Mill Creek Watershed Action Plan
(A Tributary to the Mahoning River)

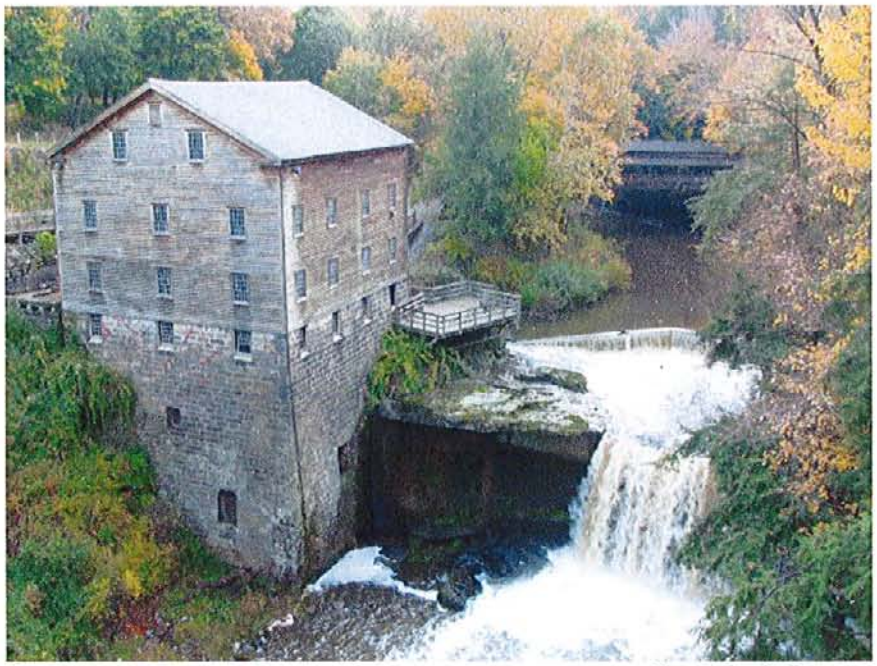

Photo: Justin Rogers

Alliance for Watershed Action and Riparian Easements

Watershed Plan Contact Information

Mill Creek MetroParks
7574 Columbiana-Canfield Road
P.O. Box 596
Canfield, Ohio 44406
(330) 702-3000 (Phone)
(330) 702-3010 (Fax)

Erin M. McCracken, Environmental Planner
erinmc@zoominternet.net

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D. Acknowledgements

Prepared and written by:

Erin M. McCracken
Environmental Planner
Mill Creek MetroParks
7574 Columbiana-Canfield Road
P.O.Box 596
Canfield, Ohio 44406
330-702-3000(Phone)
330-702-3010 (Fax)
erinmc@zoominternet.net

Heather M. Moser
Mahoning Soil and Water Conservation District
850 Industrial Road
Youngstown, Ohio 44509
330-740-7995 (Phone)
330-259-1075 (Fax)
www.mahoningswcd.org

Maps and Statistics:
John D. Bralich
Senior GIS Analyst
Center for Urban and Regional Studies
Youngstown State University
One University Plaza
Youngstown, OH 44555
330-941-2302 (Phone)
330-941-1527 (Fax)
jdbralich@ysu.edu

In cooperation with and/or writing contributions by:
Stephanie Dyer, Eastgate Regional Council of Governments
AWARE Committee members and working partners
John M. Woolard, Mahoning County Engineers
Wesley J. Vins, Mahoning County District Board of Health
John D. Bralich, YSU Center for Urban Studies

The watershed planning process in the Mill Creek Watershed is being undertaken as a cooperative effort between Mill Creek MetroParks, Youngstown State University, Mahoning Soil and Water Conservation District and AWARE, The Alliance for Watershed Action and Riparian Easements and its many partners.

E. Distribution List

The draft of Mill Creek Watershed Action Plan has been provided to the following organizations and is available at the AWARE website http://www.watershed.cboss.com/, and the YSU http://cfweb.cc.ysu.edu/psi/psi_maps_mill_creek.htm.

- Mahoning Soil and Water Conservation District
- Columbiana Soil and Water Conservation District
- Mill Creek MetroParks
- Youngstown State University
- Mahoning County District Board of Health
- AquaOhio(Consumers Ohio Water Company)
- Eastgate Regional Council of Governments
- Ohio EPA ~ Division of Surface Water
- Mahoning County Engineers
- Beaver Township
- Canfield Township
- Fairfield Township
- Austintown Township Parks
- Recycling Division of Mahoning County/The Green Team
- Mahoning River Consortium
- Audubon Society of the Mahoning Valley
- League of Women Voters of Greater Youngstown
- Mahoning County Emergency Management
- Boardman Township
- Mahoning County GIS Department
- Mahoning Valley Sanitary District
- Ohio State University Extension
- City of Youngstown
- City of Canfield
- City of Columbiana
- Mahoning County Sanitary Engineer
- Mahoning County Commissioners
- Mahoning County Planning Department
- Main Branch Youngstown/Mahoning County Library

F. Enforcement of Plan by Watershed Stakeholders

This plan was financed through a grant from the Department of Natural Resources, Division of Soil and Water Conservation, under the "Agreement for the establishment of a Watershed Coordinator Partnership Project" with Mahoning Soil and Water Conservation District.

Upon endorsement by the Ohio Environmental Protection Agency and Ohio Department of Natural Resources, AWARE members, identified stakeholders, and local public officials will be asked to provide signatures for the acceptance and to pursue the implementation of the Watershed Action Plan.

The Mahoning County Engineer will provide copies of the Mill Creek Watershed Action Plan to the stakeholders for their endorsement along with sample legislation. The following is a list of government stakeholders:

Mahoning Soil and Water Conservation District
Board of Mahoning County Commissioners
Mahoning County District Board of Health
Eastgate Regional Council of Governments
Austintown Township
Beaver Township
Boardman Township
Canfield Township
Green Township
City of Youngstown
Fairfield Township
City of Columbiana
Mill Creek MetroParks
Youngstown State University
City of Canfield
Mahoning Valley Sanitay Engineer

The Watershed Action Plan will be submitted to the government stakeholders by Fall 2007 and it is expected that endorsement will be granted by Spring 2008.

After the Watershed Action Plan has been endorsed by the government stakeholders, a thirty day public comment period will be advertised and any comments will be addressed.

Resolution R-XX-07
A Resolution in Support of the Endorsement of the
Mill Creek Watershed Action Plan

WHEREAS, the Mill Creek Watershed Action Plan is a dynamic document, reflective of the extensive coordination and collaboration between various local, state and federal agencies, that addresses non-point source pollution and water quality issues within the Mill Creek Watershed; and

WHEREAS, the Plan provides strategies to efficiently and effectively restore the health of the watershed and provide the greatest environmental benefits to its residents by:

- Identifying locally-based water quality problems and solutions
- Preventing further degradation of our area's water resources
- Linking financial resources to environmentally effective actions
- Matching appropriate actions to known causes of non-point source pollution impairments
- Educating residents and public officials on proper watershed management techniques
- Providing a resource and reference guide for agencies and organizations concerned with improving the environmental status of the watershed

WHEREAS, the desired environmental outcomes through implementation of the identified programs and projects in the Plan include the restoration of impaired waters, protection of existing high quality waters, and measures to prevent non-point source pollution from ever reaching the waters of the Mill Creek Watershed; and

WHEREAS, the Plan has been submitted to the Ohio Environmental Protection Agency and the Ohio Department of Natural Resources, where upon review by a professional committee representing each agency, the Plan has received full statewide endorsement.

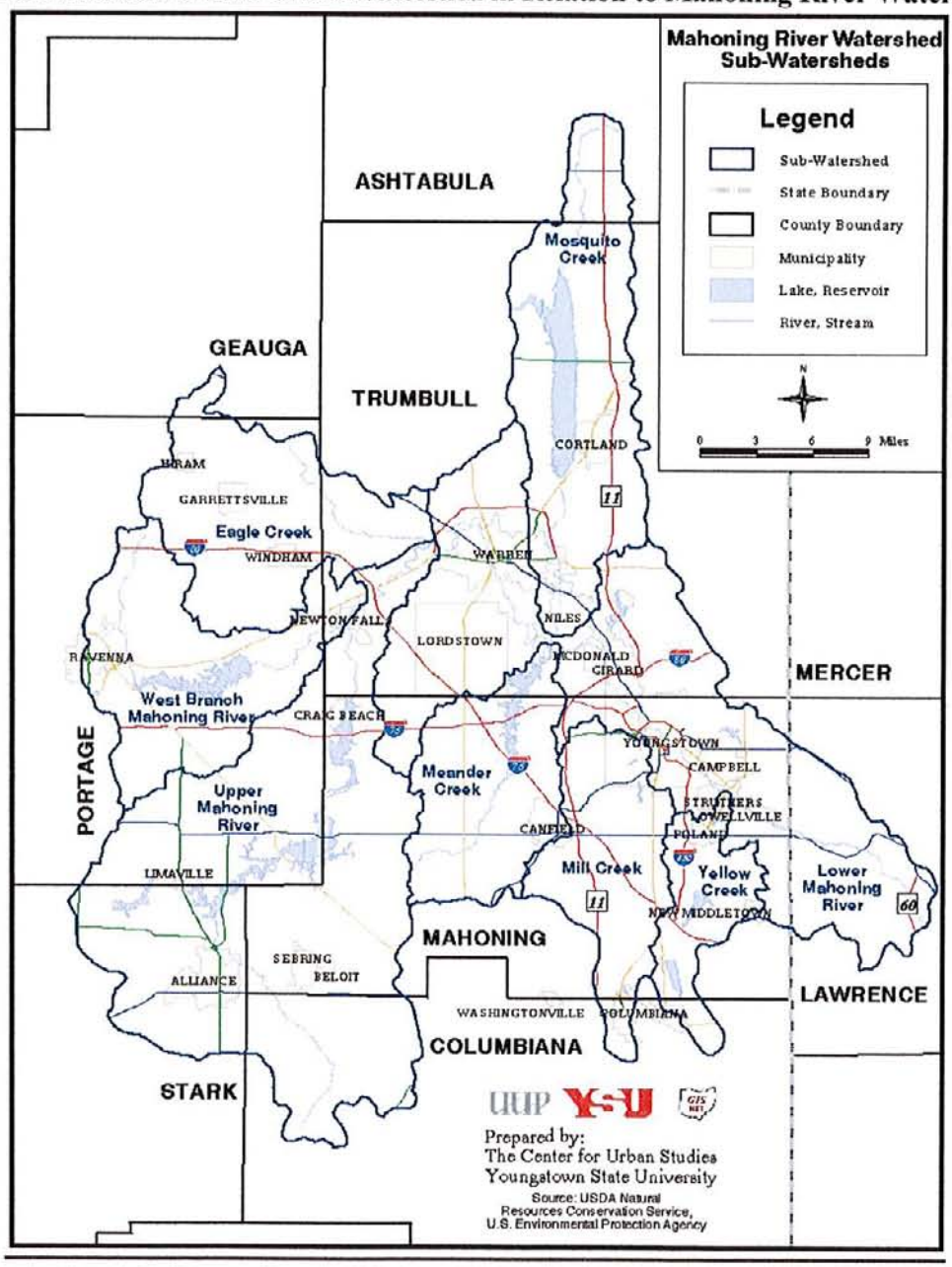
NOW THEREFORE BE IT RESOLVED BY _____:

The _____ hereby expresses its support for the endorsement of the Mill Creek Watershed Action Plan. We acknowledge that the Plan will provide environmental benefits to our local communities situated within the Mill Creek Watershed by providing guidance to resolve the current and pending issues affecting the watershed.

1.0 Introduction

This document presents the Watershed Action Plan (WAP) developed for the Mill Creek watershed, a sub-watershed of the Mahoning River watershed located in Northeast Ohio. The goal of the WAP is to address the causes and sources of water quality impairment and habitat degradation within the watershed. The WAP will act as a source of guidance towards lessening environmental perturbations and creating an improved quality of life within the watershed through recommended goals for education, preservation/protection, restoration, reduction of bacteria, sedimentation and storm-water, increased data collection and the creation of model ordnances.

Figure 1. Location of Mill Creek Watershed in Relation to Mahoning River Watershed.



"Children of a culture born in a water-rich environment, we have never really learned how important water is to us. We understand it, but we do not respect it."- William Ashworth, Nor Any Drop to Drink, 1982

2.0 Mill Creek Watershed

The Mill Creek Watershed is located in Columbiana and Mahoning Counties, Ohio. The Mill Creek watershed drainage basin is approximately 51,070 acres (78.4 square miles) which can be broken down into three (3) sub-watershed areas that are identified as fourteen (14) digit Hydrologic Unit Codes:

pg. 22
- **HUC 05030103-080-030** (Bears Den Run, Axe Factory Run, Anderson Run, Mill Creek mainstem, Cranberry Run, UNT21011, UNT21009, UNT21010, UNT21012, UNT22008, UNT21029, UNT21030, UNT21031, UNT21028, UNT21032, UNT21036, UNT22033).

pg. 23
- **HUC 05030103-080-020** (Little Indian Creek, Indian Run, Mill Creek mainstem, UNT21059, UNT21047, UNT21048, UNT21046, UNT21050).

pg. 24
- **HUC 05030103-080-010** (Sawmill Run, Moff Run, Sharrott Run, Turkey Creek, Mill Creek mainstem, UNT 21055, UNT 21056, UNT 22058, UNT21059, UNT21062, UNT22063,UNT21064, UNT21074,UNT21067, UNT22066, UNT21073, UNT21069, UNT21071, UNT21072, UNT21076, UNT21077, UNT21078, UNT21079, UNT22080, UNT21082, UNT22083).

Mill Creek begins on the "Headwaters Farm" in Fairfield Township, Columbiana County, Ohio then flows north through the City of Columbiana, Beaver Township, Boardman, Township and the City of Youngstown before joining the Mahoning River just west of downtown Youngstown. Portions of Green, Canfield and Austintown Townships and the southeast portion of the City of Canfield are included in the Mill Creek watershed.

Portions of Mill Creek were formerly considered as a State Resource Water because it traverses through Mahoning County's largest metropolitan park. The designation has been changed to a General High Quality Water because of the new method of designating streams through the Integrated Report. This designation is based on the fact that it is not found within the Superior High Quality Waters, Outstanding State Waters, or Outstanding National Resource Waters. Fore more information on the Integrated Report please see Sections 6.0, 7.1 and 8.2.

2.1 Demographics

Population and demographic information was based on the US Census Bureau Census of Population and Housing, 2000 and was analyzed based on the Mill Creek watershed boundaries through the GIS department of Youngstown State University.

There are approximately 96,500 citizens living within the Mill Creek Watershed. Based on the 2000 census information there were 45,427 males and 50,898 females living in the

watershed with an overall average household income of $58,518.00 per year. More detailed census and population information is provided in Table 1 below and in Appendix G.

Table 1. Population and Demographics for Mill Creek Watershed

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DEMOGRAPHICS FOR SUB-WATERSHED 05030103080030		
Variable	Total	Percent of Total
Total Population	71,727	
Male:	33,741	47.0%
Female:	37,986	53.0%
Total Households	30,633	
Average Household Income	$45,627	
Year Residential Structure Built		
Residential Structures	32,765	
Built 1999-2000	195	0.6%
Built 1995-1998	753	2.3%
Built 1990-1994	730	2.2%
Built 1980-1989	1,367	4.2%
Built 1970-1979	5,409	16.5%
Built 1960-1969	6,007	18.3%
Built 1950-1959	9,317	28.4%
Built 1940-1949	4,401	13.4%
Built 1939 or earlier	4,586	14.0%
DEMOGRAPHICS FOR SUB-WATERSHED 05030103080020		
Variable	Total	Percent of Total
Total Population	6,059	
Male:	2,959	48.8%
Female:	3,100	51.2%
Total Households	2,432	
Average Household Income	$78,390	
Year Residential Structure Built		
Residential Structures	2,592	
Built 1999-2000	89	3.4%
Built 1995-1998	259	10.0%
Built 1990-1994	458	17.7%
Built 1980-1989	394	15.2%
Built 1970-1979	364	14.0%
Built 1960-1969	381	14.7%
Built 1950-1959	294	11.3%
Built 1940-1949	102	3.9%
Built 1939 or earlier	251	9.7%

pg. 23

Source: U.S. Census Bureau Census of Population and Housing, 2000

Table 1 Cont. Population and Demographics for Mill Creek Watershed

DEMOGRAPHICS FOR SUB-WATERSHED 05030103080010		
Variable	**Total**	**Percent of Total**
Total Population	18,539	
Male:	8,727	47.1%
Female:	9,812	52.9%
Total Households	7,796	
Average Household Income	$51,537	
Year Residential Structure Built		
Residential Structures	8,213	
Built 1999-2000	169	2.1%
Built 1995-1998	580	7.1%
Built 1990-1994	667	8.1%
Built 1980-1989	1,005	12.2%
Built 1970-1979	2,275	27.7%
Built 1960-1969	1,140	13.9%
Built 1950-1959	977	11.9%
Built 1940-1949	482	5.9%
Built 1939 or earlier	918	11.2%

Source: U.S. Census Bureau Census of Population and Housing, 2000

2.2 Phase 2 Storm Water Communities

NPDES Phase II Storm Water Regulations are designated by The US EPA and the Ohio EPA and require communities to develop and implement a storm water management plan. Components of the plans include public education, public involvement, illicit discharge detection and elimination, construction site runoff control, post construction site runoff control and good housekeeping. The regulated area within the Mill Creek watershed consists of 120.93 square miles.

