Number of workshop attendants.	Jan. 2008 – 2017.

maintenance.	**HCWA** – watershed coordinator **ONDR,DSWC** - Watershed Awareness to Watershed Action (WAWA) mini-grants	system maintenance. Create handouts promoting HSTS pumping and management. Implement two experimental HSTS locations	Number of handouts distributed. Two sites implemented	
Educate watershed residents on drinking water from wells	**Local Health Depts.** **HCWA** – watershed coordinator **ODNR,DSWC** - District staff **Various Grants**	Implement a "Test Your Well" program in Miami County annually	Number of program participants	Jan 2008 – Dec 2017

Great Miami River
HUC 05080001 200 060




Great Miami River
HUC 05080001 200 060
HONEY CREEK
WATERSHED
Tipp City
SR-571
I-75
MIAMI
Great Miami River
SR-202
Dayton
US-40
Vandalia
NATIONAL
I-70
OLD TROY
Huber Heights
MONTGOMERY
Northridge
Dayton
I-75
Northridge
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BRANDT
Great Miami River
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0 0.5 1 2 Miles

Great Miami River Subwatershed
HUC 050800001 200 060

The Great Miami River Subwatershed encompasses 34,104 acres in Miami (Monroe Township) and Montgomery (Butler and Harrison Townships) counties. The total drainage area is 53.3 square miles (37% of the total watershed project area). The main stem of Great Miami River is 20 miles with an average fall of 3.4 feet/mile. This subwatershed is the largest 14-digit HUC subwatershed in the Project Area. This subwatershed includes the Great Miami River from Tipp City to the City of Dayton before the Stillwater River empties into the Great Miami River (RM 81.2 - 99). The only named tributary in this subwatershed is Poplar Creek. The main stem is 3.1 miles with an average fall of 73.5 feet/mile. The total drainage area for Poplar Creek is 4.22 square miles and is located in the northwestern region of the Great Miami River Subwatershed.

The Great Miami River Subwatershed contains approximately 54 miles of total stream length including the main stem and tributaries. There are 17 miles of that channelized and 57 miles (includes both sides of the stream) that has less that 30 linear feet of buffer between the present land use. There is 5 miles that is levied and 5 miles that is dammed. These construction practices were implemented to prevent flooding in Dayton, Huber Heights, Vandalia, North Ridge and surrounding areas. Riparian buffers are restricted in these areas because of that prevention.

The dominant land use is urban/residential (57%). The main stem and unnamed tributaries are mainly channelized (50%) for urban reasons. Water quality in these channelized areas show drastic impacts from non-point source pollution, such as storm water drains and runoff from impervious services. There are 1,797 acres of hydric soils (5% of the total subwatershed) and 3,172 acres of highly erodible land (9.3%). Based on detailed 1990 Census Block data, nearly 80,000 people were recorded in this subwatershed with a density of nearly 1,500 people/square mile. Priorities of the HCWA will be the implementing storm water best management practices and low impact development strategies.

This subwatershed is also impacted by failing HSTS, especially in concentrated areas in Phoneton, Ohio and West Charleston, Ohio and along the following roads in Miami County: Coach Drive, Essex Drive, Sterling Court, Surrey Drive, Michaels Road, Kent Road, Kim Circle, Meadow Drive, Ginghamsburg-Frederick Road, Curtwood Drive, Kitrina Ave., Todd Court, Dean Circle, Burnside Drive, Windham Road, and Newbury Road. This subwatershed has the highest number of HSTS in the Project Area. There are 1,095 HSTS located in this subwatershed. The number of HSTS in Miami County was determined from a detailed inventory and GIS. However, the above data does not include HSTS in Montgomery County. A priority of the HCWA is to work with Montgomery Health Department to create an inventory of all HSTS and to work with both Miami and Montgomery Health Departments in upgrading failing HSTS.

Sanitary sewer service in the Great Miami River Subwatershed is provided by Tri-Cities North Regional Wastewater Authority, Montgomery County and the City of Dayton. Approximately, 51% of the subwatershed is currently served by sanitary sewer. The Tri-Cities North Regional Wastewater Treatment Plant, which serves Huber Heights, Tipp City and Vandalia is located in this subwatershed. The plant operates under an NPDES permit and discharges to the Great Miami River. There are three industrial facilities that are permitted to discharge to surface waters under NPDES, 189 registered underground storage tanks, 134 SARA sites, and 10 Ohio EPA's Master Sites List sites in this subwatershed. For more information on the above sites refer to the ***Potential Pollution Sources Section.***

The following tables list the aquatic life use attainment for applicable use designations (existing and recommended) in the Upper Great Miami River study area. Attainment status is based on data collected between June and October 1994 (OEPA 1996). All of the streams evaluated as part of the 1994 sampling effort are designated agricultural and industrial water supply, and primary contact recreation.

Use designations for water bodies in the Great Miami River drainage basin (Ohio Water Quality Standards - OAC 3745-1)

Water Body Segment	*Aquatic Life Habitat*	*Water Supply*	*Recreation*
Great Miami River (GMR)– CSX RR bridge (RM 84.5) to the Taylorsville dam (RM 92.6) +	EWH	AWS ; IWS	PCR
GMR – Taylorsville dam to Ross Rd. (RM 95.7) (*State Resource Water)* +	EWH	AWS ; IWS	PCR
GMR – Ross Rd. to the Troy dam (RM 107.0) +	EWH	AWS ; IWS	PCR
Poplar Creek +	WWH	AWS ; IWS	PCR

WWH = warmwater habitat; EWH = exceptional warmwater habitat; AWS = agricultural water supply; IWS = industrial water supply; PCR = primary contact recreation;
+ Designated use based on the results of a biological field assessment performed by the OEPA.
° Designated use based on the 1978 water quality standards

1994 Aquatic life use attainment for applicable use designations in the Upper Great Miami River (OEPA 1996). (Eastern Corn Belt Plain – WWH / EWH Use Designation (Existing / Recommended))

River Mile Fish/Invert.	IBI	Modified Iwb	ICI	QHEI	Attainment Status	Comment
98.7 / 100.8	57	10.4	52	77.0	FULL / FULL	SR 571
95.9 / 95.7	57	10.5	52	88.0	FULL / FULL	Ross Rd.
93.8 / - -	56	10.1	- -	78.0	(FULL / FULL)	Old Vandalia WWTP
91.0 / 91.1	54	10.5	56	68.0	FULL / FULL	Little York Rd.
87.3 / 87.7	54	10.2	52	80.5	FULL / FULL	Needmore
86.6 / 86.6	47	9.0	22	- -	N/A	MCD N Reg. Mixing Zone
85.0 / 85.9	56	10.1	38	72.0	FULL / PARTIAL	Dst. MCD N WWTP

Portions of the GMR sub-watershed were covered in each of the Ohio EPA assessments. The 1994 assessment includes the section from Honey Creek

(approximately RM 100) to just downstream of the Tri Cities North Regional WWTP (formerly the North Regional WWTP). The 1995 assessment includes the small stretch upstream of Steele Dam near Needmore Road, to just upstream of the confluence with the Stillwater River. The river attained the warmwater habitat (WWH) aquatic life use designation throughout the segments, with the exception of the Steel Dam impoundment, which only achieved partial attainment. The partial attainment in water impoundments is most often due to nutrient enrichment and marginal DO levels. The 2000 Ohio EPA 305 (b) list indicates the causes of impairment are flow alteration and other habitat alterations; and the source of impairment is dam construction.

Based on strong indications by both the fish and macroinvertebrate communities, a major recommendation of the Ohio EPA is to redesignate from WWH to EWH the GMR mainstem upstream of the Steel Dam impoundment stretch. With the exception of a 1.6 mile stretch downstream of the Tri Cities North Regional WWTP, the EWH was fully attained in 1994. The small partial attainment stretch misses the EWH cut off for invertebrate strength by a very small margin that should be attainable by continued improvement in pollution reduction. In fact, when the same stretch was reassessed as part of the 1995 assessment of the Middle and Lower GMR, full EWH attainment was recorded.

Fish and macroinvertebrate communities exhibited exceptional performance in all free-flowing stretches downstream from the Quincy Dam in Logan County to Dayton. This includes the entire length of the GMR in the Project Area. The high quality environmental conditions were attributed to both exceptional water quality as well as a predominance of high quality habitat.

An important conclusion drawn from both reports is that the mainstem GMR showed a remarkable improvement in water quality from earlier reports. In all cases, the marked improvement of the water quality is mainly attributed to reduction in point-source loads due to improvements at WWTP's.

Below are strategies highlighted by the HCWA as the top implementation priorities and will be addressed first as funding becomes available. However, there are additional implementation strategies listed in the watershed action plan that will be addressed as well for each subwatershed, but are not top priorities of the HCWA. This subwatershed was given a low water quality restoration potential by the HCWA Board of Directors because of other infrastructure already in place to protect water resources.