The below regulated entities have agreed to enter into a Memorandum of Understanding (MOU) to implement their respective storm water management plans as joint permittee's, with Mahoning County taking the lead role.

- Mahoning County, 58 (miles^2)
- Austintown Township, 19.7 (miles^2)
- Beaver Township, 1.1 (miles^2)
- Boardman Township, 22.5 (miles^2)
- Canfield Township, 7.36 (miles^2)
- Coitsville Township, 0.12 (miles^2)
- Poland Township, 1.3 (miles^2)
- Springfield Township, 6.8 (miles^2)
- Mill Creek MetroParks, 4.06 (miles^2)

Special districts within the watershed consist of the Mill Creek MetoParks, which owns protected lands.

Incorporated areas consist of three (3) cities: Youngstown, Columbiana and Canfield. Information on the past and current watershed management activities and planning documents can be found in section 5.4.1 of this plan.

3.0 Watershed Plan Development

"I believe that education is all about being excited about something. Seeing passion and enthusiasm helps push an educational message". -Steve Irwin

In 2000 the Mahoning Soil and Water Conservation District (MSWCD) received funds through the Ohio Department of Natural Resources (ODNR) to hire a Watershed Coordinator. Per the requirements of the position, one of the objectives to be completed was the development of a watershed action plan for Mill Creek watershed. Mahoning SWCD submitted a preliminary draft of the Mill Creek Watershed Action Plan in the spring of 2004. The first Ohio Environmental Protection Agency (OEPA) and ODNR review of the plan was completed, and comments were made for the conditionally endorsed plan. The conditionally endorsed plan would then need to be revised and resubmitted per the agency requirements and comments. However, Mahoning SWCD was unable to fulfill those requirements due to personnel and funding issues. Acknowledging the need for a fully endorsed watershed action plan, Mill Creek MetroParks entered into an agreement with ODNR to complete the Mill Creek Watershed Action Plan by utilizing the remaining funds from the Watershed Coordinator grant.

Mill Creek MetroParks has addressed the agency comments from the initial watershed action plan submittal and reformatted the entire document to comply with the "Appendix 8 Update" outline for plan submittal. Mill Creek MetroParks will then submit to Ohio EPA and ODNR a final draft of the Mill Creek Watershed Action Plan for full endorsement.

In addition to addressing the agency comments and requirements, the lapse in time from the initial submittal required additional research, project revisions and updates to figures, mapping and text to complete and thorough and concise plan. Additionally, items not addressed in the plan per the "Appendix 8 Update" outline and grant agreement with ODNR had to be researched and added to the final document. These revisions and additions to the plan have resulted in a thorough, all-inclusive watershed action plan that exceeds the requirements per the agency comments to be addressed from the initial submittal. The new plan was developed to ensure that a more useable document was created, one that incorporates additional information to assist with watershed planning efforts. To review the original plan comments please see Appendix L.

3.1 Watershed Group History

The Lake Newport Advisory Committee was formed in 1997 by Mill Creek MetroParks to address sedimentation issues facing Mill Creek Park's Lake Newport, a man-made lake on Mill Creek. The sources of pollution and sedimentation were analyzed and addressed from numerous perspectives. The resultant solution developed to address the sedimentation issues facing Lake Newport was the construction of the Lake Newport Wetlands, completed in 1998. In concurrence with the plans for the constructed wetlands, the advisory committee understood that addressing water quality concerns, non-point source pollution and the protection of riparian areas at the watershed level was a priority. Realizing that the committee was successful in its endeavors, the group took a broader scope of water quality issues facing the local communities. Planning on a watershed basis not only became the priority but also became an essential component in alleviating the increasing pollution and sedimentation issues. In the fall of 1999, the advisory committee reorganized to form the Alliance for Watershed Action and Riparian Easements (AWARE). AWARE would take an expansive view of three watershed in the area: Mill Creek; Yellow Creek; and Meander Creek; and provide technical assistance for local agencies and the surrounding community.

3.1.1 Mission Statement:

AWARE serves as an alliance of stewards for the Mill Creek, Yellow Creek and Meander Creek watersheds by preserving green space and restoring and enhancing waterways through conservation easements, education, and technical resources for the community.

3.1.2 Vision Statement:

To be a proactive organization regarded as a key resource producing tangible improvements in watersheds.

AWARE is a organization comprised of partnering agencies throughout the Mahoning Valley region along with state and federal agencies and private citizens that share a common goal to improve the region's water resources. AWARE serves as a task force, providing technical assistance and guidance for partnering agencies and organizations, as well as local groups facing water quality issues. AWARE is a non-incorporated watershed group that is led by a bi-annually elected chair, and a steering committee. The steering committee is comprised of the chair, a representative from Mahoning SWCD, Mill Creek MetroParks, Youngstown State University, the chair of each standing committee and two at-large members (at least one of which must not be monetarily reimbursed for attendance).

A strategic planning effort was undertaken by the group in 2001 to outline the successes of the group and define the future objectives. AWARE secured a Watershed Coordinator Grant in 2000 through ODNR to hire a watershed coordinator to be employed at Mahoning SWCD and facilitate the future efforts of AWARE. After the life of the grant and employment restructuring at SWCD, the need to take a comprehensive look and reevaluate the objectives of AWARE became paramount. Therefore, in 2005, a second strategic planning effort was undertaken. Through this effort, multiple meetings were held throughout the year and attended by the stakeholders and partners in AWARE. The objectives, goals, mission, vision, membership, formal organization, standing committees and other issues for the group were analyzed and discussed. Strategies such as recruiting and maintaining stakeholders, marketing and publicizing the group, educational outreach, restructuring and funding sources were identified.

Several meetings were held specifically to investigate the formalization of AWARE, including applying for 501(c)3 status. As a result of these meetings, the decision to formalize as a 501(c)3 was not approved, yet the need for a more formal structure within the group was identified. As it was agreed upon, AWARE will continue to function as an as hoc committee and serve as a forum for ideas by stakeholders and partnering agencies. However, the decision was made to establish a committee to create bylaws for AWARE. The Bylaws Task Force was established and has met on several occasions to discuss the structure of AWARE in terms of membership requirements, leadership composition, voting practices and committee organization. This committee would develop a more organized group structure, one with the potential to formally incorporate as a 501(c)3 in the future. A formal set of bylaws will be established within the next several months.

3.1.3 Active AWARE Partners

- Mahoning Soil and Water Conservation District
- Mill Creek MetroParks
- Youngstown State University
  - Department of Civil, Chemical and Environmental Engineering
  - Center for Urban and Regional Studies
  - Re:CREATE Program
- Mahoning County District Board of Health
- Consumers Ohio Water Company (AquaOhio)
- Eastgate Regional Council of Governments
- Ohio EPA ~ Division of Surface Water
- Mahoning County Engineers
- Beaver Township
- Canfield Township
- Austintown Township Parks
- Recycling Division of Mahoning County/The Green Team
- Mahoning River Consortium
- Audubon Society of the Mahoning Valley
- League of Women Voters of Greater Youngstown
- Private Citizens and Landowners
- Mahoning County Emergency Management
- Boardman Township

- Mahoning County GIS Department
- Mahoning Valley Sanitary District
- The City of Columbiana
- Ohio State University Extension Office

3.1.4 Past Partners and Project Specific Cooperators

- USDA Natural Resource Conservation Service
- Youngstown Warren Regional Chamber of Commerce
- Crossroads Resource Conservation and Development
- MRB Environmental Services
- The Sierra Club ~ Salt Springs Chapter
- Poland Village
- Town Crier News
- Animal Charity
- Mahoning County Sanitary Engineers
- Mahoning Valley Home Builders Association
- Mahoning County Planning Commission
- Wallace & Pancher, Inc.
- Ohio Department of Natural Resources
- Springfield Township
- Mahoning County Commissioners- Special Projects Office

AWARE members continue to change as the group evolves, however the majority of the core participants remain the same. The above lists are accurate at this point in time and will be updated as needed. Involvement in AWARE is open to anyone interested in attending the meetings or assisting in goals or projects of the group. AWARE partners have in the past, and continue to support the mission and vision statements. Some examples of tasks that have been completed and tangible materials that have been produced are:

- GIS based maps
- Educational Workshops
- Educational Fact Sheets
- Landowner Assistance
- Riparian/Conservation Easement Coordination

If you would like more information on AWARE please see the AWARE website at: http://www.watershed.cboss.com/ or contact Justin Rogers at Mill Creek MetroParks, 7574 Columbiana – Canfield Road, PO Box 596, Canfield, Ohio 44406-0596. Phone (330)-702-3000, Fax (330)-702-3010. jarogers@zoominternet.net.

4.0 Description of the Watershed

4.1 Geology

The bedrock underlying Mill Creek Park is made up of Mississippian-age siltstone and shales of the Cuyahoga Formation and Pennsylvanian-age sandstone and shales of the Pottsville Group. The Mississippian-Pennsylvanian contact was reported to be seen approximately 55 feet above the Mahoning River below the dam at the mouth of Mill Creek. The approximate elevation of the contact is 885 feet above sea level. Mill Creek flows on or near the bedrock surface south of Lake Glacier. The exposed bedrock is dominantly the Sharon Sandstone of the Pottsville Group. The Quakertown coal bed was reported to be found north of Canfield Road on the east side of Mill Creek.

The surface material is made up largely of clayey-loamy late Wisconsinan glacial till, along with lacustrine and course outwash material. These deposits overlay Mississippian and Pennsylvanian shale and sandstone [3].

West of Mill Creek, from Anderson's Run to the Mahoning River, is a fairly deep Pre-Pleistocene- or Early Pleistocene-age buried valley. This valley is part of drainage system that flowed southward from Lake Erie. The Mahoning River occupies much of this old valley system. The valley reaches depths greater than 75 feet south of Anderson's Run. A tributary to this buried valley runs northward under Lake Newport and then disappears in outcrop on the north end of Lake Newport. This buried valley system is very complex because Mill Creek had down cut deep enough to intersect the valley at several locations from Lake Cohasset to the Mahoning River. It appears this buried valley joins the Mahoning River valley near the Lake Glacier dam. During the Pleistocene (Wisconsinan) this valley system was filled in with till from advancing ice sheets followed by outwash sands and gravel as the ice melted away. Much of the area is 0-60 feet sand and gravel underlain by 0-30 feet of till.

The Upper Mill Creek Valley north of the city of Columbiana is one of the typical broad valleys referenced above, and overlays a buried sand and gravel aquifer (as evidenced by stream substrates and well records) formed by glaciation.

There are several impressive ravines within the Mill Creek watershed, such as those along Indian Run in Canfield Township; and the Mill Creek Gorge, Mill Creek mainstem in Youngstown.

4.1. 1 Topography

The watershed is located in the end moraine of the Wisconsin glacier, with kames, eskers, and outwash remaining from Pre-Illinioan glaciation (300,000+ years ago)[i]. Due to the glaciated nature of the area, the physiography tends toward rolling plains and rounded hills, gentle slopes and broad valleys. With the exception of steep gorges adjacent to the northern portion of the Mill Creek channel and adjacent to Indian Run near Canfield, the topography of the watershed is relatively flat to gently rolling.

Figure 2

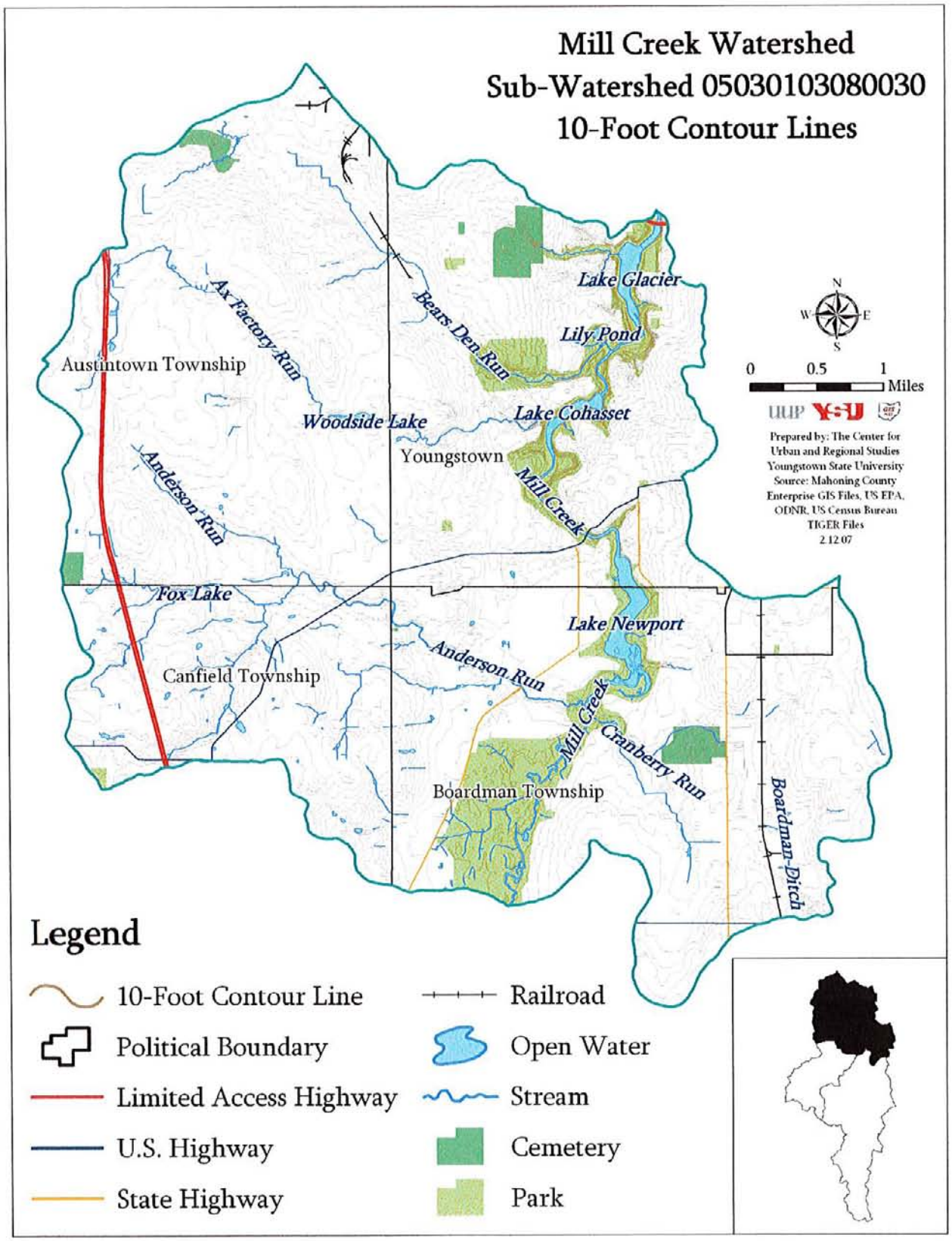

Mill Creek Watershed
Sub-Watershed 05030103080030
10-Foot Contour Lines
Lake Glacier
Lily Pond
Ax Factory Run
Bears Den Run
Austintown Township
Woodside Lake
Lake Cohasset
Youngstown
Anderson Run
Mill Creek
Fox Lake
Lake Newport
Anderson Run
Canfield Township
Mill Creek
Cranberry Run
Boardman Township
Boardman Ditch
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.12.07
Legend
10-Foot Contour Line
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad
Open Water
Stream
Cemetery
Park