HCWA Top Priorities for Local Implementation Actions in Great Miami River

Water Quality Restoration Potential = *LOW*

- Gather surface water quality data to identify specific water quality pollution problems
- Reduce sedimentation and nutrient run off from agricultural fields through best management practices
- Reduce sedimentation and nutrient run off by implementing proper streambank restoration methods
- Locate 100% of HSTS and determine discharge status
- Educate watershed residents about storm water management and how it affects water quality

Impairments in this subwatershed include:

- Channelization & lack of riparian buffer areas
- Nutrients
- Sedimentation
- Pathogens

LAND USE

Land Use	Percent	Acres
Urban	57%	19,575
Forest	21%	7,183
Pasture	2%	665
Woody Wetlands	0.4%	146
Cropland	17%	5,809
Water	2%	726

Total Acres = 34,104 (Data provided by 1994 land use maps from ODNR)

Great Miami River Subwatershed
HUC 050800001 200 060

IMPAIRMENT: NUTRIENTS & SEDIMENT

Background

Based on biological sampling done in 1995, the Great Miami River Subwatershed from RM 81.2 – 99 is meeting exceptional warmwater habitat (EWH). With the exception of a 1.6 mile stretch downstream of the Tri Cities North Regional WWTP the EWH was fully attained. The following have been identified as sources of impairments in this subwatershed: runoff from impervious surfaces and construction/development sites.

Problem Statement

According to land use calculations urban/residential makes up 57% or 19,575 acres of the total land use. The source of sediment is extensive row-crop agriculture, impervious surface runoff, and improper erosion control practices. According to the STEPL loading program, there is an estimated sediment loss of 5,606 tons/year from urban, cropland, pastureland, and forest. The sediment amount in tons/year is 18% of all the sediment impairing the entire watershed.

The highest source of sediment comes from extensive row-crop agriculture (55%). However, the highest source of nutrients comes from urban land uses (Nitrogen Load – 105,234 lbs/year; Phosphorus – 16,194 lbs/year). This problem is intensified by a partial lack of riparian buffers and the high percentage of impervious surfaces in this subwatershed. A slight amount comes from septic, forest, and pastureland. More data needs to be collected to see the impact of livestock in the subwatershed and whether or not they are contributing additional nutrients. Nutrients and sediment enter the stream from runoff events during heavy rain, leaching through the soil, and improper application of pesticides and fertilizer, including manure. The subwatershed currently has 301,356 linear feet (53%) of streambank with less than 30 feet of riparian buffer. A riparian buffer is extremely important in preventing excess nutrients such as nitrogen and phosphorus and sediment from entering the stream. Riparian buffer establishment and proper pesticide and fertilizer application will be implemented in this subwatershed. As well as, the promotion of proper storm drain management and construction erosion control practices and education on why these implementation strategies are important in preventing excess nutrients from entering the waterways.

SEDIMENT LOAD (TONS / YEAR)	
Land Use	Sediment Load
Urban	2,416.6
Cropland	3,082.4
Pastureland	58.3
Forest	48.2
TOTAL SEDIMENT LOAD	5,605.5

** Calculations based on the STEPL load reduction program.*

Goals

1. Reduce sedimentation, pesticides, herbicides nutrients and other non-point source pollutants from agricultural & urban land areas at least by 50%.
2. Work with developers in the subwatershed on implementing low impact development.
3. Educate watershed residents about storm water management and how it affects water quality.
4. Promote education of proper pesticide and fertilizer, including manure applications to improve water quality.
5. Promote the establishment of riparian buffers. Restore at least 75,339 linear feet (25%) of streambank.
6. Create a livestock inventory for Montgomery County and update Miami County's livestock inventory within the subwatershed.

Table 39
Action Plan for Nutrient and Sediment Reduction in
Great Miami River Subwatershed

Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce sedimentation and nutrient run off from agricultural fields through promoting conservation tillage, crop rotation and establishment of filter strips, grassed waterways, field borders & riparian buffers. Reduce nitrogen and phosphorus load at least by 25% (34,255 tons/ year for N; 5,958 tons/year for P)and	**USDA, NRCS** – CRP; CSP; EQIP **Miami Conservancy District (MCD)** – Water Quality Credit Trading Program **Miami County Pheasants Forever** – CSP **ODNR,DSWC** – Agricultural	Work in conjunction with Montgomery & Miami SWCD/NRCS to promote streamside buffers through USDA and MCD programs on agricultural lands Submit newspaper and newsletter articles advertising the benefits of riparian buffers Target landowners and operators who farm HEL land Educate watershed	Acres of agricultural lands enrolled in conservation programs. Newsletters produced and number of articles appearing in local newspapers. Load reductions will be calculated using the Region 5 Model and STEPL program.	Jan. 2008 – Dec 2017

sediment load at least by 50% (2,803 tons/year) Promote grid soil sampling and precision application of fertilizers, pesticides and herbicides.	Pollution Abatement Cost-Share Program	residents on proper lawn care.	Sediment reduction of approximately 34,255 tons/year; nitrogen reduction of approximately, 5,958 tons/year; and phosphorus reduction of approximately 2,803 tons/year.	
Reduce sedimentation from riparian land areas by promoting protection of riparian buffers and proper streambank restoration methods improving instream habitat. At least 25% of the streambank restored.	**Miami Conservancy District** – Water Quality Credit Trading Program **OEPA** – 401 mitigation list **OEPA –** 319 funding **ODNR,DSWC –** Agricultural Pollution Abatement Cost-Share Program	Work Montgomery & Miami SWCD/NRCS to identify riparian landowners with eroded streambank issues. Establish one demonstration site along the Great Miami River utilizing bioengineering erosion control and natural channel design methods and natural stream channel design	Create mailing list targeting streamside landowners to receive educational materials. Linear feet of streambank restored and protected. Improved QHEI scores. Load reductions will be calculated using the Region 5 Model.	Jan. 2008 – Dec 2017.
Create livestock inventory for Montgomery County & update Miami County's livestock inventory.	**ODNR, DSWC** – District Staff **HCWA –** Watershed Coordinator	Work Montgomery & Miami SWCD/NRCS to gather livestock numbers, including horse numbers.	Livestock Inventory completed for Miami & Montgomery County.	Jan 2008 – Dec 2017 .
Develop comprehensive manure nutrient management plans for each livestock operation not permitted by Ohio EPA	**ODNR, DSWC** – District Staff **USDA, NRCS** - staff	CMNPs are required for farmers to participate in government programs.	75% of livestock producers has CMNPs.	Jan 2008 – Dec 2017
Target livestock producers in the subwatershed where livestock has been identified to have access to the stream. Work with the producer to install fencing and	**USDA, NRCS** – EQIP, CRP **OEPA –** 319 funding	Work Montgomery & Miami SWCD/NRCS to identify livestock that has access to the stream.	Document miles of streambank fencing installed along with acreage of riparian area protected. Load reductions will be calculated using	Jan 2008 – Dec 2017

alternative drinking water sources.			Region 5 Model.	
Continue to survey all the streams in the subwatershed by Rosgen Channel Type and QHEI / HHEI.	**HCWA** – Watershed Coordinator **ONDR,DSWC** - staff	Drive watershed, stopping at each stream crossing to determine channel type	All streams are categorized by Rosgen Channel Type and QHEI / HHEI	Jan 2008 – Dec 2017
Educate the public and local officials on proper channel design and the advantages of natural channels with floodplains.	**HCWA** – Watershed Coordinator **ONDR,DSWC** – District Staff **ONDR,DSWC** - Watershed Awareness to Watershed Action (WAWA) mini-grants	Hold an education/informational workshop once a year on stream geomorphology.	One workshop held each year.	Jan 2008 – Dec 2017
Implement the use of proper storage and containment of farm chemicals.	**ONDR,DSWC** – District Staff **OSUE** – staff **USDA, NRCS** – EQIP	Farmers are encouraged to take advantage of EQIP funds for proper chemical storage	Three new chemical containment facilities built each year in the Honey Creek Watershed	Jan 2008 – Dec 2017
Implement the use of integrated pest management.	**ONDR,DSWC** – District Staff **OSUE** – staff **USDA, NRCS** – EQIP	Integrated pest management is discussed with farmers as part of their conservation planning	Integrated pest management is discussed as part of 100% of new conservation plans.	Jan 2008 – Dec 2017
Reduce NPS pollutants associated with storm water by implementing BMP's and education of watershed residents on storm water management.	**Montgomery County, Butler & Harrison Twp. and Miami County - Monroe Twp & Tipp City** – Work with entities involved in Phase II areas. **OEPA**- DEFA Program **HCWA** – Watershed Coordinator	Storm drain labeling in areas with curb and gutter storm water systems. Create and submit articles to local newspapers on storm water and stream health. Participate in the Phase II educational program.	Number of storm water drains labeled. Number of articles submitted & published. Water quality activities reported to OEPA for Phase II as required.	Reduce NPS pollutants associated with storm water by implementing BMP's and education of watershed residents on storm water management.
Educate watershed residents on low impact development BMPs.	**Montgomery County, Butler & Harrison Twp. and**	Implement 5 low impact development educational demonstration sites in	5 sites completed	Educate watershed residents on low impact

	Miami County - Monroe Twp & Tipp City – Work with administrators to implement low impact development BMPs. **HCWA** – Watershed Coordinator **Montgomery & Miami SWCDs** – Staff **OEPA** – 319 grant program / OEEF Grant **ONDR,DSWC** - Watershed Awareness to Watershed Action (WAWA) mini-grants	the Great Miami River Subwatershed. Create and submit articles to local newspapers on low impact development and stream health. Conduct Better Site Design / Low Impact Development workshop for developers and local zoning commissions.	Number of articles submitted & published. Number of workshop participants.	development BMPs.