Figure 3

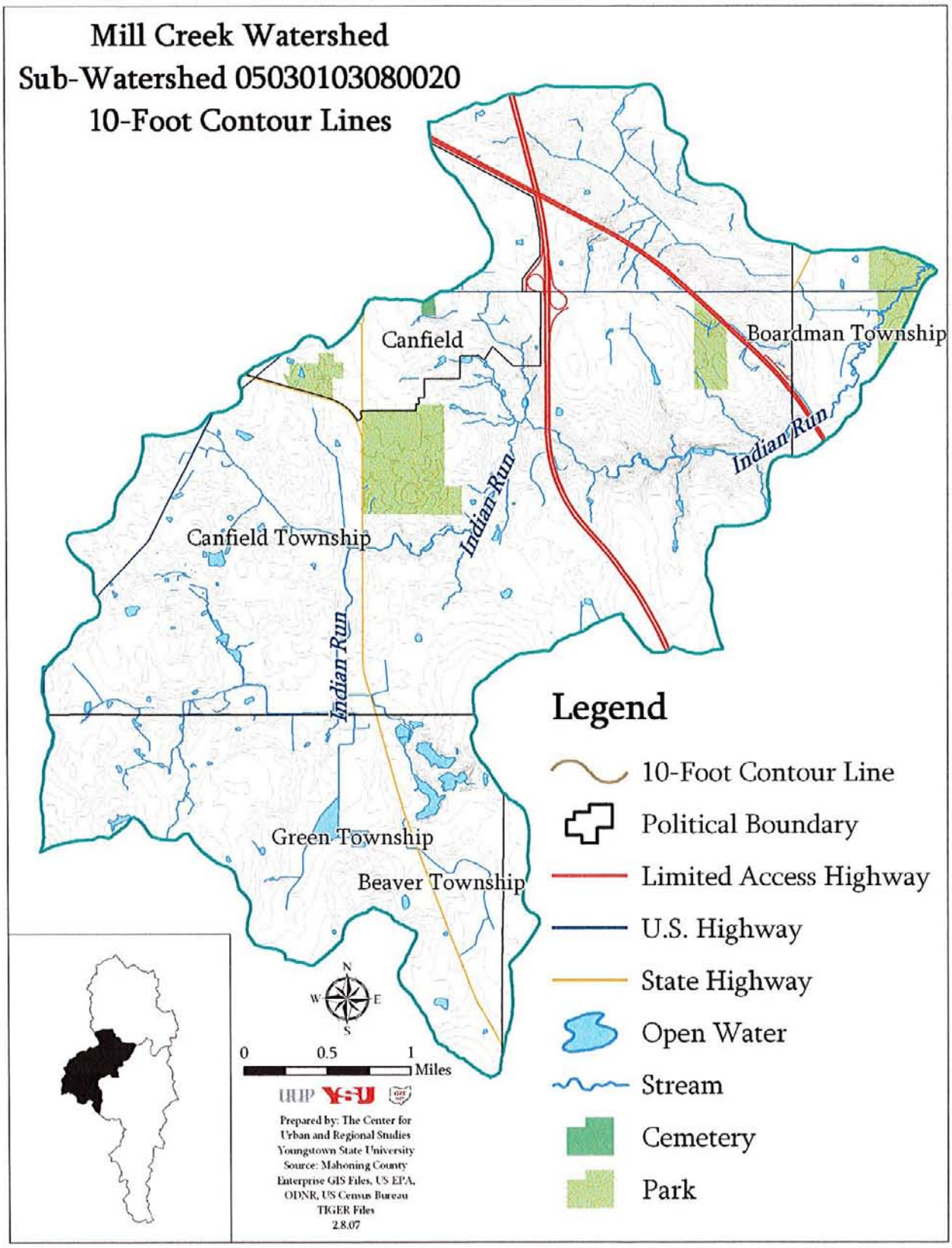
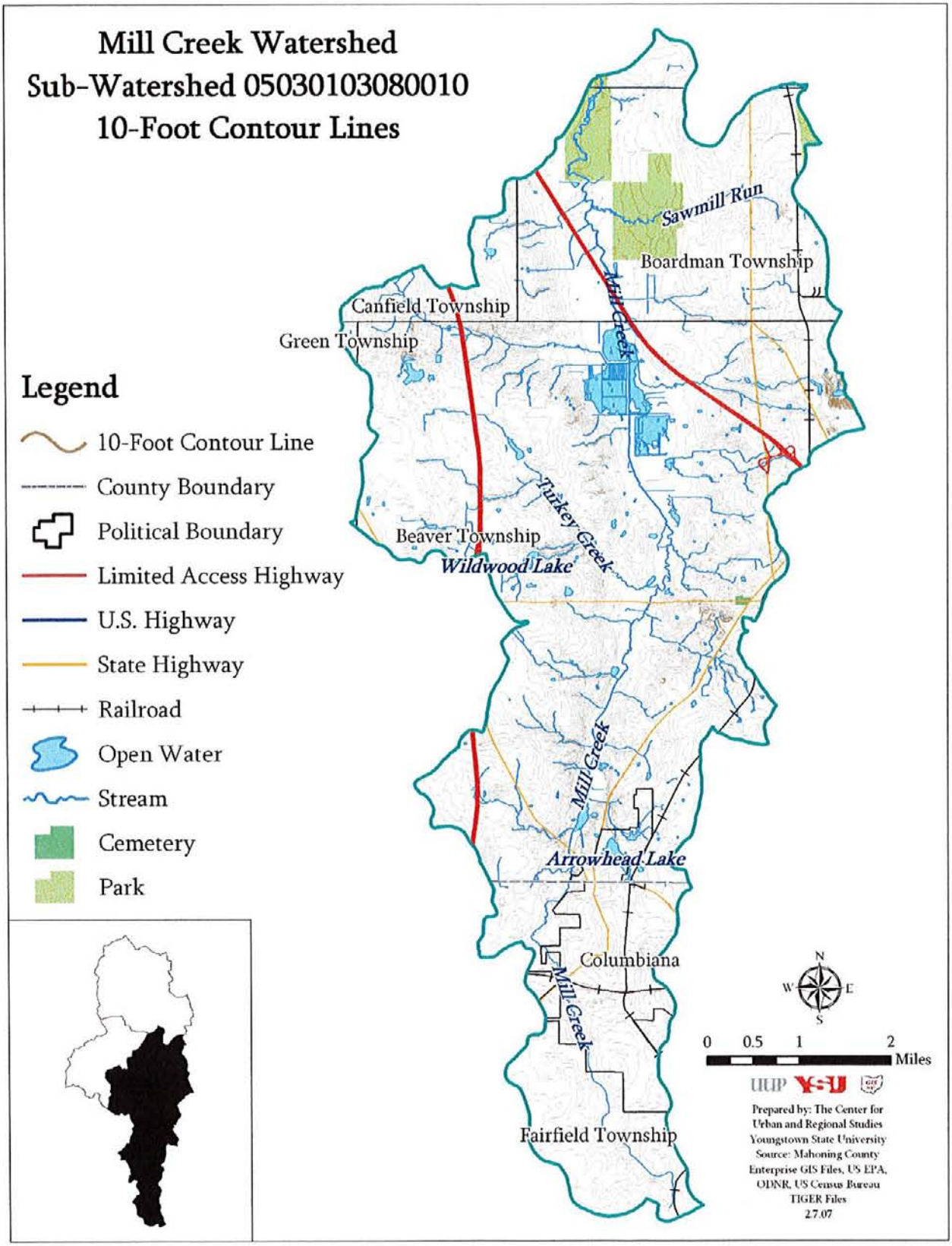

Mill Creek Watershed
Sub-Watershed 05030103080020
10-Foot Contour Lines
Canfield
Boardman Township
Indian Run
Indian Run
Canfield Township
Indian Run
Green Township
Beaver Township
Legend
10-Foot Contour Line
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Open Water
Stream
Cemetery
Park
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.8.07

Figure 4


Mill Creek Watershed
Sub-Watershed 05030103080010
10-Foot Contour Lines
Legend
10-Foot Contour Line
County Boundary
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad
Open Water
Stream
Cemetery
Park
Sawmill Run
Boardman Township
Canfield Township
Green Township
Mill Creek
Turkey Creek
Beaver Township
Wildwood Lake
Mill Creek
Arrowhead Lake
Columbiana
Mill Creek
Fairfield Township
N
W
E
S
0 0.5 1 2
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

4.1. 2 Soils

"Man - despite his artistic pretensions, his sophistication, and his many accomplishments - owes his existence to a six inch layer of topsoil and the fact that it rains". - Unknown

Soils in most of this region were formed in glacial deposits from the Wisconsin glacier (14,000 to 24,000 years ago). (See Appendix F for complete soil maps and descriptions). Soils on floodplains formed in alluvium deposited more recently. The most common soils on floodplains along the mainstem of Mill Creek are Wayland and Orrville Soils. These are nearly level, poorly to somewhat poorly drained soils.

The most common soils on stream terraces and near uplands for most of the length of the watershed are Bogart, Chili, and Jimtown soils. They are sloping to gently sloping, well drained to somewhat poorly drained soils with a gravely subsoil.

In the lower watershed (near the confluence of Mill Creek with the Mahoning River) the most common soil type(s) in the riparian and near uplands are Loudonville, Muskingum, and Dekalb soils, which are gently sloping to steep and well drained. These soils are moderately deep over sandstone or siltstone[3].

The most common soil type(s) in the upland areas formed in glacial till. Rittman, Wadsworth, and Frenchtown are the most common on uplands that drain into the watershed downstream of the confluence of Indian Run and Mill Creek and also in the western part of the Indian Run watershed. These soils are finer-textured than the Canfield, Ravenna, and Wooster soils, which are more common on uplands in the rest of the Mill Creek watershed. All six of these upland soils have a fragipan that restricts water movement through the lower part of the subsoil. Well or moderately well drained soils are more common in the uplands upstream from the confluence of Indian Run and Mill Creek than in uplands in the Indian Run watershed and in uplands that drain downstream from the confluence of Indian Run and Mill Creek.

Pockets of Sebring and Fitchville soils are recognized in parts of the watershed. They are poorly to nearly level to gently sloping, somewhat poorly drained soils that formed in glacial lakebeds.

For more information and maps relating to the soils of the watershed please see Appendix F, and section 7.5.2.d.

4.1.3 Glacial History

Please Note: *The Glacial History section was taken directly from: Angle, P. Michael, 2003. Ground Water Pollution Potential of Mahoning County, Ohio- Ground Water Pollution Potential Report No. 51. Ohio Department of Natural Resources Division of Water, Water Resources Section.*

During the Pleistocene Epoch (2 million to 10,000 years before present (Y.B.P.)) several episodes of ice advance occurred in northeastern Ohio. Table 2 summarizes the

Pleistocene deposits found in Mahoning County. Older ice advances that predate the most recent (Brunhes) magnetic reversal (about 730,000 Y.B.P.) are now commonly referred to as pre-Illinoian (formerly Kansan). Lessig and Rice (1962) reported encountering some weathered "Kansan-age" tills near Elkton in central Columbiana County. Weathered till closely resembling the pre-Illinoian Slippery Rock Till found in northwestern Pennsylvania has been identified in eastern Mahoning County (White et al., 1969). The age of these deposits has been disputed over time. The age and nature of many of the deposits found in the deeper buried valleys of Mahoning County are poorly understood.

The majority of the glacial deposits fall into four main types: (glacial) till, lacustrine, outwash, and ice-contact sand and gravel (kames). Buried valleys may contain a mix of all of these types of deposits. Drift is an older term that collectively refers to the entire sequence of glacial deposits.

Till is an unsorted, non-stratified (non-bedded), mixture of sand, gravel, silt, and clay deposited directly by the ice sheet. There are two main types or facies of glacial till. Lodgement till is "plastered-down" or "bulldozed" at the base of an actively moving ice sheet. Lodgement till tends to be relatively dense and compacted and pebbles typically are angular, broken, and have a preferred direction or orientation. "Hardpan" and "boulder-clay" are two common terms used for lodgement till. Ablation or "melt-out" till occurs as the ice sheet melts or stagnates away. Debris bands are laid down or stacked as the ice between the bands melts. Ablation till tends to be less dense, less compacted, and slightly coarser as meltwater commonly washes away some of the fine silt and clay.

At the land surface, till accounts for two primary landforms: ground moraine and end moraine. Ground moraine (till plain) is relatively flat to gently rolling. End moraines are more ridge-like, with terrain that is steeper and more rolling or hummocky. Cummins (1950) reported that the average till thickness in ground moraine areas was 10 to 20 feet. Streams tend to parallel the margins of the moraines, which helps to enhance the relief and steepness of these features. Locally, end moraines commonly serve as drainage divides. Totten and White (1987) have delineated the end moraines in Mahoning County in detail. Due to the complexity of the moraines in Mahoning County, the individual end moraines have not been named or differentiated. Totten and White (1987) and White (1982) do suggest that the majority of the end moraines are related to the Kent Moraine that is more readily identified in Portage County. In eastern Mahoning County, the topography is primarily bedrock-controlled and differentiating between ground moraine and end moraines is difficult.

End moraines commonly represent a thickening of till. Thicknesses of till in end moraines (not including drift in underlying buried valleys) ranges from roughly 40 to 80 feet. Such a thickening may have occurred along the edge of a glacier that was melting or "retreating". The ice would carry sediment to the edge where it would be deposited somewhat in conveyor-belt fashion. Conversely, an advancing ice sheet may deposit an end moraine. As the ice sheet hits an obstruction such as a hill or ridge, a thicker wedge of till is deposited. This wedge then serves as an obstruction for successive, over-riding

ice sheets. Many of the end moraines in northeastern Ohio have "cores" formed of till older than the surficial till (Totten, 1969).

Wisconsinan-age deposits compose the surficial material across all of Mahoning County except along steep slopes where the bedrock crops-out at the surface. Illinoian-age till, referred to as the Mapledale Till by White (1982) and Totten and White (1987 underlies the Wisconsinan-age till through most of the county. Totten and White (1987) report that the underlying Illinoian-age glacial till was observed in at least three areas in Mahoning County.

Moran (1967) also discussed the presence of Illinoian tills in eastern Mahoning County. Deposition of Illinoian deposits is believed to have occurred prior to 100,000 Y.B.P. Stephenson (1933) and Cummins (1950) discussed the possibility of Illinoian tills, outwash, and kame deposits at depth in eastern Mahoning County.

Ice sheets associated with the Grand River Lobe deposited Wisconsinan-age tills. The earliest Wisconsinan-age till was formerly believed to be the Altonian sub-stage Titusville Till (Table 9). The Titusville Till was proposed as being older than 40,000 Y.B.P. based upon radiocarbon (C14) dates from exposures in northwestern Pennsylvania (White et al., 1969). Current thinking (Totten, 1987 and Eyles and Westgate, 1987) suggests that there was probably insufficient ice available in North America for a major ice advance into the Great Lakes area until the Late Wisconsinan Woodfordian sub-stage (approximately 25,000 Y.B.P.). The age of deposits previously determined to be early to mid-Wisconsinan in age is therefore being re-evaluated. Moran (1967) and Gross and Moran (1971) identified at least 5 sub-units of the Titusville Till. The Titusville Till tends to be very firm, compact, stony, and silty to sandy in nature. Sand and gravel lenses are commonly found interbedded within this till. The Titusville Till also contains a higher percentage of crystalline igneous and metamorphic pebbles and boulders that were transported from Canada. The Titusville Till extends across Mahoning County and is found in many exposures, excavations and strip-mined areas. In many upland areas, the Titusville Till appears to lie directly upon the bedrock and the underlying Illinoian Mapledale Till is lacking.

Table 2. Generalized Pleistocene Stratigraphy of Mahoning County, Ohio

Epoch	Age (years ago)	Stage	Grand River Lobe
Pleistocene	25,000 to 70,000	Wisconsinan	Hiram Till Lavery Till Kent Till Titusville Till?
	70,000 to 120,000	Sangamonian	Lake and alluvial deposits
	120,000 to 730,000	Illinoian	Titusville Till Mapledale Till
	730,000 to 2,000,000	Pre-Illinoian	Slippery Rock Till (sediments in deep buried valleys)

The Kent Till is the oldest of the Late Wisconsinan Woodfordian tills. This till extends across Mahoning County, but is only exposed at the surface in the far southeastern corner. The Kent Till is friable (loose), non-compact, sandy, and stony. Sand and gravel lenses are common in this till. Many of the kame and outwash deposits found in the county are associated with this till unit (Totten and White, 1987). The Kent Moraine is also primarily composed of the Kent Till (Winslow and White, 1966).

The Lavery Till is the surficial till found in much of southern, central, and eastern Mahoning County. The Lavery Till is moderately compact, dense, sparingly to moderately pebbly, and has a clayey-silty texture. Totten and White (1987) have delineated two separate areas where the Lavery Till is the surficial unit. In south-central and southeastern Mahoning County, the Lavery Till is considered as being thin, discontinuous and spotty. In these areas, the entire thickness of the Lavery Till is typically weathered as the till is thin. To the north and west, the Lavery Till is thicker and more continuous.

The Hiram Till is the youngest till encountered in Mahoning County. It is the surficial till found in western, northwestern, and north-central Mahoning County. The Hiram Till is relatively soft, non-compact, and sparingly pebbly and has a silty-clay to clayey texture. It tends to be particularly fine-grained in western Mahoning County. The fine texture is probably due to the till eroding and incorporating lacustrine deposits or shale bedrock. The Hiram Till may have been deposited in a fairly wet environment transitional between lacustrine and an ablational environment.

Lacustrine deposits were created as a result of numerous shallow lakes forming. Within stream valleys, the damming of streams by advancing ice sheets formed lakes. Some buried valleys contain appreciable thicknesses of lacustrine deposits (Totten and White, 1987). A large area of surficial lacustrine deposits is found in Mill Creek (east). In ground moraine areas, lakes were formed as meltwater was trapped between the melting ice sheet and adjacent, previously-deposited moraines. In some low-lying areas, lakes formed as the ice melted quicker then drainage systems could evolve. Deposits from shallow, inter-morainal lakes are also referred to as slackwater deposits. Typically, lacustrine deposits are composed of fairly dense, cohesive, uniform silt and clay with minor amounts of fine sand.

Thin bedding, referred to as laminations, is common in these deposits. Such sediments were deposited in quiet, low-energy environments with little or no current. Large areas of surficial lacustrine deposits in upland areas include areas northwest of Sebring, northeast of Beloit, and northeast of Beloit Center.

Outwash deposits are created by active deposition of sediments by meltwater streams. These deposits are generally bedded or stratified and are sorted. Outwash deposits in Mahoning County is predominantly located in stream valleys. Such deposits were referred to in earlier literature as valley trains. Sorting and degree of coarseness depend upon the nature and proximity of the melting ice sheet. Braided streams usually deposit outwash. Such streams have multiple channels that migrate across the width of the valley

floor, leaving behind a complex record of deposition and erosion. As modern streams down-cut, the older, now higher elevation, remnants of the original valley floor are called terraces. Totten and White (1987) and Lessig et al. (1971) have delineated some of the major terraces in the county. All of the surficial terraces were reported as being Wisconsinan in age (Totten and White, 1987). White and Totten (1985) and Totten and White (1987) noted a difference in the coarseness and lithologies of the gravel between the Woodfordian and older Altonian (Titusville equivalent) outwash.

Kames and eskers are ice contact features. They are composed of masses of generally poorly-sorted sand and gravel with minor till, deposited in depressions, holes, tunnels, or other cavities in the ice. As the surrounding ice melts, a mound of sediment remains behind.

Typically, these deposits may collapse or flow as the surrounding ice melts. These deposits may display high angle, distorted or tilted beds, faults, and folds. In Mahoning County, the majority of the kames are deposited along the margins or flanks of valleys, particularly within the headwaters of the drainage systems. These kames tend to coalesce together along the valley margins. Such features are referred to as kame terraces. They represent deposition of materials between the melting ice sheet and the bedrock and till slopes flanking the ice-filled valleys. A few isolated, knob-like kames are found in the uplands of south-central Mahoning County. Totten and White (1987) suggest that the majority of kames and kame terraces may be associated with the deposition of the Kent Moraine during the Woodfordian sub-stage.

Peat and muck are organic-rich deposits associated with low-lying depressional areas, bogs, kettles, and swamps. Muck is a dense, fine silt with a high content of organics and a dark black color. Peat is typically brownish and contains pieces of plant fibers, decaying wood, and mosses. The two deposits commonly occur together, along with lacustrine or slackwater clays and silts. The majority of these deposits are found along lower-lying portions of valley floors including margins of floodplains and terraces.

4.2 Biological Features

Ohio can be divided into 5 eco-regions. Each eco-region is comprised of areas that consist of similar biological communities and other natural resources. The Mill Creek watershed is located in the Low Lime Drift Plain of the glaciated Erie/Ontario Drift and Lake Plain Eco-Region (Level III). The climax plant communities typical of this eco-region are mixed mesophytic forest, mixed oak forest, beech forest, oak sugar maple forest, and elm-ash swamp forests [ii].

4.2.1 Rare, Threatened and Endangered Species

a. Fish

According to Ohio EPA's survey in 1994, no rare threatened or endangered species are found in the Mill Creek Drainage.

The list of fish species below is from the OEPA Division of Surface Water Ecological Assessment Unit, Fish Catch Summary for Mill Creek Watershed, sample dates rage 8/1/94-10/5/94. Sample sites Mill Creek (10), Bears Den Run, Ax Factory Run, and Indian Run.

- Grass Pickerel, *Esox americanus vermiculatus*
- Largemouth Bass, *Micropterus salmoides*
- Yellow Perch, *Perca flavescens*
- White Crappie, *Pomoxis cyanellus*
- Black Crappie, *Pomoxis nigromaculatus*
- Green Sunfish, *Lepomis cyanellus*
- Bluegill, *Lepomis macrochirus*
- Pumpkinseed, *Lepomis gibbosus*
- Warmouth SF, *Lepomis gulosus*
- Bluegill x Pumpkinseed, *Lepomis spp.*
- Longear Sunfish, *Lepomis megalotis*
- Hybrid x Sunfish, *Lepomis spp.*
- Common Carp, *Cyprinus carpio*
- Green SF X Hybrid, *Lepomis spp.*
- Green SF X Bluegill, *Lepomis spp.*
- Yellow Bullhead, *Ameiurus spp.*
- Blacknose Dace, *Rhinichthys atratulus*
- Central Stoneroller, *Campostoma anomalum*
- Johnny Darter, *Etheostoma nigrum*
- Fantail Darter, *Etheostoma flabellare*
- Golden Shiner, *Notemigonus crysoleucas*
- Creek Chub, *Semotilus atromaculatus*
- Fathead Minnow, *Pimephales promelas*
- Bluntnose Minnow, *Pimephales notatus*
- White Sucker, *Catostomus commersoni*

The narrative for "Mill Creek and Tributaries states that fish assemblages in Mill Creek were also impacted throughout the eleven (11) miles sampled. The total catch consisted of 5,697 individuals, comprised of twenty (20) species and four (4) hybrids. A highly tolerant fish, common carp, overwhelmingly dominated the fauna and consisted of 52.8% numerically and 74.8% of the weight. IBI values were indicative of very poor quality from Western Reserve Road to US 224 (RM 11.0 to 7.7), followed by slight signs of some improvement to the fair range near Lake Glacier (RM 0.8-0.3). MIwb values fluctuated from poor to very poor quality range throughout the eleven (11) miles surveyed."

"Fish sampling results from the four headwater tributaries of Mill Creek were also indicative of severely impacted fish assemblages. IBI values represented only poor quality fish assemblages in three of the headwater tributaries (Bears Den Run, Anderson

Run and Indian Run) and a fair community in Ax Factory Run. Indian Run contained the most diverse community with twelve (12) fish species and Bears Den Run the least diverse community with only one (1) fish species (Creek Chubs). Numerically dominant species included small yellow bullheads and bluntnose minnows, in Axe Factory Run; white suckers, green sunfish, bluntnose minnows and creek chubs in Indian Run: and creek chubs and green sunfish in Anderson Run."

b. Mussels

According to Randy Sanders with the ODNR Division of Wildlife, the historic mussel populations in the mainstem of Mill Creek would have been wiped out due to the poor water quality from the Boardman WWTP. While improvements have been made, the dams and impacted quality of the Mahoning River would likely prevent recolonization. It is not currently known, but possible, that some species might remain in the headwaters and move downstream again.

c. Invertebrates

According to Ohio EPA's survey in 1994 no special status or species of special interest macroinvertebrates are found in the Mill Creek drainage. Volunteer monitors have performed macro-invertebrate sampling at selected points in the watershed. Maps with the locations of Ohio EPA and volunteer monitor sites are available in Appendix C and a list of the macroinvetebrates collected by volunteers is located in Appendix L. The information listed below is from Ohio EPA.

Ohio EPA Water Quality Monitoring and Assessment Section Macroinvertebrate Collection Summary for Mill Creek Watershed

Sample Dates Range: 09/13/94 – 09/14/94 **Sample Sites:** Mill Creek (8)

Narrative: Macroinvertebrate communities were evaluated at eight locations on Mill Creek from RMs 11.2-0.1. Community performance ranged from poor to good with the lowest ICI scores recorded in the section of creek affected by the Boardman WWTP effluent.

The 2 sites upstream from the Boardman WWTP scored ICI values of 28 (fair) at RM 11.2, and 30 (marginally good) at RM 9.7. Quantitative samples were very similar in the numbers of tanytarsini midges and caddisflies of the genus *Cheumatopsyche* collected. The major difference was an increased number of other dipterans and non-insects and tolerant species at RM11.2. Very few mayflies were collected at either site (<1% of total organisms), but they were present in the quantitative and qualitative samples.

ICI scores dropped abruptly downstream from the Boardman WWTP to 14 (fair) at RM 9.5 and 12 (poor) at 7.8. Densities of tolerant taxa: oligochaeta, *Dicrotendipes simpsoni, Polypedilum (P.) fallax* group and *Polypodilum (P.) illinoense* were predominant (58.3%at RM 9.5 and 55.4% at RM7.8) on the artificial substrates. No mayflies were

collected with either sampling protocol downstream from the Boardman WWTP between RM 9.5 and RM 5.4.

Community performance in Mill Creek began to recover from the effect of the Boardman WWTP effluent at RM 5.4. Percentage of tolerant organisms declined (6.9%) and tanytarsini midge density increased resulting in an ICI score of 24. The communities improved from fair at RM5.4 to good at RMs 2.7 and 1.6 (ICI's 40 and 38 respectively). There was higher species richness and higher percentages of caddisflies on the artificial substrates at the lower sites.

Near the mouth, the ICI score dropped to 24. Densities of tolerant organisms (oligochaeta and the midges *Nanocladius (N.) distinctus* and other dipterans and non-insects increased while densities of tanytarsini midges were reduced on artificial substrates.

Table 3. Macroinvertebrate Collection 09/13/94 – 09/14/94:

Ablabesmyia sp	*Menetus (Micromenetus) dilatatus*
Ancyronyx variegate	*Microtendipes pedellus group*
Argia sp	*Namocladius (N.) crassicornus or N. (n.) rectinervus*
Baetis flavistriga	*Nanocladius (N.) crassicornus or N. (N.) rectinervus*
Baetis intercalaris	*Nanocladius (N.) distinctus*
Belostoma sp	*Nanocladius (N.) spiniplenus*
Brillia flavifrons group	*Nigronia serricornis*
Caecidotea sp	*Notonecta sp*
Caenis sp	*Odontomyia (O.) sp*
Calopteryx sp	*Oligochaeta*
Ceratopogonidae	***Oligochaete***
Chauliodes rastricornis	*Orconectes (Crokerinus) obscurus*
Cheumatopsyche sp	*Parachironomus frequens*
Chironomus (C.) decorus group	*Parakiefferiella n.sp 1*
Chironomus (C.) riparius group	*Parametricotopus sp*
Coenagriondae	*Parametriocnemus sp*
Conchapelopia sp	*Paranytarsus sp*
Corynoneura lobata	*Paratanytarsus exiguus group*
Crangony sp	*Paratanytarsus sp*
Cricopopus (C.) tremulus group	*Paratendipes albimanus or P. duplicatus*
Cricotopus (C.) bicinctus	*Paratrichocladius sp*
Cryptochironomus sp	*Peltodytes sexmaculatus*
Cryptotendipes sp	*Phaenopsectra obdiens group*
Dicrotendipes Lucifer	*Physella sp*

Dicrotendipes neomodestus	*Plumatella sp*
Dicrotendipes simpsoni	*Polypedilum (P.) albicorne*
Dubiraphia vittata group	*Polypedilum (P.) contictum*
Enochironomus nigricans	*Polypedilum (P.) convictum*
Erpobdella punctata punctata	*Polypedilum (P.) fallax group*
Eunapius fragilis	*Polypedilum (P.) illinoense*
Ferrissia sp	*Polypedilum (Tripodura) scalaenum group*
Glyptotendipes (Phytotendipes) sp	*Ptilostomis sp*
Harnichia curtilamellata	*Ranatra sp*
Hayesomyia senata or Thienemannimyia norena	*Rheocricotopus (Psilocricotopus) robacki*
Helichus sp	*Rheocricotopus sp*
Helopelopia sp	*Rheotanytarsus exiguous group*
Helophorus sp	*Sialis sp*
Hemerodromia sp	*Simulium sp*
Heyesomyia senta	*Sphaerium sp*
Hydra sp	*Spongilla sp*
Hydracarina	*Spongillidae*
Hydrobiidae	*Stenacron sp*
Hydropsyche (Ceratopsyche) morose group	*Stenacron sp*
Hydropsyche (H.) depravata group	*Stictochironomus sp*
Hydropsyche (H.) dicantha	*Tanytarsus glabrescens group*
Hydropsyche (H.) valanis	*Tanytarsus guerlus group*
Hydropsyche (H.)dicantha	*Tanytarsus sp*
Leptoceridae	*Thienemanniella xena*
Limonia sp	*Tribelos fuscicorne*
Limonia sp	*Turbellaria*
Macronychus glabratus	*Urnatella gracilis*

d. Mammals

No threatened, endangered or special status mammals have been recorded in the Mill Creek Watershed. The list below is comprised of mammals that are presumed to be within the Mill Creek watershed. This list was developed by Dan McMillen, Private Lands Biologist, ODNR-Division of Wildlife (December 2003).

- White-tailed Deer, *Odocoileus virginianus*
- Eastern Coyote, *Canis latrans*
- Gray Fox, *Urocyon cinereoargenteus*
- Least Weasel, *Mustela rixosa*
- Long-tailed Weasel, *Mustela fernata*
- Mink, *Mustela vison*
- Raccoon, *Procyon lotor*

- Red Fox, *Vulpes fulva*
- Striped Skunk, *Mephitis mephitis*
- Big Brown Bat, *Eptesicus fuscus*
- Eastern Pipistrelle, *Pipistrellus subflavus*
- Hoary Bat, *Lasiurus cinereus*
- Little Brown Bat, *Myotis lucifugus*
- Red Bat, *Laiurus borealis*
- Silver-haired Bat, *Lasionycteris noctivagens*
- Eastern Mole, *Scalops aquaticus*
- Hairy-tailed Mole, *Parascalops breweri*
- Star-nosed Mole, *Condylura cristata*
- Black Bear, *Ursus americanes*
- Least Shrew, *Cryptosis parva*
- Coyote, *Canis latrans*
- Short-tail Shrew, *Blarina brevicauda*
- Cottontail Rabbit, *Sylvilagus floridanus*
- Virginia Opossum, *Didelphis marsupialis*
- Beaver, *Castor canadensis*
- Deer Mouse, *Peromyscus maniculatus*
- Eastern Chipmunk, *Tamias striatus*
- Fox Squirrel, *Sciurus niger*
- Gray Squirrel, *Sciurus carlinensis*
- Red Squirrel, *Tamiasciurus hudsonicus*
- House Mouse, *Mus musculus*
- Meadow Vole, *Microtus pennsylvanicus*
- Meadow Jumping Mouse, *Zapus hudsoniaus*
- Muskrat, *Ondatra zibethica*
- Norway Rat, *Rattus norvegicus*
- Southern Flying Squirrel, *Claucomys colans*
- White-footed Mouse, *Permoysucs leucopus*
- Woodchuck, *Marmota monax*
- River Otter , *Lutrans canadensis*

e. Birds

Below is a list of the bird species that have been identified within the Mill Creek watershed that was developed by Nancy Brundage, Member - Audubon Society of the Mahoning Valley and William Jones, Mill Creek MetroParks Volunteer (List developed 1986-2006).