Listed below are best management practices implemented within the last five years in the Great Miami River Subwatershed.

Conservation Practice	Funding Source	14-Digit Subwatershed	# of Acres	County
Ag Containment	USDA, CRP	Great Miami River	1 unit	Miami
Field Border	USDA, CRP	Great Miami River	5.3	Miami
Field Border	USDA, CRP	Great Miami River	13.2	Miami
Grassed Waterway	USDA, CRP	Great Miami River	0.8	Miami
Grassed Waterway	USDA, CRP	Great Miami River	3	Miami
Grassed Waterway	USDA, CRP	Great Miami River	0.8	Miami
Prairie Grass Planting	USDA, CRP	Great Miami River	4	Miami
Timber Stand Improvement	USDA, CRP	Great Miami River	2	Miami
Tree Planting	USDA, CRP	Great Miami River	4	Miami
Wetland Restoration	USDA, CRP	Great Miami River	1.5	Miami
Wetland Restoration	USDA, CRP	Great Miami River	0.4	Miami
Windbreak	USDA, CRP	Great Miami River	1.9	Miami
Wetland Permanent Preservation	Clean Ohio Funds / WRRSP	Great Miami River	337	Miami
Wetland Permanent Preservation	WRRSP	Great Miami River	58	Miami

Great Miami River Subwatershed
HUC 050800001 200 060

IMPAIRMENT: Pathogens

Background

In the Great Miami River Subwatershed malfunctioning household sewage treatment systems (HSTS) contribute to the elevated levels of pathogens in this subwatershed. This subwatershed has the largest number of HSTS in the entire Project Area.

Problem Statement

According to land use calculations urban makes up 57% or 19,575 acres of the total land use. There is an estimated 1,095 home sewage treatment systems (HSTS) in the subwatershed. This number only includes Miami County's portion. The average age of the systems is 24 years. Problem areas include: Phoneton, Ohio (includes Shroyer Drive, Dinsmore Drive and a portion of US Route 40) – 77 HSTS; West Charleston, Ohio (includes Ginghamsburg-West Charleston Road and a portion of State Route 202 - 50 HSTS; Coach Drive, Essex Drive, Sterling Court, Surrey Drive, Michaels Road, and 25A – 105 HSTS; Kent Road, Kim Circle – 39 HSTS; Meadow Drive, Ginghamsburg-Frederick Road – 30 HSTS; Curtwoood Drive, Kitrina Ave., Todd Court, Dean Circle, Burnside Drive – 80 HSTS; Windham Road, and Newbury Road – 38 HSTS. HSTS are known to fail in this subwatershed because of a slow permeability, slope and high clay content in the soil.

There are 5 livestock operations in this subwatershed totaling of 23 animals (not animal units). None of the operations have CNMPs. There are 665 acres of pastureland. The Great Miami River Subwatershed has the lowest number of livestock; however, the above numbers are only for Miami County. Livestock manure contains several pollutants, including ammonia, nitrogen, phosphorus, bacteria and nitrate nitrogen. These pollutants can harm the aquatic environment, cause water quality problems in streams and ponds and contaminate drinking water supplies. By improving these operations there will be a reduction in nutrient loadings, pathogens and sediment runoff. This will be accomplished by restricting livestock access to the stream, improving pasture management, encouraging alternative drinking water sources, and reducing runoff from feedlots.

Livestock Numbers in Great Miami River Subwatershed

Livestock Animals	Number	Animal Units*
Beef Cattle	12	12
Dairy Cattle	0	0
Swine (Hogs)	0	0
Goats / Sheep	0	0
Horses	11	22
Chickens	0	0
TOTAL	**23**	**34**

*** Animal Units – The number of animals of various size and species which are equivalent to one slaughter or feeder beef with regard to daily waste production. Multiply the following to the actual number of animals: A) 1.0 slaughter and feeder cattle; b) 1.4 Mature dairy cattle; c) 0.4 swine weighing over 55lbs.; d) 0.01 laying hens or broilers; e) 2.0 Horses; f) 0.1 - sheep/goats
Source: Animal Waste Pollution Abatement Rules; ODNR

Known pollutant loads within this segment of stream includes 137,021 lbs/year of nitrogen; 23,833 lbs/year of phosphorus and 475,420 lbs/year of biological oxygen demand.

Biological Oxygen Demand (BOD) LOAD (TONS / YEAR)

Land Use	BOD Load
Urban	404,576.9
Cropland	55,502.4
Pastureland	9,503.7
Forest	3,056.5
Septic	2,780.1
TOTAL BOD LOAD	475,419.7

** Calculations based on the STEPL load reduction program.*

Goals

7. Upgrade at least 25% of those identified failing HSTS in the Great Miami River Subwatershed.
8. Complete and obtain approval of Montgomery Countywide HSTS plan to identify needed sewage treatment upgrades and their locations.
9. Livestock pathogen reductions (see previous section goals).
10. Educate watershed residents on the proper maintenance of HSTS.
11. Educate watershed residents on drinking water protection.

Table 40
Action Plan for Pathogen Reduction in Great Miami River Subwatershed

Action	Resources Needed	How to Accomplish	Measure of Success	Time Frame
Reduce organic enrichment & pathogen/bacterial sources of pollution from HSTS. Reduce BOD load at least by 25% (32,517 tons/year) Locate 100% of HSTS and determine discharge status. Upgrade at least 20 failing HSTS.	$10,000 for data gathering and completing the plan. **OEPA** – DEFA Program **Local Health Depts.** – funds for inventory & write plan	Work with the local health departments to complete the HSTS inventory, which identifies the failing systems in the subwatershed. The plan will also identify the needs and types of systems necessary to correct the problem sites. Work with the Montgomery & Miami County Health Department on locating failing HSTS and create an inventory. Work with the Miami County Health Department in establishing a low interest loan program for HSTS upgrades through OEPA-DEFA.	Approved County-wide HSTS plan by OEPA & Montgomery County Health Board. Number of on site septic systems upgraded/replaced. Load reductions will be calculated using the Region 5 Model and STEPL program.	Jan. 2008 – 2017.
Educate watershed residents on proper on site septic system maintenance.	**Local Health Depts.** **HCWA** – watershed coordinator **ONDR,DSWC** - Watershed Awareness to Watershed Action (WAWA) mini-grants	Host workshop for watershed residents on proper on site septic system maintenance. Create handouts promoting HSTS pumping and management. Implement two experimental HSTS locations	Number of workshop attendants. Number of handouts distributed. Two sites implemented	Jan. 2008 – 2017.
Educate watershed residents on drinking water from wells	**Local Health Depts.** **HCWA** – watershed coordinator **ODNR,DSWC** - District staff **Various Grants**	Implement a "Test Your Well" program in Montgomery and Miami Counties annually	Number of program participants	Jan 2008 – Dec 2017

Chapter 7: Funding and Evaluation

Funding Strategies

A list of possible funding sources has been created as a guideline for implementation practices outlined in the ***Subwatershed Inventory Section***. Many of the sources are already providing assistance while others will be investigated in the near future as potential sources. The list will grow as other funding sources become available.

- **Federal Farm Bill Funds**
  - Conservation Reserve Program (CRP)
  - Conservation Security Program (CSP)
  - Environmental Quality Incentives Program (EQIP)
  - Wildlife Habitat Incentives Program (WHIP)
  - Wetland Reserve Program (WRP)

- **US Fish & Wildlife Funds**
  - Funding for wetland restoration and acquisition

- **Ohio Department of Natural Resources**
  - Agricultural Pollution Abatement Cost-Share Program
  - Watershed Awareness to Watershed Action (WAWA) mini-grants
  - Pollution Abatement Toolbox
  - Watershed Coordinator Grants
  - Urban Streams Program
  - Community Development

- **Ohio Environmental Protection Agency**
  - 319 Grant Funds
  - Environmental Education Funds
  - Low Interest Loans (DEFA)
  - Special Project Funds

- **Ohio State University Extension**

- **Miami Conservancy District Water Quality Trading Program**
  - Cost Share for Best Management Practices

- **Ohio Farm Bureau**

- Ohio Farm Bureau Foundation Agriculture Action and Awareness Grants

- **Counties**
  - County Commissioners – Champaign, Clark, Miami & Montgomery
    - General Fund
  - Soil and Water Conservation Districts - Champaign, Clark, Miami & Montgomery
    - Facilities
    - Membership
    - Technical assistance
  - Park Districts – Clark, Miami & Montgomery
    - Technical assistance
    - Facilities
    - Membership

- **Townships – Membership**
- **Cities – Membership**
- **Business Membership**
- **Individual Membership**

- **Private Foundations / Corporations**
  - Grants

- **Miami Conservancy District**
  - Program assistance
  - Grants

Best management practices, educational programs/materials, stream restoration/preservation, wetland restoration/preservation, farmland preservation, and special projects will be funded through state, federal, and private foundation/corporation grants. HCWA administrative/operational expenses will be funded through local funds, HCWA membership and ODNR watershed coordinator grant.