Endangered **(E)**; Threatened **(T)**; Species of Concern **(SC)**; Special Interest **(SI)**

- Eastern Screech Owl, *Otus asio*
- Great Horned Owl, *Bubo virginianus*
- Barred Owl, *Strix varia*
- **Barn Owl, *Yyto alba* (T)**
- **Short-eared Owl, *Asio flammeus* (SI)**
- Coppers Hawk, *Accipiter cooperii*
- Red-Shouldered Hawk, *Buteo lineatus*
- Red Tailed Hawk, *Buteo jamaicensis*
- Turkey vulture, *Cathartes aura*
- **Bald Eagle, *Haliaeetus leucocephalus*, (E/T)**
- **Northern Harrier, *Circus cyaneus* (E)**

- Broad-winged Hawk, *Buteo platypterus*
- Rough-legged Hawk, *Buteo lagopus*
- **Sharp-shinned Hawk, *Accipter striatus* (SC)**
- Merlin, *Falco columbarius*
- American Kestrel, *Falco sparverius*
- **Peregrine Falcon, *Falco peregrinus* (E)**
- **Osprey, *Pandion haliaetus* (E),**
- Red-headed Woodpecker, *Melanerpes erythracephalus*
- Red-bellied Woodpecker, *Melanerpes carolinus*
- Downy Woodpecker, *Picoides pubescens*
- Hairy Woodpecker, *Picoides villosus*
- Northern Flicker, *Colaptes auratus*
- Pileated Woodpecker, *Dryocopus pileatus*
- Canada Goose, *Branta canadensis*
- Wood Duck, *Aix sponsa*
- Mallard, *Anas platyrhynchos*
- Bufflehead, *Bucephala albeola*
- Canvasback, *Aythya valisineria*
- American Coot, *Fulica americana*
- Double-crested Cormorant, *Phalacrocorax auritus*
- American Black Duck, *Anas rubripes*
- Ring-necked Duck, *Aythya collaris*
- **Ruddy Duck, *Oxyura jamaicensis* (SI)**
- Pied-billed Grebe, *Podilymbus podiceps*
- Horned Grebe, *Podiceps auritus*
- Common Merganser, *Mergus merganser*
- Hooded Merganser *Lophodytes cucullatus*
- Red-breasted Merganser *Mergus serrator*
- American White Pelican, *Pelecanus erythrorhynchos*
- **Northern Pintail, *Anas acuta* (SI)**
- Black-bellied Plover, *Pluvialis squatarola*
- Semipalmated Plover, *Charadrius semipalmatus*
- **King Rail, *Rallus elegans* (E)**
- **Virginia Rail, *Rallus limicola* (SC)**
- Redhead, *Aythya americana*
- Blue-winged Teal, *Anas crecca*
- **Green-winged Teal, *Anas crecca*(SI)**
- Lesser Scaup, *Aythya affins*
- **Northern Shoveler, *Anas clypeata* (SI)**
- **Common Snipe, *Capella gallinago* (SI)**
- Sora, *Porzana carolina*
- Mute Swan, *Cygnus olor*
- Great Blue Heron, *Aredea herodias*
- Green Heron, *Butorides stratus*
- **Black-crowned Night-Heron, *Nycticorax nycticorax* (T)**
- **Yellow-crowned Night-Heron, *Nycticorax violacea*(T)**
- **American Bittern, *Botaurus lentiginosus* (E)**
- **Least Bittern, *Ixobrychus exilis* (T)**
- **Great Egret, *Casmerodius albus,* (SC)**
- American Woodcock, *Philohela minor*
- Baird's Sandpiper, *Calidris bairdii*
- Least Sandpiper, *Calidris minutilla*

- Pectoral Sandpiper, *Calidris melanotos*
- Semipalmated Sandpiper, *Calidris pusilla*
- Solitary Sandpiper, *Tringa solitaria*
- Spotted Sandpiper, *Actitis macularia*
- Stilt Sandpiper, *Micropalama himantopus*
- Western Sandpiper, *Calidris mauri*
- White-rumped Sandpiper, *Calidris fuscicollis*
- Greater Yellowlegs, *Tringa melanoleuca*
- Lesser Yellowlegs, *Tringa flavipes*
- Bonaparte's Gull, *Larus philadelphia*
- Herrin Gull, *Larus argentatus*
- Ring-billed Gull, *Larus delawarensis*
- **Black Tern, *Chlidonias niger* (E)**
- Caspian Tern, *Sterna caspia*
- **Common Tern, *Sterna hirundo*(E)**
- Forster's Tern, *Sterna forsteri*
- House Sparrow, *Passer domesticus*
- Chipping Sparrow, *Spizella passerina*
- Song Sparrow, *Melospiza melodia*
- American Tree Sparrow, *Spizella arborea*
- Field Sparrow, *Spizellapusilla*
- Fox Sparrow, *Passerella iliaca*
- **Henslow's Sparrow, *Ammodramus henslowii* (SC)**
- Lincoln's Sparrow, *Melospiza lincolnii*
- Savannah Sparrow, *Passerculus sandwichensis*
- Swamp Sparrow, *Melospiza georgiana*
- Vesper Sparrow, *Pooecetes gramineus*
- White-crowned Sparrow, *Zonotrichia leucophrys*
- White-throated Sparrow, *Zonotrichia albicollis*
- Barn Swallow, *Hirundo rustica*
- Tree Swallow, *Tachycineta bicolor*
- Bank Swallow, *Riparia riparia*
- Northern Rough-winged Swallow, *Stelgidopteryx ruficollis*
- Northern Rough - Winged Swallow, *Stelgidopteryx serripennis*
- Chimney Swift , *Chaetura pelagica*
- Blue Jay, *Cyanocitta cristata*
- American Crow, *Corvus brachyrhynchos*
- Eastern Kingbird, *Tyrannus tyrannus*
- Great Crested Fly Catcher, *Myiarchus crinitus*
- Eastern Pewee, *Contopus virens*
- Eastern Phoebe, *Sayornis phoebe*
- Belted King Fisher, *Ceryle alcyon*
- Black-capped Chickadee, *Poecile atricapilla*
- Tufted Titmouse, *Baeolophus bicolor*
- White-breasted Nuthatch, *Sitta carolinesis*
- **Brown Creeper, *Certhia familiaris*(SI)**
- **Red-breasted Nuthatch, *Sitta canadensis* (SI)**
- House Wren, *Troglodytes aedon*
- Carolina Wren, *Thryothorus ludouicianus*

- **Marsh Wren, *Cistothorus palustris*(SC)**
- **Sedge Wren *Cistothorus* platensis(SC)**
- **Winter Wren , *Troglodytes troglodytes*(SI)**
- Blue-gray Gnatcatcher, *Polioptilla caerulea*
- Ruby-crowned Kinglet, *Regulus calendula*
- Gray Catbird, *Dumetella carolinensis*
- Brown Thrasher, *Toxostoma rufum*
- Wood Thrush, *Hylocichla mustelina*
- American Robin, *Turdus migratorius*
- Swainson's Thrush, *Catharus ustulatus*
- Eastern Bluebird, *Sialia sialis*
- **Loggerhead Shrike, *Lanius ludovicianus* (E)**
- Cedar Waxwing, *Bombycilla cedrorum*
- White-eyed Vireo, *Vireo grisues*
- Warbling Vireo, *Vireo gilvus*
- Red-eyed Vireo, *Vireo olivacues*
- Yellow-throated Vireo, *Vireo flavifrons*
- Yellow Warbler, Dendrocia petechia
- Cerulean Wabler, *Dendrocia cerulea*
- Common Yellowthroat, *Geothlypis trichos*
- Ovenbird, *Seiurus aurocapillus*
- **Blackburnian Warbler, *Dendrocia fusca* (SI)**
- Blackpoll Warbler, *Dendrocia striata*
- Black-and-white Warbler, *Mniotilta varia*
- **Black-throated Blue Warbler, *Dendrocia nigrescens* (SI)**
- Black-throated Green Warbler, *Dendrocia virens*
- **Canada Warbler, *Wilsonia canadensis* (E/SI)**
- Cape May Warbler, *Dendrocia tigrina*
- **Magnolia Warbler, *Dendrocia magnolia* (SI)**
- **Mourning Warbler, *Oporornis philadelphia* (SI)**
- Nashville Warbler, *Vermivora fuficapilla*
- Palm Warbler, *Dendrocia palmarum*
- Tennessee Warbler, *Vermivora peregrina*
- Yellow Warbler, *Dendrocia petechia*
- Yellow-rumped Warbler, *Dendrocia coronata*
- American Redstart, *Setophaga ruticilla*
- Bay-breasted Warbler, *Dendrocia castanea*
- Louisiana Waterthrush, *Seiurus motacilla*
- **Northern Waterthrush, *Seiurus noveboracensis* (SI)**
- Red-winged Blackbird, *Agelaius pheniceus*
- Brown-headed Cowbird, *Molothrus ater*
- Common Grackle, *Quiscalus quiscula*
- Baltimore Orlole, *Icterus galbula*
- Bobolink, *Dolichonyx oryzivorus*
- Eastern Meadowlark, *Sturnella magna*
- Scarlet Tanager, *Piranga olivacea*
- Rose-breasted Grosbeak, *Pheucticus ludovicianus*
- Indigo Bunting, *Passerina cyanea*
- Dickcissel, *Spiza americana*

- Northern Cardinal, *Cardinalis cardinails*
- Eastern Towhee, *Pipilo erythrophthalmus*
- European Starling, *Sturnus vulgaris*
- **Northern Bobwhite, *Colinus virginianus* (SC)**
- Rock Dove, *Columba livia*
- Mourning Dove, *Zenaida asiatica*
- Black-billed Cuckoo, *Coccyzus erythropthalmus*
- Yellow-billed Cuckoo, *Coccyzus americanus*
- House Finch, *Carpodacus mexicanus*
- American Goldfinch, *Carduelis tristis*
- Killdeer, *Charadrius vociferous*
- Ruby-throated Hummingbird, *Lampornis clemenciae*
- Short-billed Dowitcher, *Limnodromus griseus*
- Alder Flycatcher, *Empidonax alnorum*
- **Least Flycatcher, *Empidonax minimus* (T)**
- Willow Flycatcher, *Empidonax trailli*
- **Gadwall, *Anas strepera* (SI)**
- Swallow-tailed Kite, *Elanoides forficatus*
- Red-necked Phlarope, *Phalaropus spp.*
- Ring-necked Pheasant, *Phasianus colchicus*
- Wild Turkey, *Meleagris gallopavo*
- **American Wigeon, *Anas americana* (SI)**

f. Reptiles & Amphibians

There is anecdotal evidence that historic populations of Hellbenders (*Cryptobranchus alleganiensis*) inhabited the gorge area of Mill Creek, however none are known to be present at this time.

The lists of species composed below were developed by Dan McMillen, Private Lands Biologist, ODNR-Division of Wildlife and were edited by Raymond J. Novotny, Naturalist, Mill Creek MetroParks, (December 2003).

Snakes

- Black Rat Snake, *Elaphe obsoleta*
- Black Racer, *Coluber constrictor constrictor*
- Eastern Garter Snake, *Thamnophis siralis*
- Eastern Milk Snake, *Lampropeltis triagulum*
- Eastern Ribbon Snake, *Thamnophis sauritus*
- Smooth Green Snake *Opheodrys vernalis*
- Five-lined Skink, *Eumeces fasciatus*
- Northern Brown Snake, *Storeria dekayi*
- Northern Water Snake, *Nerodia sipedon*
- Queen Snake, *Natrix harteri*
- Eastern Hognose snake, *Heterodan platyrhinos*

- Northern Ringneck Snake, *Diadophis punctatus*

Turtles

- Common Snapping Turtle, *Chelydra serpentina*
- Eastern Box Turtle *Terrapene carolina*
- Midland Painted Turtle *Chrysemys picta marginata*
- Common Musk Turtle- Stinkpot , *Sternotherus odoratus*
- Spiny Softshell Turtle, *Trionyx spiniferus*

Frogs and Toads

- American Toad, *Bufo americanus*
- Bullfrog, *Rana catesbeiana*
- Gray Treefrog, *Hyla vericolor*
- Green Frog, *Rana clamitans*
- Northern Leopard Frog, *Rana pipiens*
- Spring Peeper, *Hyla crucifer*
- Western Chorus Frog, *Pseudacris triseriata*
- Wood Frog, *Rana slyvatica*

Salamanders

- Jefferson's Salamander, *Ambystoma jeffersonianum*
- Marbled Salamander, *Ambystoma opacum*
- Spotted Salamander, *Ambystoma maculatum*
- Eastern Red-backed Salamander, *Plethodon cinereus*
- Slimy Salamander, *Plethodon glutinosus*
- Two-lined Salamander, *Eyrycea bisleneata*
- Red-Spotted Newt, *Notophthalmus viridescens* v.
- Four-toed Salamander, *Hemidactylium scutatum*
- Northern Dusky Salamander, *Desmognathus fuscus*
- Mudpuppy, *Necturus maculosus*

g. Plants

The Division of Natural Areas and Preserves Natural Heritage Database identified the following Rare, Threatened and Endangered plant species in the Mill Creek Watershed:

- **Long Beech Fern**, *Phegopteris connectilis* (recorded June 1985)
- **Spotted Coral Root**, *Corrallorhiza maculata* (recorded 1976)
- **Appalachian Sedge**, *Carex appalachica* (recorded May 26, 1993)
- **Speckled Wood Lily**, *Clitonia umbellulata* (recorded May 27, 1993)

4.2. 2 Non-native Invasive Species

Over five hundred (500) species of plants in Ohio are not native to the state. Although no formal surveys have been completed within the Mill Creek Watershed for invasive

species and exact locations, it is estimated that there is a great probability that the following species of plants may occur within the watershed.

- Reed Canary Grass, *Phalaris arundinacea*
- Purple Loosetrife, *Lythrum salicaria*
- Multiflora Rose, *Rosa multiflora*
- Japanese Knotweed, *Polygonum cuspidatum*
- Japanse Honeysuckle, *Lonicera japonica*
- Garlic Mustard, *Alliaria petiolata*
- Common Reed Grass, *Phragmites australis*
- Buckthorn, *Rhamnus fragula*
- Bush Honeysuckle, *Lonicera maakii, L. tatarica, L. morrowii*
- Autumn-olive, Elaeagnus umbellate

Management measures have been taken for Purple Loostrife, *Lythrum salicaria* and Garlic Mustard, *Alliaria petiolata,* Reed Canary Grass, *Phalaris arundinacea,* Multiflora Rose, *Rosa multiflora* and Japanese Knotweed, *Polygonum cuspidatum* in areas that are owned by the Mill Creek MetroParks within the watershed.

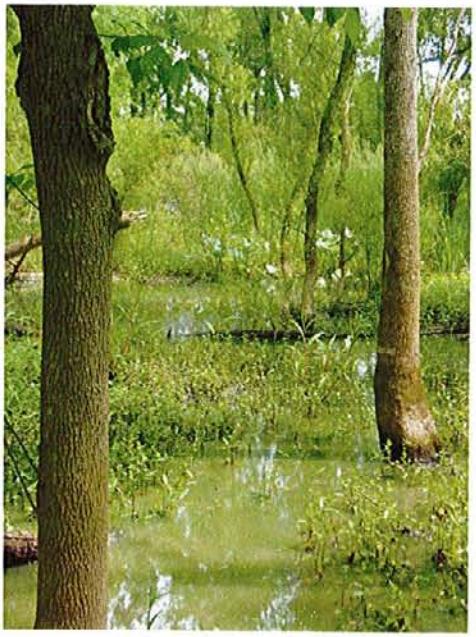
4.3 Water Resources

4.3.1 Climate and Precipitation

Approximately 36 inches of precipitation falls on Mahoning County annually. Based on 30-year records (1961-1990), the average precipitation is 3.0 inches per month, with February (1.7 inches) typically being the driest month, and July (4.1 inches) the wettest. The average snowfall for the area 55.8 inches, with the heaviest snowfall occurring in January.

4.3.2 Surface Waters

a. Wetlands



Wetlands are ecosystems that are based on five characteristics – hydrology, vegetation, soils, pH, and its trophic state. Hydrology is defined by isolation from, or connection to, waters of the state (regulated waters). Vegetation is categorized by class, community, and type. Wetland soils are classified as hydric or non-hydric with hydric inclusions. Soils and hydrology are further characterized by their pH as alkaline, neutral, or acidic. Trophic state relates to the amount and availability of nutrients to support the ecosystem.

Wetlands are identified under either scenario by having three distinguishing characteristics.

1. Wetlands have water (hydrology) at or above the ground surface or present at the plant root zone during the growing season, and
2. Wetlands have unique soil (hydric) conditions that differ from upland areas, and
3. Wetlands have vegetation adapted to periods of inundation (hydrophytes).

A wetland system contains these three characteristics, and supports wetland species (plants, animals, microbes) that have adapted to varying degrees to a wet environment. The degrees of adaptation range from *facultative*, meaning a species is able to exist in either a dry or wet environment, to *obligate*, meaning a species is only able to survive in a wet environment.

Hydrology is the study of water movement and storage. Wetlands may be supported by surface water within waterways such as rivers, streams, lakes, and other drainage ways, as well as by direct precipitation. Flow of surface waters may be ephemeral, intermittent, or perennial. Ephemeral streams flow only in direct response to precipitation; the stream channel is always above the ground water table. Intermittent flow occurs seasonally from input from springs, rainfall, and other surface sources such as snowmelt. Perennial flow occurs continually, even during lengthy periods with no rain. Perennial waterways usually have some ground water input, but may dry up in extreme drought conditions.

In addition, wetlands may receive water from, or supply water to, the ground water. Wetlands and other surface waters may be classified as gaining, losing, or insulated with respect to the ground water table. Gaining indicates a waterway or wetland receiving water from the ground water. Losing indicates waterways and wetlands that contribute water to the ground water table. Insulated indicates a waterway or wetland that does not receive from, or contribute to, the ground water. This is typically due to an impermeable barrier (e.g., soil) between the wet area and the ground water table. Wetlands may also be supported by horizontal zones of water-saturated soils located above the general groundwater table. Where these zones intersect the ground surface, they are often called seeps.

Hydric soils have standing water or are saturated for sufficient periods during the growing season to develop anaerobic conditions. Anaerobic soil conditions are those where oxygen is not present within soil pores. Hydric soils do not require long periods of flooding, as anaerobic conditions can occur after two weeks of soil inundation. Traditionally, hydric soils are considered to be poorly drained with a water table or saturation zone present within one foot of the surface for two weeks or more during the growing season.

Hydraulic conductivity is an important factor in the formation of hydric soils. Hydraulic conductivity is described as the process by which water (in the form of precipitation, irrigation water, or snowmelt) enters and travels down through the soil. Factors that influence hydraulic conductivity are pore size or soil texture, soil structure, amount of organic material, amount of water already in the soil, depth to impervious layers (hardpan

or bedrock) below soil, compaction of the soil, soil temperature, topography, vegetative cover, and evaporation rate.

Soil texture (or grain size) has a dramatic effect on hydraulic conductivity. Soils with larger grain sizes (and thus larger pore spaces), such as sand and gravel, have a higher hydraulic conductivity than fine-grained soils (e.g., silt and clay) with smaller pore spaces. Organic matter in hydric soils can cause large variations in hydraulic conductivity. Soil saturation also affects the hydraulic conductivity. As soil saturation increases, there is less pore space for water to travel through.

Capillary action is the ability to draw water against the pull of gravity upwards towards the ground surface. Silt has the potential to draw water up 14-20 inches above the groundwater table. When soil is saturated within the rhizosphere (section of soil surrounding plant roots), there is generally no oxygen available. Plants use their roots to take up oxygen from the soil, and if they not adapted to these wet conditions, the plants will die. Hydrophytes are plants having adaptations to help them take oxygen directly from the atmosphere or water instead of the soil. So when a soil is flooded long enough during an individual species growing season, only plants with the adaptations to retrieve oxygen will survive and grow.

Mahoning County has 14 hydric soils that support wetlands, and represent soil types from organic to mineral, with textures of sand, clay, silt, and loam. Tilling and other land change practices can create hydric soil inclusions in otherwise non-hydric soils. These inclusions can be found in 12 Mahoning County soils. Lists of hydric soils and non-hydric soils containing hydric inclusions are presented in Table 4.

Table 4. Hydric Soils and Non-Hydric Soils With Hydric Inclusions found in Mahoning County.

Hydric Soils		Non-Hydric Soils with Hydric Components
Soil Type	**Acres**	**Soil Type**
Canadice silty clay loam	1,712	Bennington silt loam, 2-6% slope
Carlisle muck	578	Fitchville silt loam, 0-2% slope
Condit silt loam	301	Fitchville-Urban land complex
Damascus loam	1,966	Mahoning-Urban land complex
Damascus loam, till substratum	557	Orrville silt loam
Frenchtown silt loam	5,202	Ravenna silt loam, 0-2% slope
Kerston muck	119	Ravenna silt loam, 2-6% slope
Lorain silty clay loam	2,729	Remsen silt loam, 0-2% slope
Luray silt loam	706	Remsen silt loam, 2-6% slope
Luray silty clay loam	1,434	Rittman-Urban land complex
Marengo silty clay loam	1,003	Wadsworth silt loam, 0-2% slope
Olmstead loam	450	Wadsworth silt loam, 2-6% slope
Papakating silt loam	838	
Papakating silty clay loam	1,252	
Sebring silt loam	10,095	
Sebring silt loam, till substratum	858	
Trumbull silt loam, 0-2% slope	9,277	
Trumbull silt loam, 2-6% slope	963	
Trumbull-Urban land complex	188	
Wayland silt loam	8,239	
Total	**48,467**	

Hydrophytic plants are those that have adapted to grow in or on a substrate that is periodically or consistently deficient in oxygen as a result of excessive water content. Adaptations to the leaves and stems help make it possible for these plants to exchange necessary atmospheric gases, such as carbon dioxide and oxygen, by means other than through the root system.

Submergent plants normally spend their entire life cycle beneath the water's surface, with the exception of the flower. Most submergent plants are rooted in the soil/substrate, but there are several species that float free in the water column. Stems and leaves have a tendency to be soft so they are flexible enough to withstand water movement without incurring damage.

The Wetland Plant Indicator Status classification system is based on the probability that a plant will be found in a wetland or upland environment. The classifications are listed in Table 5.

Table 5. U. S. Fish and Wildlife Service Wetland Plant Indicator Status Classification System.

Wetland Indicator Status	Frequency Found in Wetlands
Obligate (OBL)	Found in wetlands 99% of time
Facultative Wet (FACW)	Found in wetlands 67-99% of time
Facultative (FAC)	Found in wetlands 34-66% of time
Facultative Upland (FACU)	Found in wetlands 1-33% of time
Upland (UPL)	Found in wetlands less than 1% of time

The Ohio Wetland Inventory (OWI) maps show approximately 3,105 acres of wetlands in the Mill Creek Watershed in Appendix D, but the figure is probably larger. Based on analysis of soil types and topography conducted by Youngstown State University (YSU) for the purpose of identifying sites for potential wetland mitigation banks, it seems likely that there are a number of areas which are not currently identified by the OWI, but would probably be subject to future delineation.

The wetland inventory maps include the land-cover classes of open water, shallow marsh and wet meadow, shrub-scrub and farmed wetland. Acreages for each class of wetland is shown in the Table 6 .

Table 6. Mill Creek Watershed Wetlands.

Wetland Type	Area (acres)
Open Water	703
Shallow Marsh	384
Scrub/Shrub	262
Wet Meadow	87
Woods on Hydric Soil	1,630
Farmed Wetland	39
Total Area	**3,105**

** Data from the Ohio Wetland Inventory*

The open-water zone is defined as the area of water without vegetation or without emergent plants extending above the water surface. The shallow-marsh zone is an area of emergent vegetation that normally maintains surface water for an extended period in spring and early summer, but is frequently dry in later summer and fall. Wet meadows are lands characterized by nearly continuous moist-soil conditions and are usually dominated by sedges rather than grasses. Wetlands were classified as 'farmed' when there is evidence of attempts at crop production within the wetlands.

Large wetlands areas are found along the riparian corridor of Mill Creek between the Columbiana-Mahoning County line and SR 224. These riparian wetlands total about 1750 acres, and are a mixture of forested, scrub/shrub, emergent, and open water wetlands. Smaller (20 acres or less), isolated wetlands are scattered around the watershed.

The NWI maps show several wetland areas near the intersection of Raccoon and Western Reserve Roads south of the City of Canfield. Some of these are open water wetlands resulting from former strip mining operations. Others are natural forested, scrub/shrub, or emergent wetlands. The wetlands of the Mill Creek watershed perform functions including storm and floodwater retention and cleansing; removal of excess nutrients and herbicides from agricultural runoff; groundwater, stream and saturation zone recharge; natural wildlife habitats and corridors; and preservation and conservation of threatened and endangered species.

b. Streams

The Mill Creek watershed has approximately 303 miles of streams (see map 3.3c for more detail). The mainstem of Mill Creek is 20.9 miles long, according to the Gazetteer of Ohio Streams (98) [iii], however according to county GIS the Mainstem of Mill Creek is 23.9 miles long (see map 3.3c). Mill Creek has 7 tributaries which are named by the Gazetteer, but several more which are recognized as being named locally.

Tributaries per Gazetteer of Ohio Streams

- Bears Den Run (4.1 miles)
- Axe Factory Run (4.0 miles)
- Andersons Run (4.5 miles)
- Cranberry Run (1.6 miles)
- Indian Run (4.8miles)
- Saw Mill Run (2.4 miles)
- Turkey Run (3.7 miles)

Other tributaries typically recognized locally are

- Calvary Run, City of Youngstown.
- Little Indian Run (tributary to Indian Run), Canfield and Boardman Township.
- North Lima Creek/Sharrott Run, Beaver Township.

According to Mahoning County GIS, Mill Creek has identified 90 unnamed tributaries, many of them are first order streams. Existing data on these streams is lacking or nonexistent. Data should be collected according to the methodologies outlined by the Ohio EPA or US EPA.

Youngstown State University, GIS has identified the following streams within Mill Creek watershed.

- **HUC 05030103-080-030** (Bears Den Run, Axe Factory Run, Anderson Run, Mill Creek mainstem, Cranberry Run, UNT21011, UNT21009, UNT21010, UNT21012, UNT22008, UNT21029, UNT21030, UNT21031, UNT21028, UNT21032, UNT21036, UNT22033).

- **HUC 05030103-080-020** (Little Indian Creek, Indian Run, Mill Creek mainstem, UNT21059, UNT21047, UNT21048, UNT21046, UNT21050).

- **HUC 05030103-080-010** (Sawmill Run, Moff Run, Sharrott Run, Turkey Creek, Mill Creek mainstem, UNT 21055, UNT 21056, UNT 22058, UNT21059, UNT21062, UNT22063,UNT21064, UNT21074,UNT21067, UNT22066, UNT21073, UNT21069, UNT21071, UNT21072, UNT21076, UNT21077, UNT21078, UNT21079, UNT22080, UNT21082, UNT22083).

Figure 5

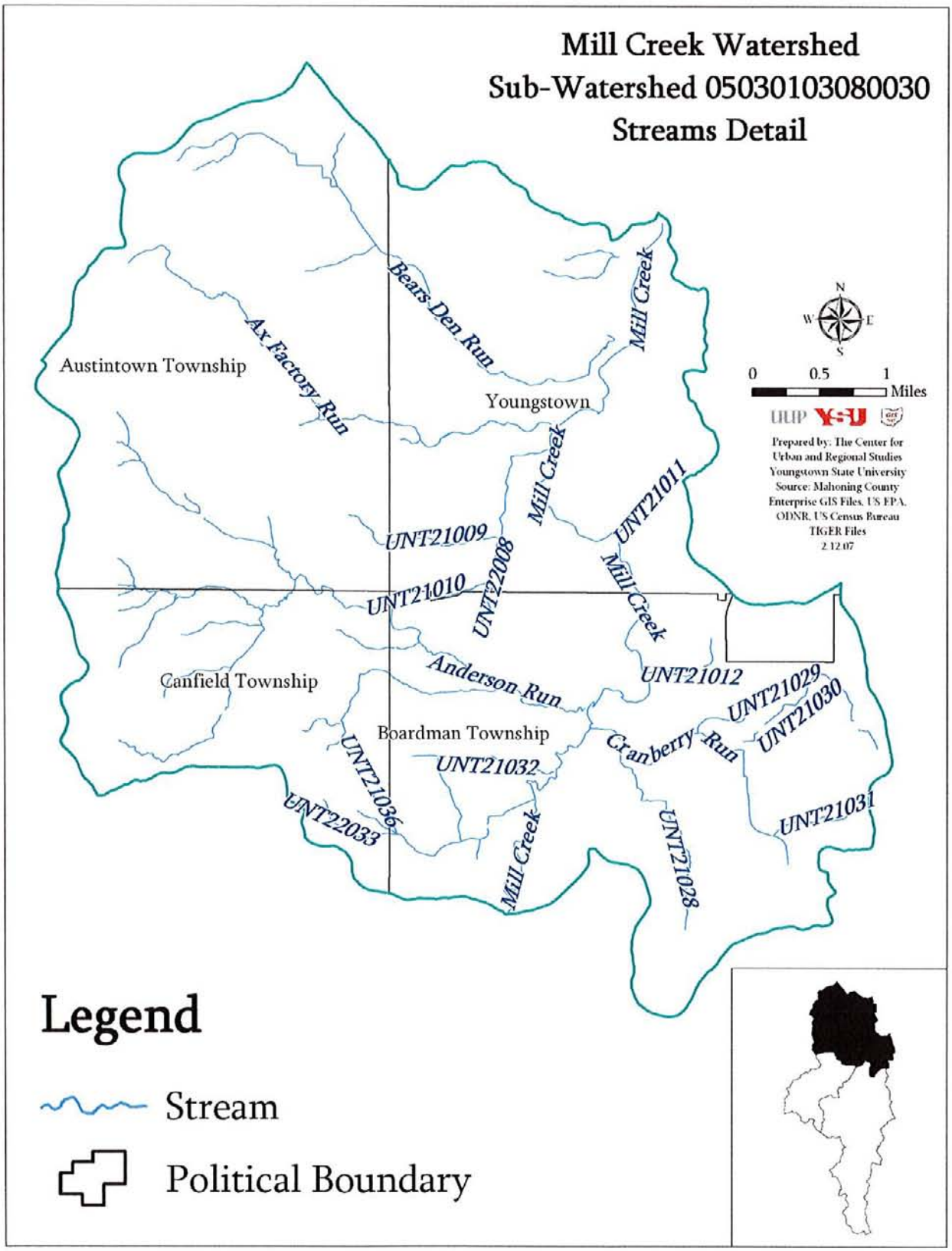

Mill Creek Watershed
Sub-Watershed 05030103080030
Streams Detail
Austintown Township
Ax Factory Run
Bears Den Run
Mill Creek
Youngstown
Mill Creek
UNT21011
UNT21009
UNT22008
Mill Creek
UNT21010
Canfield Township
Anderson Run
UNT21012
UNT21029
UNT21030
Boardman Township
Cranberry Run
UNT21032
UNT21036
UNT22033
Mill Creek
UNT21028
UNT21031
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.12.07
Legend
Stream
Political Boundary