Evaluation

Evaluation is crucial to the success of any watershed partnership. The ultimate goal is for all stream segments within the watershed to move to full attainment as a result of implementation strategies outline in this watershed action plan. Evaluation tools can include: models; such as, the US EPA Region 5 Load Reduction Program; surveys; focus groups; educational activity participation, inventories, and water quality monitoring. All of the above tools can be used to determine the overall effectiveness and success of the watershed action plan. Listed below is an outline of the evaluation activities, who, how and the approximate time frame for completing the activity.

Evaluation Activity	Who	How	Timeframe
Load reduction calculations for all BMPs installed	Watershed Coordinator, Local SWCDs in Project Area	Set load reduction criteria by using the STEPL program and Region 5 model for calculating load reduction after BMP implementation	Pre and post implementation project
Water Quality Monitoring	Watershed Coordinator, Stream Team, Ohio EPA, MCD	Set up a surface water monitoring program shortly after the WAP is endorsed to track the improvements made by the implementation strategies	Ongoing
Evaluate education outreach activities and meetings by tracking the number of participants	Watershed Coordinator, & HCWA Board of Directors	Use sign in sheets and public participation documents to evaluate the effectiveness of the educational programs	Ongoing
Evaluate stakeholder attitudes and education through surveys	Watershed Coordinator, & HCWA Board of Directors	Annually mail out surveys or handout surveys out at educational events to determine the watershed citizens ideas, concerns, and attitudes toward the HCWA	Ongoing

Produce a yearly "State of the Watershed" report to promote highlights of the HCWA and water quality.	Watershed Coordinator, & HCWA Board of Directors, & SWCDs	Produce a document with accomplishments, water quality information, educational efforts throughout each year addressing improvements and/or problems	Annually
Evaluate funding	Watershed Coordinator, & HCWA Board of Directors	Evaluate current and future funding and track to see if on schedule with implementation strategies outlined in the WAP	Every two years or more if needed
Track the progress of the WAP and water quality results	Watershed Coordinator, focus groups, SWCDs, & HCWA Board of Directors	Determine if the progress of the WAP is satisfactory or unsatisfactory	Every two years or more if needed.

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Distribution List

- City & Village Administrators in the watershed
- HCWA Board of Directors
- OSU Extension Offices (Champaign, Clark, Miami, & Montgomery)
- Local Health Districts (Champaign, Clark, Miami, & Montgomery)
- Local Park Districts (Clark, Miami, & Montgomery)
- Ohio Department of Natural Resources
    - Division of Soil and Water Conservation
    - Division of Forestry
    - Division of Wildlife
    - Division of Natural Areas & Preserves
- Ohio Environmental Protection Agency
- OSU Extension Offices (Champaign, Clark, Miami, & Montgomery)
- Planning Commission
- Soil & Water Conservation Districts (Champaign, Clark, Miami, & Montgomery)
- Township Trustees in the watershed
- Watershed Community Libraries
- USDA, NRCS Offices (Champaign, Clark, Miami, & Montgomery)

Appendix A: Summary of Town Hall Meetings

New Carlisle, Bethel and Pike Townships, Clark County, October 12, 2000

This Town Hall meeting was held at the Lake Avenue Church in New Carlisle and included a spaghetti dinner before the meeting. Sixty-eight attended.

Summary

The meeting was chaired by James L. Caplinger, Chairman of the Honey Creek Steering Committee and City Manager for New Carlisle. Following the dinner, and a series of brief presentations, small groups were formed with meeting participants. The groups were asked: 1.) What they liked most about living in the Honey Creek Watershed, 2.) To review some goals the steering committee had selected from previous meetings, add any new goals or concerns they had and rank them in order of importance and, 3.) Discuss ideas on how to achieve these goals.

1. What they liked most about living in the Honey Creek Watershed.

Natural Resources:

Trees, wildlife, nature parks, open space, aesthetics
Quality of drinking water
Soil fertility

Social and Demographic:

Country living, low population, good place to raise a family, convenience, private control of preservation, freedom and privacy, zoning in the past.

2. Goals & Concerns groups were asked to rank. (In ranked order)

- How do we protect our drinking water?
- How do we preserve prime agriculture lands?
- How do we increase incentives to encourage rural land managers to use farming practices that protect water quality and promote wetland restoration?
- How do we use zoning to protect integrity of the watershed?

Addressing multiple species using one water source?

- How do we get more information on the stream and aquifer quality?

3. Ideas on how to achieve these goals

A. How do we protect our drinking water?

Incentives

Increased incentive programs for best management practices.
Balance traditions and economic concerns of the farmer with protection of water.

Education

Inform homeowners of chemical risk/responsibility by education and certification.
Education on ground water resources.
Encourage wise use of agricultural inputs (chemical etc.).

Enforcement
Strict enforcement of existing regulations.
Protect what we have but don't over restrict farms or industry.
Aquifer zoning (in regard to placement of industry).
Identify offenders.
Zoning for less density in critical areas.

Research
Establish data on home drinking water through monitoring.
Protection from farm chemical treatment.
PLT and FLT storm drainage. (??)
More research on stream and aquifer quality.
Develop reliable, low cost testing procedure for water quality.

B. How do we preserve prime agricultural lands?

Incentives
Provide incentives to build on non-productive lands.
Incentives to maintain land integrity.
Give farmers fair price for crops.
Conservation easements to protect prime lands.
Provide dollar incentives equal to development prices for lands.
Involve landowners in planning process.

Enforcement
Utilize and enforce already established zoning laws.
Establish "AG" Districts to restrict development.
Restrict lot size to 5-10 acres.
Establish development areas.
Make prime agricultural lands unattractive to developers with high tax.
Do not establish "AG" Districts

Research
Determine why it should be preserved (e.g. is it really needed?)

C. How do we increase incentives to encourage rural land managers to use farming practices that protect water quality and promote wetland restoration?
- Tax reduction on wetlands.
- Tax credits for wetlands preservation.
- Education; farmers armed with correct information do, generally, consider wetlands important.
- Better communication of existing programs.
- More education on function of wetlands, what do they do.
- Conservation plans that provide incentives.
- Provide funding for incentives to protect wooded buffer zones around wetlands.

- Restore former wetlands.
- Limit development in wetlands.
- More information on Corps of Engineers and OEPA permits.

BETHEL TOWNSHIP TOWN HALL MEETING, NOVEMBER 16, 2000, 30 ATTENDED

Some 30 residents of Bethel Township (Miami Co.) and the Honey Creek/Upper Great Miami River Watershed got together November 16 at the Township Hall in Brandt to discuss water quality. James Caplinger, Chairman of the Honey Creek Watershed Steering Committee and City Manager of New Carlisle, opened the meeting explaining its purpose. "We want to hear your concerns about such things as drinking water quality, clean streams, preserving prime farmlands and wetlands in Bethel Township and set some goals for the Watershed Action Plan." He said the plan will be a citizens' plan and not a plan put together by agencies.

Matt Davis, President of the Bethel Township Board of Trustees spoke on concerns that have been brought to the Trustees and noted that we have bountiful resources of ground water and prime farm lands that need the careful thoughts of each citizen to assure their preservation. "Please don't hesitate to call on the Trustees, your elected officials, to express your concerns and offer ideas on how to manage these resources in the future," he offered.

Jerry Eldred, Director of the Miami County Park District, sponsoring agency for the Honey Creek Watershed Project, gave listeners an update on the Watershed Steering Committee's progress. He emphasized the Park District's willingness to work with all citizens and agencies within the Watershed to help preserve these resources.

Scott Hammond, Director of Water Quality for Miami Valley Regional Planning Commission provided extensive information on the Water Resources Inventory published by MVRPC in April of 2000.

Jeff Layman, County Agent for Miami County, presented the highlights of the Miami County Plan for Preserving Prime Agricultural Lands and encouraged rural landowners to consider the use of conservation easements as a tool for preserving farmlands.

Dane Mutter, Coordinator for the Honey Creek Watershed, discussed the buried valley aquifer, the source of ground water that produces the quality wetlands found between New Carlisle and Tipp City along the Honey Creek Valley. He also illustrated the geological cross section of the buried valley at Silver Lake on Scarff Road.

Later, in small group discussions, those attending selected their top two goals:

1. PROTECTION OF OUR DRINKING WATER
2. FARMLAND PRESERVATION.

Some strategies suggested for achieving these goals are listed.

1. PROTECTION OF OUR DRINKING WATER

A. Education on ground water resources, use of local media.
B. Education on lawn care and use of natural methods in place of chemicals.
C. Establish permanent monitoring sites of drinking water sources.
D. Establish hazardous waste drop offs.
E. Research on pros and cons of no-till farming.
F. Encourage certification of ag/chemical placement.
G. Improved sanitation practices.
H. Identify risks (e.g., regions susceptible to pollution identified).
I. Determine what puts an area at risk (e.g. what activities).
J. One on one contact of agency professionals with landowners

2. FARMLAND PRESERVATION.

A. Zoning to increase lot size.
B. Encourage more use of the County Land Use Plan.
C. Develop an alternative retirement plan for farmers in exchange for Conservation easements preserving prime lands.
D. Honest projections on worst/best case scenarios on depletion of farmland for future generations.
E. Improve returns to agriculture.
F. Take advantage of existing CRP programs.
G. Decide what makes practical/good farm land and what can be developed for residence and commerce.
H. Honest projections on best/worst case scenarios of depletion of farmland for future generations.

ELIZABETH TOWNSHIP TOWN HALL MEETING, JANUARY 11, 2001, 46 ATTENDED.

The Elizabeth Township, Miami County Town Hall meeting was held at the Township Trustees Office on January 11, 2001, with 46 attendees. The meeting was opened by Paul Gearhardt, Trustee and chaired by James L. Caplinger, Chairman of the Steering Committee. Participants were asked to react to the following statements:

1. Envision how you would like the Township to be in the year 2025.
2. Vote on the top three goals to be included in the Honey Creek Watershed Action Plan.
3. Suggestions on how to achieve these goals.

1. Envision how you would like the Township to be in the year 2025.

Major themes:

Preservation particularly with regard to rural character, school system, and local control and land ownership. Change should be gradual but flexible regarding new ideas to manage natural resources. Development should be gradual and there should be limits on housing units. Coyote control and management important to protect livestock. Limited government involvement--keep landownership and utility control in private hands. Increase communication among livestock agency and livestock owners, township government and citizens, agriculture and non-ag sectors of community.

Individual comments:

- Gradual change.
- Open to new ideas/manage current resources.
- Understand livestock related issues (livestock, agency relationships).
- Preserve rural areas.
- Keep farms in township.
- Preserve as is.
- Likes as is. Maintain buildings and schools.
- Less development; change to accommodate gradual development.
- Pretty nice; gradual; well thought out change.
- Slow well thought out change.
- Maintain watershed as is.
- Maintain pride.
- Less houses.
- Not a lot of houses/building.
- Don't lower 10 acre minimum.
- Coyote, big issue. Love as is, would gradual change less development.
- Concern: Houses popping up and coyote problem.

- Increased coyote habitat (serious concern for livestock).
- Not to allow sell-off frontage.
- Ability to have township government and citizens communicate.
- Improve school system.
- Keep pace regarding zoning issues.
- Less government; maintain status quo.
- Consider where water is not going (i.e., would like to get water off property); keep township as is.
- Certain changes ok; remain in farming.
- Keep it so communication between agriculture and non agriculture sector is clear.

2. Vote on the top three goals to be included in the Honey Creek Watershed Action Plan.

Goals were voted on (19, etc., represents number of votes)

(19) Protect our drinking water.
(19) Preserve prime agricultural lands.
(16) Local control of land and water.
(10) Increase incentives for farming practices that protect water quality and promote wetlands restoration.
(7) Use zoning to protect the integrity of the watershed.
(4) Obtain more information on aquifer (groundwater) and stream quality.

3. Suggestions on how to achieve these goals. (The suggestions were also voted on.)

A. Protecting Drinking Water

(18) Control of sludge application in Creek. Prevent contamination from land disposal systems.
(10) Chemical application education programs for farm sprayers
(11) Testing all waters (wells & creeks).
(10) Case studies of contamination and prevention from other areas made available; use of groundwater 2000.
(8) Ordinances to prevent contamination from manure runoff.
(8) Control of sludge application in creek land disposal (prevent contamination).
(8) Ordinances prevention of runoff (manure, chemicals)
(7) Well capping (artesian).
(5) Tighter regulations on agricultural wells (inspections).
(1) Retention pond/slack lime breakdown waste.
(3) Septic designs to prevent well contamination. -Use of sub irrigation/wetland systems.

Preserve Prime Ag Land

(21) Use of conservation easements (make local program available to increase interest).
(12) Zoning control (limit housing developments).
(8) At least 10 acres for home lots.
(9) Use of larger frontages.

Local Control of Land and Water Resource decisions

(20) Establish long term plans for local control.
Example: Prevention of US Fish and Wildlife purchases similar to those posed in the Darby Wildlife Refuge proposal.
(15) Changes in zoning - increase number of acres.
(8) Inspections of septic systems.
(8) Restrict water uses.
(1) Consider business and controls on how much you can pump from one entity.

CHRISTIANSBURG, JACKSON TOWNSHIP, CHAMPAIGN COUNTY, LOST CREEK TOWNSHIP, MIAMI COUNTY, MARCH 8, 2001, 48 ATTENDED

This Town Hall meeting was held at the Christiansburg Fire Station on March 8, 2001.
Harvey Zimmerman, Mayor of Christiansburg, Dale Circle, President of the Jackson Township Trustees and Richard Walker, President of the Lost Creek Township Trustees welcomed the 48 participants and discussed local water quality concerns.

Participants were asked, "Envision the year 2025. How would you envision your township or village progressing during the next 25 years? What would you like to see change? What would you like to see remain the same?" Results follow.

Themes:

Have adequate sewage treatment and enough clean drinking water for residents. Good agricultural stewardship that allows agriculture, wetlands, and development to coexist. Improvement in river health and beauty.

Comments:

-Preserve river health.
-Increase cooperation and communication between/among subdivisions.
-Study development effects on drainage and existing tile patterns and ditches.
-Hook in with existing sewage treatment in another town (e.g., Troy, Casstown).
-Less trash and brush (garbage.)
-Preservation and restoration of wetlands.
-Better treatment of wastewater.
-Monitoring of nitrogen and pesticide application.
-Limit streamside habit degradation.
-Concerned about water and sewage treatment in Casstown. Wondering why there is a group forming for watershed protection in Christiansburg (relatively small amount of pollution) when one compares to the impact combined sewer overflows have below Dayton.
-Wells affected by sewage want water quality and quantity to remain as good; runoff should be addressed of pesticide in stream.
-Trash in creek and streams; Casstown sewage effects on water quality.
-Wetlands, ag, and development co-existing.
-Prevent sewage from affecting creeks.
-Improve water quality.
-Incorporate buffer zones; wetlands and agriculture where compatible.
-Expand wetland on own property.
-Enough water to accommodate number of homes (thinking in particular of development along 201).
-Keeping water clean.
- addressing drainage on personal property/201 by Casstown Park.
-Clean water draining to stream via tiles. Address visible pollution.
-Life in creek on property affected by sewage outfalls.

-Install conservation practices.-Sewage treatment for Christiansburg.

Ranking of current Honey Creek Project Goal Areas:

1. CLEAN DRINKING WATER
2. WASTE WATER TREATMENT
3. URBAN SPRAWL
4. PRESERVING PRIME AGRICULTURAL LANDS
5. MAKING MONEY FROM WETLANDS
6. WELLHEAD PROTECTION

SUGGESTIONS ON ACHIEVING THE TOP THREE GOALS (listed in ranked order by vote of participants)

1. CLEAN DRINKING WATER [(6) represents the number of votes.]

    A. (6) Education of village residents on pollution from their septic systems.
    B. (5) Identify and address point sources of pollution such as automotive salvage yards.
    C. (5) Reduce pesticide usage.
    D. (4) Address effect of runoff from nurseries.
    E. (3) Reduce threat of ground water contamination from wells.
    F. (2) Wastewater treatment practices (villages).
    G. (2) Prevent wastewater from contaminating drinking water.
    H. (2) Monitor farming practices including use of pesticides and tillage practices.
    I. (1) New housing and commercial developments encouraged around existing services vs. new wells.
    J. (1) Monitor home owned septic systems for proper function
    K. (1) Assessment of development affects on drainage (i.e. impact on hydrology from runoff including tiles).
    L. (1) Increase quantity of Buffer Zones.
    M. (1) Prevent manure from polluting water

2. WASTEWATER TREATMENT

    A. (18) Build cooperative plan between villages. Suggestions: Connect Christiansburg to New Carlisle for sewage treatment; build relationship between Christiansburg and Casstown and Troy for sewage treatment.
    B. (10) Develop buffer zone between septic leach beds and field tiles.
    C. (6) Address where funding for Casstown and Christiansburg sewage treatment will come from and plan for development.
    D. (4) Tighter regulations for rural septic systems.
    E. (3) Restrict size and number of mega hog farms
    F. (1) Better education of sanitation to help installers and homeowners
    G. (1) Villages prioritize where sewage treatment needed most.