Figure 6

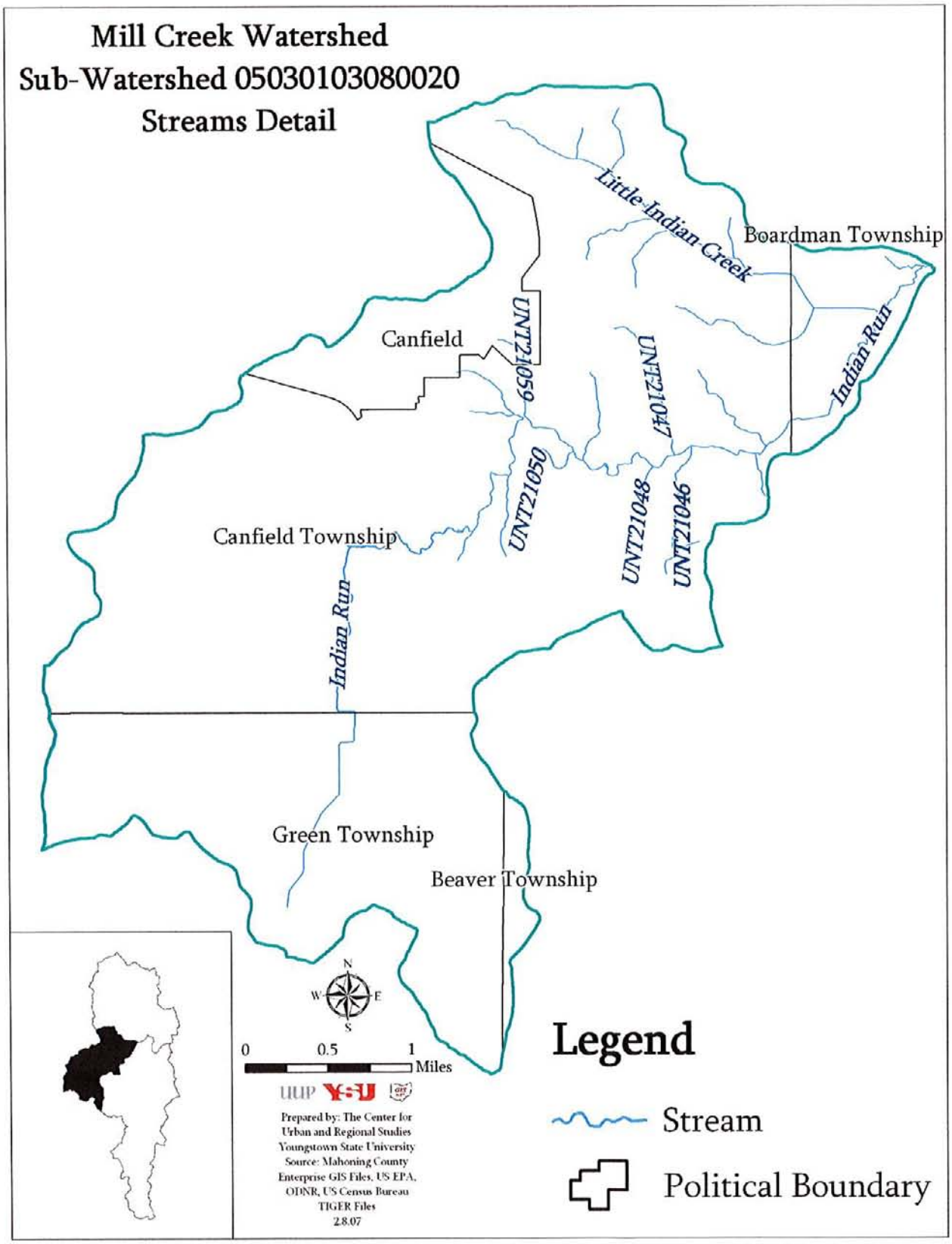
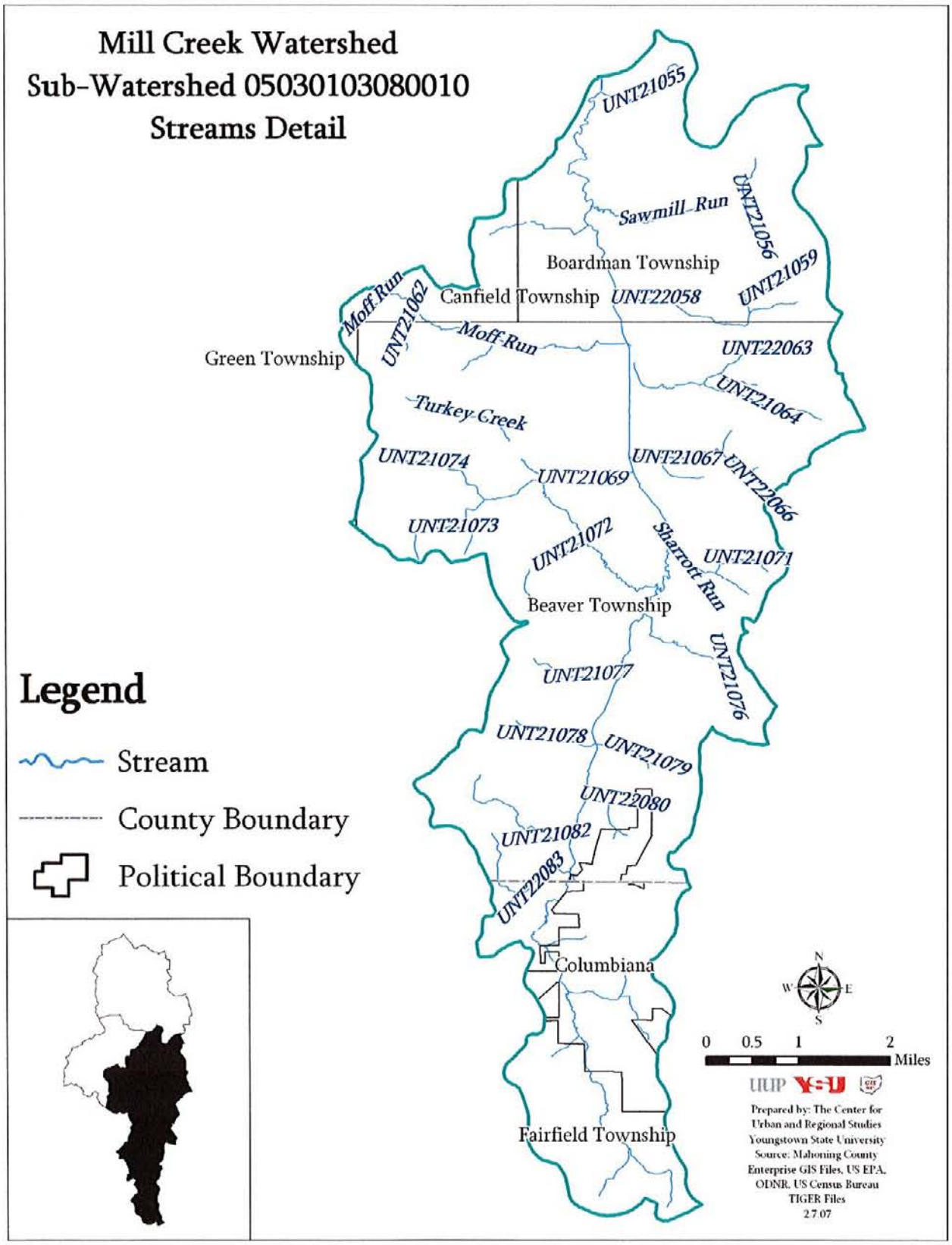

Mill Creek Watershed
Sub-Watershed 05030103080020
Streams Detail
Little Indian Creek
Boardman Township
Indian Run
Canfield
UNT21059
UNT21047
UNT21050
UNT21048
UNT21046
Canfield Township
Indian Run
Green Township
Beaver Township
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files 2.8.07
Legend
Stream
Political Boundary

Figure 7


Mill Creek Watershed
Sub-Watershed 05030103080010
Streams Detail
UNT21055
Sawmill Run
UNT21056
UNT21059
Boardman Township
Canfield Township
UNT22058
Moff Run
UNT21062
Moff Run
Green Township
UNT22063
UNT21064
Turkey Creek
UNT21074
UNT21069
UNT21067
UNT22066
UNT21073
UNT21072
Sharrott Run
UNT21071
Beaver Township
UNT21077
UNT21076
UNT21078
UNT21079
UNT22080
UNT21082
UNT22083
Columbiana
Fairfield Township
Legend
Stream
County Boundary
Political Boundary
N
W
E
S
0 0.5 1 2
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

c. Low Flow

Low-flow stream data is important for water-resource managers for things including but not limited to the proper design of hydrologic structures, habitat assessments, industrial or municipal supply or waste disposal limitations. Knowing the amount of flow in a stream is critical for making decisions about water resources and preventing actions that are potentially harmful to water quality and aquatic life. Many agencies use the low flow characteristics such as the minimum 7 day average streamflow within a 10 year reoccurrence interval ($7Q_{10}$), or the harmonic mean flow as target conditions or thresholds for making regulatory decisions.

There are three USGS stations on Mill Creek, and consist of the following:

- USGS 03098406 Mill Creek at Shields Rd. at Boardman, Ohio
- USGS 03098500 Mill Creek at Youngstown, Ohio
- USGS 03098513 Mill Creek at Price Rd. at Youngstown, Ohio

Although there are three USGS streamflow gaging stations located on Mill Creek, (and in the entire Mill Creek watershed) only one station has computed low-flow statistics completed. The information below is provided as listed in the USGS (U.S. Geological Survey) Low-Flow Characteristics of Streams in Ohio through Water Year 1997 - Water Resource Investigation Report, 01-4140.

Beaver River Basin
03098500 Mill Creek at Youngstown, Ohio

LOCATION: Lat: 41° 04' 19", Long 80° 41' 26", Mahoning County, Hydrologic Unit 05030103, on right bank 600 ft upstream from Suspension Bridge in Mill Creek Park at Youngstown, 1.0 mi downstream from Newport Dam, and 2.5mi upstream from mouth.

DRAINAGE AREA: 66.3 mi^2

TRIBUTARY TO: Mahoning River

STREAMFLOW DATA USED: October 1952 to September 1971

REMARKS: Flow regulated intermittently by Newport Dam beginning 1952.

SELECTED STREAMFLOW CHARACTERISTICS:

Harmonic Mean Flow:	3.86 ft^3/s
Average Streamflow:	58.1 ft^3/s (19 years)
Minimum Daily Streamflow:	0.10 ft^3/s

Table 7. Magnitude and Frequency of Low Flows for Indicated Periods

Peroid	Number of consecutive days	Streamflow (ft³/s) for indicated recurrence interval (years)				
		2	5	10	20	50
Apr-Mar	1	0.5	0.2	0.1	0.1	0.1
	7	0.9	0.3	0.2	0.1	0.1
	30	3	1.2	0.8	0.5	0.3
	90	6.1	3.5	2.8	2.4	2
May-Nov.	1	0.6	0.2	0.1	0.1	0.1
	7	0.9	0.3	0.2	0.1	0.1
	30	3.1	1.3	0.8	0.5	0.3
	90	6.3	3.6	2.9	2.4	2

Peroid	Number of consecutive days	Streamflow (ft³/s) for indicated recurrence interval (years)				
		2	5	10	20	50
Dec.-Feb.	1	7.7	2.1	0.8	0.3	0.1
	7	13	5	2.2	0.9	0.3
	30	19	8.2	5	3.3	2
	90	69	33	20	13	6.9
Sep.-Nov.	1	0.8	0.3	0.2	0.1	0.1
	7	1.3	0.5	0.3	0.2	0.1
	30	4.6	2	1.2	0.8	0.4
	90	14	6.7	4.7	3.6	2.6

Table 8. Duration of Daily Flows for Idicated Periods.

Peroid	Streamflow (ft³/s) that was equaled or exceeded for the indicated percent of time												
	98	95	90	85	80	75	70	60	50	40	30	20	10
Apr.-Mar.	0.4	1.3	2.5	3.6	5	6.7	8.3	13	19	28	41	70	148
May-Nov.	0.3	0.7	1.7	2.4	3.1	3.9	4.8	6.9	9.6	14	20	31	66
Dec.-Feb.	2.3	4.3	7.3	9.3	12	14	16	22	28	37	54	94	194
Sep.-Nov.	0.4	0.6	1.3	1.9	2.4	2.9	3.5	5.2	7.4	10	15	23	41

For more detailed information about low flow data for Mill Creek, please see the full report text. A copy of this report can be purchased through USGS or downloaded at the USGS website http://oh.water.usgs.gov/reports/wrir/wrir01-4140.pdf .

d. Lakes and Reservoirs

County GIS shows approximately 1,204 acres of ponds and lakes in the Mill Creek Watershed). There are 193.1 acres of lakes within the watershed. The largest lakes in the watershed are the impoundments on the mainstem of Mill Creek itself. Of these three, Lake Glacier is the farthest north, with its dam located approximately 500 feet from the Mill Creek confluence with the Mahoning River. Lake Glacier covers a surface area of 38.3 acres. Lake Cohasset covers 23.8 acres and is the center lake in the chain with its dam situated near where Old Furnace Road crosses Mill Creek. Lake Newport is the southern most of the Mill Creek impoundments and covers 75.2 acres. The Newport dam is just within the Youngstown City limits, south of the US 62 bridge over Mill Creek. Table 10 provides the acreages for each lake within the watershed.

Data is collected by the Ohio EPA within the pools of Lake Glacier and Lake Cohasset, but data for Lake Newport is interpolated from Ohio EPA data for nearby points on Mill Creek. Please contact Ohio EPA for data collected in the past that is specific to these lakes. The 305b report for 2000 does not list any data for Lake Glacier, Lake Cohasset or

Lake Newport.[iv]. Information and data is lacking or nonexistent for other lakes and ponds within the watershed.

Table 9. Lakes and Reservoirs in Mill Creek Watershed

Watershed	Name	Acreage
05030103080010	Arrowhead Lake	34.4
05030103080010	Wildwood Lake	2.4
05030103080030	Fox Lake	3.7
05030103080030	Lake Cohasset	23.8
05030103080030	Lake Glacier	38.3
05030103080030	Lake Newport	75.2
05030103080030	Lily Pond	3.1
05030103080030	Woodside Lake	12.2

Sources: Mahoning County Enterprise GIS Files; US EPA reach file, v3

e. Ground Water

"Water is the one substance from which the earth can conceal nothing; it sucks out its innermost secrets and brings them to our very lips." Jean Giraudoux, The Madwoman of Chaillot, 1946

According to the publication Water Resources of Mahoning County. AEX-480.50-97 John M. Stamm, Karen T. Ricker, Larry C. Brown. Ohio State University Extension Food, Agricultural and Biological Engineering

"As water moves through the sandstone, shale, and sand and gravel aquifers underlying Mahoning County, it dissolves the minerals contained in these formations and carries them in solution. Publication AEX-490.50 summarizes some of the county's natural ground-water quality aspects."

Human activities, such as agricultural production, domestic waste disposal, and lawn and turf care may have some influence on the county's ground-water quality. In a 1987 study by Heidelberg College, 417 wells in the county were sampled for nitrate-nitrogen content, an indicator of water quality. Results showed that 360 wells (86 percent of total) contained nitrate-nitrogen concentrations in the range of 0 to 0.3 parts-per-million (ppm). This range is assumed to represent natural background levels. Forty-three wells (10 percent) tested in the range of 0.3 to 3.0 ppm, values that may or may not indicate human influence. The 10 wells (two percent) that tested in the range of 3.0 to 10 ppm may indicate elevated concentrations resulting from human activities. Only four wells (0.01 percent) tested over the safe drinking-water standard of 10 ppm nitrate-nitrogen. The average nitrate-nitrogen concentration for the 417 wells tested was 0.4 ppm. The design, location, and condition of a well, combined with the characteristics of the soils and geologic formations in which the well is constructed, influence the potential for pollutants to enter the well. In 1995, at the request of mortgage lenders, the Mahoning County General Health District tested septic tanks and wells at 65 private residences; 31 of the wells tested positive for coliform bacteria. For more information about

bacteriological water sampling contact the Mahoning County Board of Health (2810 Market St., Youngstown, Ohio 44507; 330-788-7041)."

f. Aquifers

Mahoning County's aquifers are varied and provide a range of yields. The highest yielding aquifer is the Pennsylvania sandstone aquifer under 100 feet of permeable sand and gravel deposits found along a small portion of Crab Creek in Youngstown and in the southwestern part of Smith Township. Sustained yields of 200 gallons per minute (gpm) can be found in wells over 300 feet deep. This is sufficient for municipal and industrial use.

Yields of 50 to 80 gpm are found in sandstone aquifers under glacial deposits in the majority of Coitsville Township, and in small parts of Milton, Jackson, Canfield, and Springfield, and around the town of Perkins Corners. Another productive aquifer consists of valley fill deposits of sand and gravel found along the Mahoning River in the northeastern part of the county, along most of Mill Creek, and the Middle Branch of Little Beaver Creek south of Ellsworth, and in part of southwestern Smith Township. Yields of 40 to 60 gpm from this aquifer are suitable for small industrial and farm supplies.