H. (1) Better education regarding quantity and affects of wastewater

3. URBAN SPRAWL

A. (9) Development fees to address the burden created on tax structure.
B. (7) Encourage development in Dayton and Springfield to discourage development in rural areas
C. (3) Collaboration between rural townships to decide on best zoning.
D. (2) Centralize development (note: difficult because of lack of sewage treatment).
E. (2) Education on theory behind current zoning and open this for discussion.
F. (1) Prime farmland saved; encourage development elsewhere.
G. (1) Zoning should address clustering development fees to address burden on tax structure, encouragement of concentrated vs. scattered development.
H. (1) Fund purchase of development rights and maintain as agriculture land; pay farmer fair market value.
I. (0) Farmland preservation plan development.

TIPP CITY-MONROE TOWNSHIP TOWN HALL MEETING, APRIL 5, 2001, 17 ATTENDED.

This meeting began with presentations by Mo Eichman, Service Director for Tipp City and welcome by Jim Flesher, Township Trustee. Refreshments were provided by the hosts. For discussion purposes, the participants decided to revise goals presented by steering committee and add additional goals before beginning ranking process. They also chose to stay in one group.

Revised Goals

A. (9) Preserve and increase accessibility of streams, rivers and wetlands.
B. (4) Preserve wellhead protection areas.
C. (2) Preserve prime agriculture land.
D. (2) Ensure adequate supply of clean drinking water.
E. (0) Address urban sprawl.

Additional Goals

3 Begin controlled planned development
2 Foster public support
1 Recruit and involve landowners
1 Increase watershed networking (involve multiple watershed groups in planning process)
1 Keep efforts bipartisan
1 Involve youth (students)

Note: Listed below are steps participants suggested to address their top ranked goal.

A. Preservation and Accessibility of Streams, Rivers and Watersheds

- Involve the landowners
- Working with Parks Departments
- Inform local farmers about buffer and filter strip programs
- More educational activities (e.g., festivals, workshops, etc.)
- Publicity campaigns
- Foster awareness with students
- Increase accessibility and public awareness at both Honey Creek
- Preserve and Tipp City Nature Center through organized activities.
- Purchase of development rights, easements, or property outright through funds generated from grants and other sources.

HUBER HEIGHTS TOWN HALL MEETING
JUNE 4, 2001, 12 ATTENDED

This Town Hall Meeting was held at the Huber Heights Government Center, Council Room. Twelve attended. Below are the visions and concerns of the attendees.

2025 Visions (What would you like to see accomplished in terms of environmental protection by the year 2025?)

-Ensure that adequate measures have been taken to prevent contamination of the Powell Road Landfill.
- Maintain water quality through cooperative agreement with EPA, Farm Bureau, major polluters, and government entities.
-Institute safety measures to prevent terrorist activities that might contaminate ground water supply areas. (Note: this was pre 9/11/01).
- Make use of eastern water supplies (use limited now because of iron and manganese contamination) and work with OEPA on requirements for citing new wells.
- Create opportunities to increase water quality given the urban constraints present in Huber Heights (i.e., projects involving restorations to natural state are difficult to institute). Develop better technology to soften water.
- Recreational opportunities explored, adjacent to Great Miami River between Little York and Wagoner Ford (e.g., bike trail/hiking); consider dredging river to accommodate recreations and increase flow to improve water quality
- Huber Heights storm drainage management (e.g., alleviate flooding; control excessive and polluted runoff)
- Attention to tributary streams such as Wild Cat; bank stabilization; increase wildlife habitat; increase water quality and recreational opportunities;
-Annual maintenance and exploit recyclable aspects of waste water treatment plants e.g. methane)
- Eliminate clean water going through storm water system
- Maintain storm sewer system and wastewater service at current level with no increase of rates
- Resolution of lack of capacity problem on east side of watershed (Fairborn), currently the Army Corps of Engineers wastewater plant (?) is what is struggling with capacity

Rank the Following Goals:

- Adequate supply of clean drinking water
- Preservation of wellhead protection areas
- Storm water drainage - address this
- Preservation of water resources
- Other concerns:

- ID and secure financial support for water quality improvement and cooperation with OEPA and landowners in agricultural community to accomplish watershed goals.
- Cooperation with other watershed groups in area. Determine how competition among groups going to be addressed.

The following is how we can accomplish securing financial and technical support to increase communication/coordination among water protection entities and other watershed groups.

- Involvement of legislators to work with OEPA to reinforce need for cooperation and accomplish project goals.
- Identify role for Miami Conservancy District, Miami Valley Regional Planning Commission , park districts, county government, cities and villages.
- Media exposure to utilize effective awareness/city sewer and water board. (President Mike Stroop)
- Education element for elementary festival-provide relevant educational opportunities to create good leaders; high school group with Weisenborn land lab may be a contact.
- Interaction with Mad River watershed group via joint projects

VANDALIA-BUTLER TOWNSHIP TOWN HALL MEETING, AUGUST 16, 2001, 18 ATTENDED

This meeting was held at the OSU Extension, Buckeye Room in Vandalia @7:00 p.m. The group discussed concerns relating to water resources in the area and agreed upon four major goals. These were voted on to determine the order of importance. Ideas pertinent to achieving these goals were listed. Here is the summary of the discussion.

GOALS AGREED ON

A. Storm Water Management, Poplar Creek, and airport runoff.

B. Preservation of aquatic life and streams and rivers.

C. Adequate supply of clean water

D. Preserve balance between environmental protection and well head protection areas and the (complex regulatory) paperwork needed; get the most bang for the effort.

Ideas, suggestions for achieving these goals.

A. Storm Water Management, Poplar Creek, and airport runoff

- Banding together through mayors and managers planning efforts
- Watershed group meet with the mayors and managers to discuss the complexity of community requirements.
- Peak problems; severity and mitigation of erosion.
- Connect stormwater management to watershed planning effort (water) quality and current ordinances.
- Need for definition basins throughout Poplar Creek (corridor).
- Capacity to filter pollutants during non-rain events.
- Applicability - stream return, natural BMPs, more green space.
- Get input from ODOT on impact to Poplar Creek, was an EIS completed? What were the findings?

B. Preservation of streams, rivers and aquatic life.

- Preserve the most unique features of our area.
- (Correct) the problem of channelization.
- Vandalia has assets in 1500 acres of park land.
- Bike path has brought people to river, access, visitation has doubled, extend bikeway north.
- River quality has improved, odor and appearance.
- (Natural area parks) are another tool for the goal of economic development.

- Five Rivers MetroParks has a "John boat" launch site in the works, just north of Little York Rd., on the west side.
- People need to develop concern for aquatic life.
- Cities zoning and planning connected with goals expressed tonight, include Park District, Miami Conservancy District and Tri-Cities Wastewater Treatment Authority.

C. Ensure adequate supply of clean water
    - Aquifer protection program
    - BUSTR - locate and assure that pollutant remains on site
    - Prioritization of areas most vulnerable (5 year catchment area)
    - Addition of sewer and water to areas not served - Butler Twp. discussion of where extensions should go encourage movement.
    - Continued monitoring of Tri-Cities plant.

Appendix B - HCWA Bylaws

BYLAWS OF THE HONEY CREEK WATERSHED ASSOCIATION

ARTICLE I – NAME, AREA, AND BOARD OF DIRECTORS

Section I – Association Name
The name of this organization shall be the Honey Creek Watershed Association. It is formed as a nonprofit corporation and holds the status as a 501 (c) (3) under the Internal Revenue Code. .

Section II – Program Area
The program area to be served includes the Honey Creek /Great Miami River Watershed HUC 05080001 200 within Champaign, Clark, Miami, and Montgomery counties as delineated on the attached map and identified as Attachment A.

Section III – Board of Directors
The Honey Creek Watershed Association shall be managed and directed by a body referred to as the Honey Creek Watershed Association Board of Directors.

The Board of Directors shall consist of a minimum of 7 to a maximum of 11 members elected at the annual meeting for staggered terms of three years each. Effort shall be made to assure that all sections of the watershed are represented on the Board of Directors. Should a Board member have three consecutive unexcused absences from Board meetings, the Board of Directors reserves the right to take action to remove that member from the Board of Directors by majority vote at a Board of Directors meeting. If a vacancy on the Board of Directors occurs between annual meetings it may be filled by the Executive Council, subject to ratification at the next annual meeting. Members of the Board of Directors shall be Active members of the organization.

Section IV – Board Meetings and Quorum
At least nine meetings shall be held annually. The Board of Directors shall determine meeting dates during the first meeting following the annual meeting. 50% of the current Board of Directors constitutes a quorum.

Section V – Powers of the Board of Directors
The Board shall have ultimate authority to do the following:
A. To establish the rules, objectives, and long range plans for the Association subject to approval at the annual meeting.
B. To establish operating policies.
C. To appoint a Watershed Director for an indefinite period.
D. To evaluate the performance and progress of the Association in accomplishing its mission and purposes.
E. To authorize contracts and applications on behalf of the Association.

F. To designate signers for checks, drafts, and other orders for payment of money.

ARTICLE II – MISSION AND PURPOSE

Section I – Mission
The Association is established exclusively for charitable and educational purposes within the meaning of section 501(c)(3) of the Internal Revenue Code.

The mission of the Honey Creek Watershed Association is to protect and enhance the Honey Creek / Great Miami River Watershed resources for the benefit of the region through education and demonstrating water quality improvements.

Section II – Purposes
A. To advocate appropriate "best management practices" to reduce nonpoint source pollution from all potential sources.
B. To promote proper manure application and management in high livestock drainage units.
C. To develop and offer public educational opportunities regarding the proper management of septic systems.
D. To encourage riparian area wetland restoration by offering technical and educational opportunities regarding relevant watershed management practices.
E. To sustain cooperation involving agriculture, residential, and commercial interests in order to structure a partnership with a common goal.
F. To conduct from time to time "town hall meetings" aimed at involving the public in the affairs of the Association.
G. To have and exercise all rights and powers which are conferred on nonprofit corporations or which may hereafter be conferred by the laws of the State of Ohio, including the power to contract, rent, acquire, lease or sell personal or real property; provided that this corporation shall not, except to an insubstantial degree, if at all, engage in any activities or exercise any powers, that are not in furtherance of the purposes of this Association.
H. Notwithstanding any other provisions of these Bylaws, the Association shall not conduct or carry on any activities not permitted to be conducted or carried on by the following:
    1. An organization exempt from taxation under Section 501(c)(3) of the Internal Revenue Code.
    2. An organization, contributions to which are deductible pursuant to Section 170(c)(2) of the Internal Revenue Code.

ARTICLE III – MEMBERSHIP

Section I – Active Members
Membership is available to individuals or other persons with an interest in supporting the mission and purposes of the Honey Creek Watershed Association. Each member has one vote. Dues may be levied by vote of the membership at the annual meeting.

Section II – Associate Members
Membership is available to all students in the watershed area with an interest in supporting the mission and purposes of the Honey Creek Watershed Association. Associate Members are not accorded voting privileges but their participation in discussion is supported and encouraged. No dues shall be required of associate members.

Section III – Termination of Membership
The Board of Directors shall from time to time strike inactive members who have not paid their dues from the records of the Association. Similarly, associate members who have not participated in activities of the Association shall be removed as associate members.

ARTICLE IV – MEETINGS

Section I – Annual Meeting
The annual meeting of the Honey Creek Watershed Association shall be held during the month of May at such time and place as designated by the Board of Directors. A notice of such meeting shall be provided to each member at least 10 days in advance. A good representation of the membership constitutes a quorum.

Section II – Special Meetings
Special meetings of the Association may be held at the request of the Board of Directors and upon providing notice as provided in Section I.

ARTICLE V – EXECUTIVE COUNCIL

Section I – Membership
The Executive Council shall consist of the Chair, Vice Chair, Secretary, Treasurer, and Watershed Director.

Section II – Responsibilities of Executive Council
A. To develop agenda and action plans for the Board of Directors subject to Board approval.
B. To provide guidance between Board of Directors meetings to the Watershed Director.
C. To represent the association on public policy issues.
D. To provide for an annual audit of all financial transactions.

ARTICLE VI – OFFICERS, INDEMNIFICATION, AND WATERSHED DIRECTOR

Section I – Officers and Tenure
The Board of Directors shall annually elect the following officers: Chair, Vice Chair, Secretary, and Treasurer at the first meeting after the annual meeting. The Chair and Vice Chair must be members of the Board of Directors.

Section II – Indemnification

Officers and members of the Board of Directors shall be indemnified by the Honey Creek Watershed Association for liability imposed upon them and expenses reasonably incurred by them in connection with any claim against the Association, or any action, suit or proceeding to which they may be a party by reason of their being a director or an officer. No director or officer is to be indemnified with respect to matters for which he or she shall be adjudged in such action, suit, or proceeding to be intentionally negligent, or with respect to misconduct in performance of duty.

Section III – Duties of Officers

A. Chair – to preside at all Board of Directors meetings and to see that the authorized business of the Association is carried to completion.
B. Vice Chair – to assist the chair and to preside in the absence of the chair.
C. Secretary – to keep minutes of all meetings, carry on official correspondence, and conduct such business as shall be authorized by the Board of Directors.
D. Treasurer – to collect all dues, pay authorized bills, present bills for auditor prior to the annual meeting each year, and to keep the financial records of the Association.

Section IV – Watershed Director

The duties of the Watershed Director shall be determined by the Board of Directors and may include the following:

A. To supervise and coordinate the activities of the Association including responsibility for human and financial resources.
B. To develop goals and plans to implement purposes of the Association subject to Board approval.
C. To execute policies developed by the Board of Directors.
D. To manage the day-to-day operations of the Association.
E. To provide reports for use by the Board and Executive Council on performance and progress of the Association.

ARTICLE VII – COMMITTEES AND WORK GROUPS

Section I – Standing Committees

These committees consist of at least one member of the Board of Directors and include committees such as nominating, funding, public relations and such other standing committees as the Board or members may establish. Committee appointments will be made during the first Board of Directors meeting following the annual meeting.

Section II – Work Groups

Work groups shall be determined by the Board of Directors as needed to work on specific programs, events, etc. for a specified period of time.

Section III – Representatives to Organizations and Agencies

Representatives to other organizations and agencies shall be appointed by the Chair and Executive Council with approval of the Board of Directors at its next meeting. Those appointed shall serve at the pleasure of the Board of Directors.

ARTICLE VIII – ORDER OF BUSINESS

Section I – Parliamentary Law
Robert's Rules of Order shall govern all meetings:

Section II – Agenda
The order of business at all meetings shall be as follows:

1. Roll Call/Introductions
2. Report of Minutes
3. Fiscal Report
4. Report of Officers and Watershed Director
5. Report of Standing Committees
6. Report of Working Groups
7. Old Business
8. New Business
9. Miscellaneous
10. Discussion
11. Adjournment

Additional items may be considered, but none of the above list may be deleted.

ARTICLE IX – FINANCIAL PREOCEDURES

Section I – Fiscal Year
The fiscal year of the Association shall be January 1 to December 31.

Section II – Authority to Receive Funds
The Honey Creek Watershed Association may accept, receive, and disburse funds and grants, from the federal government; from state or local governments; civic organizations; private individuals or groups; and from foundations, trusts, or corporate giving departments. It may contract with respect thereto and may provide such information and reports as may be necessary to secure such financial aid.

Section III – Deposits
All funds shall be deposited in financial institutions selected by the Board of Directors.

Section IV – Approvals
The Board of Directors must approve all expenditures or disbursements from the Honey Creek Watershed Association except for those in an amount to be determined by the Board of Directors, which may then be approved solely by the Watershed Director.

Section V – Audit
The Executive Council shall provide for an annual audit at the end of each fiscal year to confirm the authorized disbursement of and receipt of funds, and shall further provide for any other audits required by law.

ARTICLE X – BOOKS AND RECORDS

The following shall be kept at the office of the Association: correct books of accounts of the activities and transactions of the Association, including a minute book, which shall contain a copy of the Articles of Incorporation, these Bylaws, and all minutes of Board meetings and annual and special meetings.

ARTICLE XI – AMENDMENT PROCEDURES

The Bylaws may be amended in the following manner:

A motion for amendment of the Bylaws may be made and seconded at any regular meeting of the Board of Directors. If the motion is approved, the Secretary shall thereafter, but not less than 10 days prior to the next scheduled meeting of members, forward to each member a copy of such proposed amendment together with a notice that it will be the subject of action at the next meeting. Such amendment, when presented and considered, shall be deemed adopted upon a two-thirds vote of the members in attendance at the meeting if there is a proper quorum.

If the Board refuses to propose an amendment of interest to members, then members may propose an amendment at one annual meeting to be voted on at the next meeting with the same voting requirements as for a proposal of the Board.

ARTICLE XII – DISSOLUTION
Upon dissolution of the Association, the Board of Directors shall, after paying, or making provision for the payment of, all liabilities of the Association, dispose of all the assets of the corporation exclusively for the primary purposes of the Association in such manner, or to such organization or organizations organized and operated exclusively for educational and environmental purposes, as shall at that time qualify as a qualified organization or organizations under Section 501(c)(3) of the Internal Revenue Code, as the Board of Directors shall determine. The Court of Common Pleas of the county in which the principal office of the organization is then located shall dispose of any such assets not so

disposed of, exclusively for such purposes, or to such organization or organizations, as said court shall determine, which are organized or operated exclusively for such purposes.

ARTICLE XIII – BONDING

The Association shall provide a bond for all officers and employees who have access to or control over Association funds.

Adopted by incorporators and members at the January 23, 2003 Organizational Meeting of the Honey Creek Watershed Association, with amendments adopted by the members at the May 8, 2003, the May 13, 2004, May 24, 2005 and May 22, 2007 Honey Creek Watershed Association Membership Meetings.

Appendix C – Summary HCWA Events Activities

HONEY CREEK WATERSHED ASSOCIATION
A Recounting of Past Events
Dane Mutter – 4/14/2005
Nikki Reese – 8/09/2007

November 4, 1991– Miami County Green Space Plan approved by the Miami County Board of Commissioners. The purpose -- "to preserve river corridors and greenways so that wildlife and natural vegetation can survive, and protect the beauty of the natural landscape for the people of Miami County." The Honey Creek/Great Miami River Corridor and the Honey Creek wetlands were cited in the plan as two key areas for preservation and management.

December 1997 – Miami Valley Wetlands Inventory published. The Miami Valley Regional Planning Commission completed an inventory of wetlands in six southwestern Ohio counties. The study was funded by US-EPA. Miami County sponsor was the Miami Soil & Water Conservation District. Three most significant wetlands in the region were in three different watersheds: 1) Honey Creek Wetlands in the Honey Creek Watershed, 2) Wenrick Fen/Medway Kettle Hole Complex in the Mad River Watershed and 3) Beaver Creek Wetlands in the Little Miami River Watershed.

Late 1997 – Honey Creek/Great Miami River Steering Committee organized. Miami County Park District in cooperation and partnership with the Miami Soil & Water Conservation District and Ohio State University Extension Service, organized the Honey Creek/Great Miami River Watershed Steering Committee.

January 1998 – $15,000, 319 Grant. The Miami County Park District/Honey Creek Steering Committee received a Section 319 Grant from the Ohio EPA for $15,000 to pursue the development of a Watershed Action Plan using Ohio EPA's "A Guide to Developing Local Watershed Action Plans in Ohio."

1998 and early 1999 – Public Educational Meetings Held. The Steering Committee held a series of public educational meetings and reviewed suggestions from participants to develop the Watershed Resources Inventory (WRI) the first step in developing a Watershed Action Plan. Additional useful data sources were tapped by steering committee members and Miami Valley Regional Planning was asked to submit a proposal for preparation of the WRI.

October 1999 – $40,000 US-EPA Grant. MVRPC's proposal came in at $21,000. The Park District prepared a grant proposal for US-EPA, Region Five, Watersheds and Wetlands Section in the amount of $40,000 to complete work on the Water Resources Inventory and the Watershed Action Plan for Honey Creek Watershed. The grant was awarded, the MVRPC contract was signed and the work proceeded. The grant emphasized public involvement and wetlands protection.

March 2000 – Watershed Steering Committee reorganized. James Caplinger began duty as the new Chair of the HCWA. The Watershed Steering Committee reorganized in February. Janeen Selanders became the recording secretary.

April 2000 – Water Resources Inventory published. The Honey Creek/Great Miami River Watershed Water Resources Inventory was published and distributed to local leaders and cooperating agencies.

October 2000 to September 2001 – Town Hall Meetings were held in seven communities within the watershed. Over 300 citizens attended contributing to the community based watershed management approach.

January 2001 – ODNR/OEPA Watershed Coordinator Grant. The Miami County Park District was awarded a Watershed Coordinator grant that provided for a half time Coordinator for two years and a full time Coordinator for an additional four years (2001-2006). Funds were from the Ohio Department of Natural Resources, Division of Soil and Water, Ohio EPA and were matched by the Park District. With match, value approximately $200,000.

January 2001 - March 2002 – Preparation of Watershed Action Plan. The Honey Creek/Great Miami River Watershed Steering Committee and the Watershed Coordinator reviewed the many suggestions derived from the Town Hall Meetings. With this public input and the data in the Watershed Resources Inventory, they prepared Goals and Objectives and proceeded to write the Watershed Action Plan.

February 2001 – Preparation of WRRSP proposal. The Honey Creek/Great Miami River Watershed Steering Committee submitted a final proposal to Ohio EPA's Division of Environmental and Financial Planning. The proposal requested funds available through the Watershed Resources Restoration Sponsorship Project (WRRSP) and the local sponsor was the Tri-Cities Waste Water Treatment Authority. The final participants were New Carlisle, Tipp City and the Miami County Park District.

March 21, 2001– $1,900,000 WRRSP proposal approved. The WRRSP proposal was approved providing funding up to $1,900,000 for purchase of stream and river corridors and wetlands. The funds were available to September 2004.

April 2001 - July 2004 – Land Acquisition w/WRRSP funds. WRRSP participants Tipp City, Miami County Park District and New Carlisle contacted landowners along the Great Miami River and Honey Creek corridors to acquire lands by fee sample purchase and conservation easement.

April 2002 – Watershed Action Plan published. The Honey Creek/Great Miami River Watershed Action Plan was published and distributed to leaders, watershed participants and elected officials.

September 2002 – $7000 ODNR, DSWC Operations Support Grant. An Operations Support Grant in the amount of $7000 was received by the Park District and the

Watershed Steering Committee from ODNR's Division of Soil and Water. The grant extended through March 31, 2003.

January 23, 2003 – Honey Creek Watershed Association, Organizational Meeting. Newly chartered Association formed at Bethel Township Fire Station.

February 6, 2003 – 1st Honey Creek Watershed Association Board of Directors Meeting was held. – Mo Eichman was elected Chairman.

April 2004 – Ohio Environmental Educational Fund Grant - The HCWA and Miami County Park District was awarded an OEEF grant to fund the "Hug the Watershed" program. The grant amount was $41,415 and covers two years.

September 2004 – OEPA Water Quality Lab Analysis Funding - The HCWA received $20,695 to sample/analysis 11 sites within the Honey Creek Watershed.

October 2004 – Adopt-A-Highway – The HCWA designated a two mile section of State Route 201 in Miami County to pick trash up.

January 2006 – Fundraising Training – The HCWA was selected by Rural Action Inc. to participate in free fundraising training and development of a fundraising plan.

March 2006 – HCWA Website Developed

March 14, 2006 – 501 (c) 3 Status approved – The HCWA received their non-profit status.

October 2006 – HCWA Watershed Director becomes a Miami SWCD Employee.

January 2007 – OEPA 319 non-point source grant awarded – The Miami SWCD and HCWA was awarded $231,192 in federal funds to implement a stream bank repair on the Honey Creek. A total of 700 linear feet will be restored.

Appendix D
Assumptions Used to Calculate Potential Load Reductions

Waterways – Sediment – 51 ton/yr; Nitrogen – 102 lbs/yr; Phosphorus – 51 lbs/yr (per typical waterway)
Gully dimensions – 3' top width; 2' bottom width; 1.5' depth; 1200 length; 5 years to form, soil texture is silt loam.

There were 30 waterways installed in the Honey Creek / Great Miami River Watershed. The load reduction was calculated for all 30 together.
Sediment – 1,531 ton/yr; Nitrogen – 3,123 lbs/yr; Phosphorus – 1,561 lbs/yr

Field Borders – Sediment – 158 tons/yr; Nitrogen – 238 lbs/yr; Phosphorus – 238lbs/yr
There were 21 field borders installed totaling 131.3 acres in the Honey Creek / Great Miami River Watershed.

For soil loss calculation – R=150; K=0.37; LS=0.28; P=1 (same for before and after)
The C factor before = 0.15
No-till beans into corn with 50% residue; corn into beans with 20% residue
The C factor after = 0.002
Used C factors for Permanent Pasture; 30/90 % canopy.
Soil texture is silt loam.

Filter Strips – Sediment – 22 tons/yr; Nitrogen – 63 lbs/yr; Phosphorus – 63 lbs/yr
There were 6 filter strips installed totaling 13.8 acres in the Honey Creek / Great Miami River Watershed.

We were unable to calculate the individual contributing acres for each filter strip so instead of selecting filter strip to calculate load reduction the Agricultural Field Practice was selected. The assumption was made that each filter strip was 30 feet wide.

For soil loss calculation – R=150; K=0.37; LS=0.28; P=1 (same for before and after)
The C factor before = 0.15
No-till beans into corn with 50% residue; corn into beans with 20% residue
The C factor after = 0.002
Used C factors for Permanent Pasture; 30/90 % canopy.
Soil texture is silt loam.

Conservation Cover – Sediment – 46 tons/yr; Nitrogen – 134 lbs/yr; Phosphorus – 67 lbs/yr
Total conservation cover acres – 32.1 acres in the Honey Creek / Great Miami River Watershed.
For soil loss calculation – R=150; K=0.37; LS=0.28; P=1 (same for before and after)

The C factor before = 0.15
No-till beans into corn with 50% residue; corn into beans with 20% residue
The C factor after = 0.002
Used C factors for Permanent Pasture; 30/90 % canopy.
Soil texture is silt loam.

Whole Field CRP - Sediment – 58 tons/yr; Nitrogen – 171 lbs/yr;
Phosphorus – 86lbs/yr
Total whole field CRP acres – 42.1 acres in the Honey Creek / Great Miami River Watershed.

For soil loss calculation – R=150; K=0.37; LS=0.28; P=1 (same for before and after)
The C factor before = 0.15
No-till beans into corn with 50% residue; corn into beans with 20% residue
The C factor after = 0.002
Used C factors for Permanent Pasture; 30/90 % canopy.
Soil texture is silt loam.

Wetland Restoration – Load reductions cannot be estimated.

Ag Containment Facility – Load reductions cannot be estimated.

Subsurface Drain – Load reductions cannot be estimated.

Agrichemical Handling Facility - Load reductions cannot be estimated.