Mahoning County's largest ground-water source in terms of area is a sandstone aquifer under unconsolidated deposits that yields from 10 to 25 gpm, sufficient for domestic and farm use. This aquifer is found throughout at least 50 percent of Mahoning County. An overview of the ground-water resources in the county is given in Mahoning County Ground-Water Resources, AEX-490.50.

The yield of a well will vary considerably depending on the age and depth of the well, well construction, the diameter of the casing, pump capacity and age, and more importantly, properties of the geologic formation. Specific information on ground-water availability and wells can be obtained by contacting the ODNR Division of Water.

Source: Ohio State University Extension, Food, Agricultural and Biological Engineering, 590 Woody Hayes Dr., Columbus, Ohio 43210, Water Resources of Mahoning County, AEX-480.50-97, John M. Stamm, Karen T. Ricker & Larry C. Brown

For detailed maps of the Mill Creek watershed aquifers, aquifer yields and other groundwater information in addition to the maps provided below please refer to Appendix E.

Figure 8

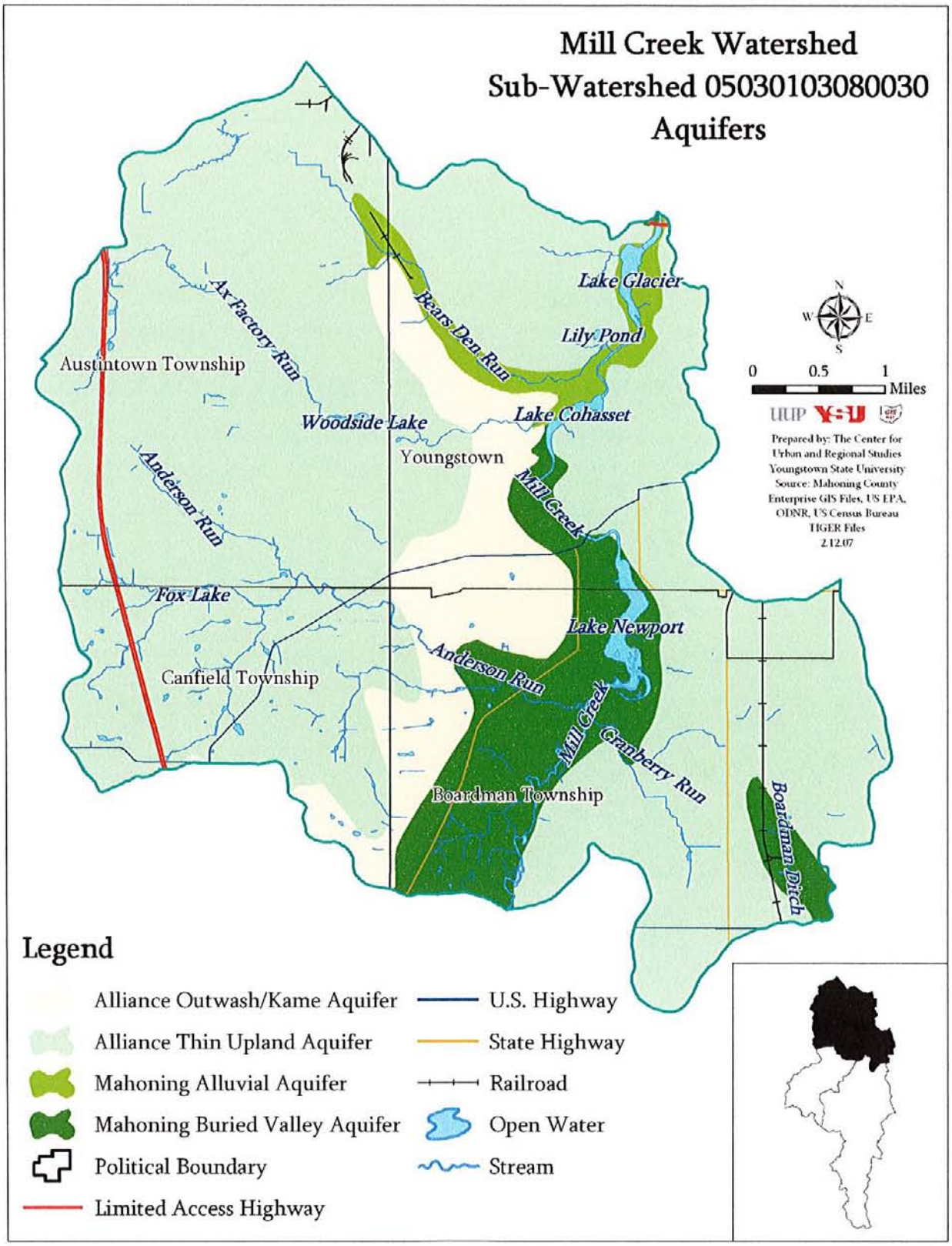

Mill Creek Watershed
Sub-Watershed 05030103080030
Aquifers
Lake Glacier
Lily Pond
Bears Den Run
Ax Factory Run
Austintown Township
Woodside Lake
Lake Cohasset
Youngstown
Anderson Run
Mill Creek
Fox Lake
Lake Newport
Anderson Run
Canfield Township
Mill Creek
Cranberry Run
Boardman Township
Boardman Ditch
N
W
E
S
0
0.5
1
Miles
UUP
Y=U
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.12.07
Legend
Alliance Outwash/Kame Aquifer
Alliance Thin Upland Aquifer
Mahoning Alluvial Aquifer
Mahoning Buried Valley Aquifer
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad
Open Water
Stream

Figure 9

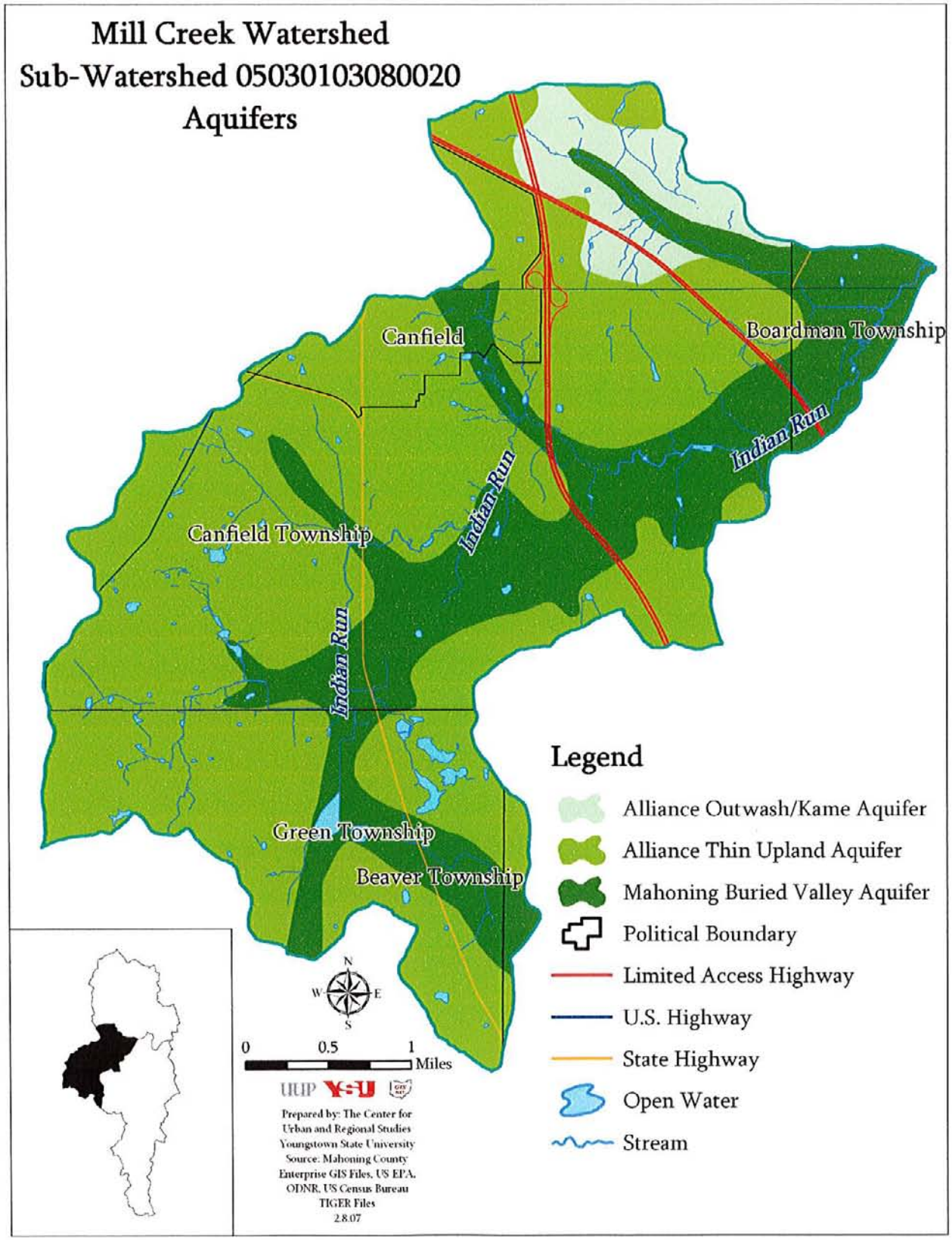
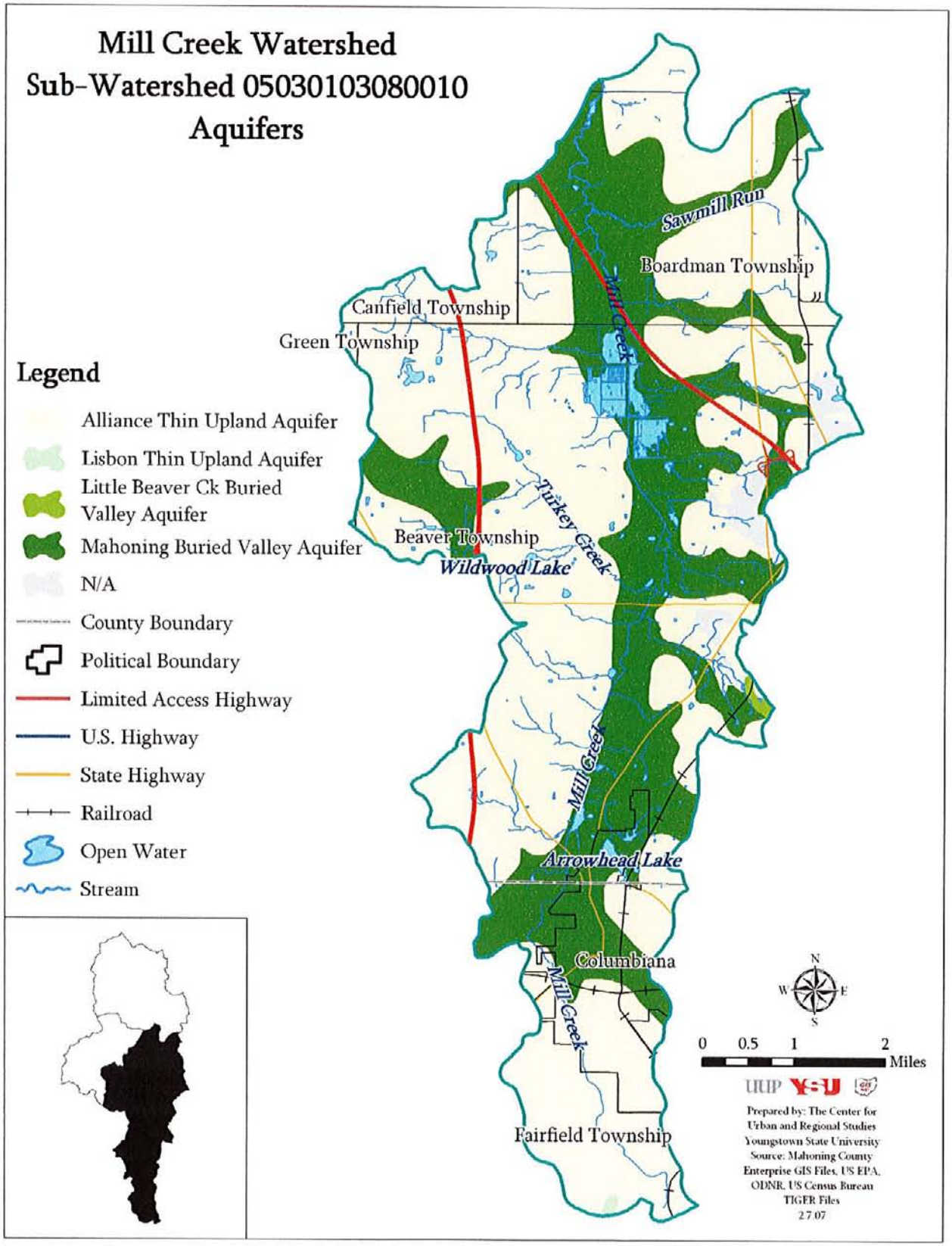

Mill Creek Watershed
Sub-Watershed 05030103080020
Aquifers
Canfield
Boardman Township
Indian Run
Indian Run
Canfield Township
Indian Run
Green Township
Beaver Township
Legend
Alliance Outwash/Kame Aquifer
Alliance Thin Upland Aquifer
Mahoning Buried Valley Aquifer
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Open Water
Stream
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.8.07

Figure 10


Mill Creek Watershed
Sub-Watershed 05030103080010
Aquifers
Legend
Alliance Thin Upland Aquifer
Lisbon Thin Upland Aquifer
Little Beaver Ck Buried Valley Aquifer
Mahoning Buried Valley Aquifer
N/A
County Boundary
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad
Open Water
Stream
Sawmill Run
Boardman Township
Canfield Township
Green Township
Mill Creek
Turkey Creek
Beaver Township
Wildwood Lake
Arrowhead Lake
Columbiana
Fairfield Township
N
W
E
S
0 0.5 1 2
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

g. Groundwater Sensitivity

The areas identified within the Mill Creek watershed with higher groundwater pollution potential are known as buried valleys. There are two major types of buried valleys described in the Ground Water Pollution Potential Reports Nos. 35 and 51 complied by the Ohio Department of Natural Resources Division of Water in 1994 for Columbiana County and 2003 for Mahoning County. The Mill Creek watershed contains the buried valley occupied by a modern stream valley. According to both reports, the buried valley occupied by a modern stream valley contains abundant outwash or kame deposits and is east to distinguish from the surrounding steep bedrock and till uplands. Valley floors are relatively flat and broad. These valleys contain variable thickness of sand and gravel outwash and finer-grained till and lacustrine deposits. The upper 20-30 feet is typically composed of sand and gravel outwash terraces or kames. Depth top water is typically less than 30 feet for the trunk of the valley and 30-50 feet for the margins. Yields up to 500 gpm have been reported for properly constructed and large diameter wells, typical yields are in the 25-100 gpm range. Streams are typically in direct hydraulic connection with the underlying aquifer. Soils are typically silt loams or sandy loams. Recharge is high due to the permeable soils and vadose media, flat topography, and shallow depth to water.

The Mahoning County Groundwater Pollution Potential Report index values for the hydrogeologic setting of buried valley range from 106-168 with the total number of GWPP index calculations equaling 64. The Columbiana County Groundwater Pollution Potential Report index values for the hydrogeologic setting of buried valley rage from 104-173 with the total number of GWPP index calculations equaling 49.

The areas that are identified within the Mill Creek watershed as sensitive to groundwater pollution are located along Mill Creek. In Boardman Township the sensitive areas along Mill Creek are located north and south of U.S. Route 224. This area is highly commercialized and contains dense residential subdivisions. Even though Mill Creek MetroParks property creates a buffer zone around Mill Creek, the intense commercial and residential development in this area is a threat to groundwater resources.

The maps presented below were created incorporating the major hydrogeologic features that effect and control ground water movement and occurrence including **D**epth to water, net **R**echarge, **A**quifer media, **S**oil media, **T**opography, **I**mpact of vadose zone media, and hydraulic **C**onductivity of the aquifer (DRASTIC).

Surface contamination potential to ground water is depicted on the maps by different colors. The warm colors (red, orange and yellow) depict areas that are more vulnerable, cooler colors (violet, blue and green) possess a lower pollution potential index (vulnerability).

Figure 11

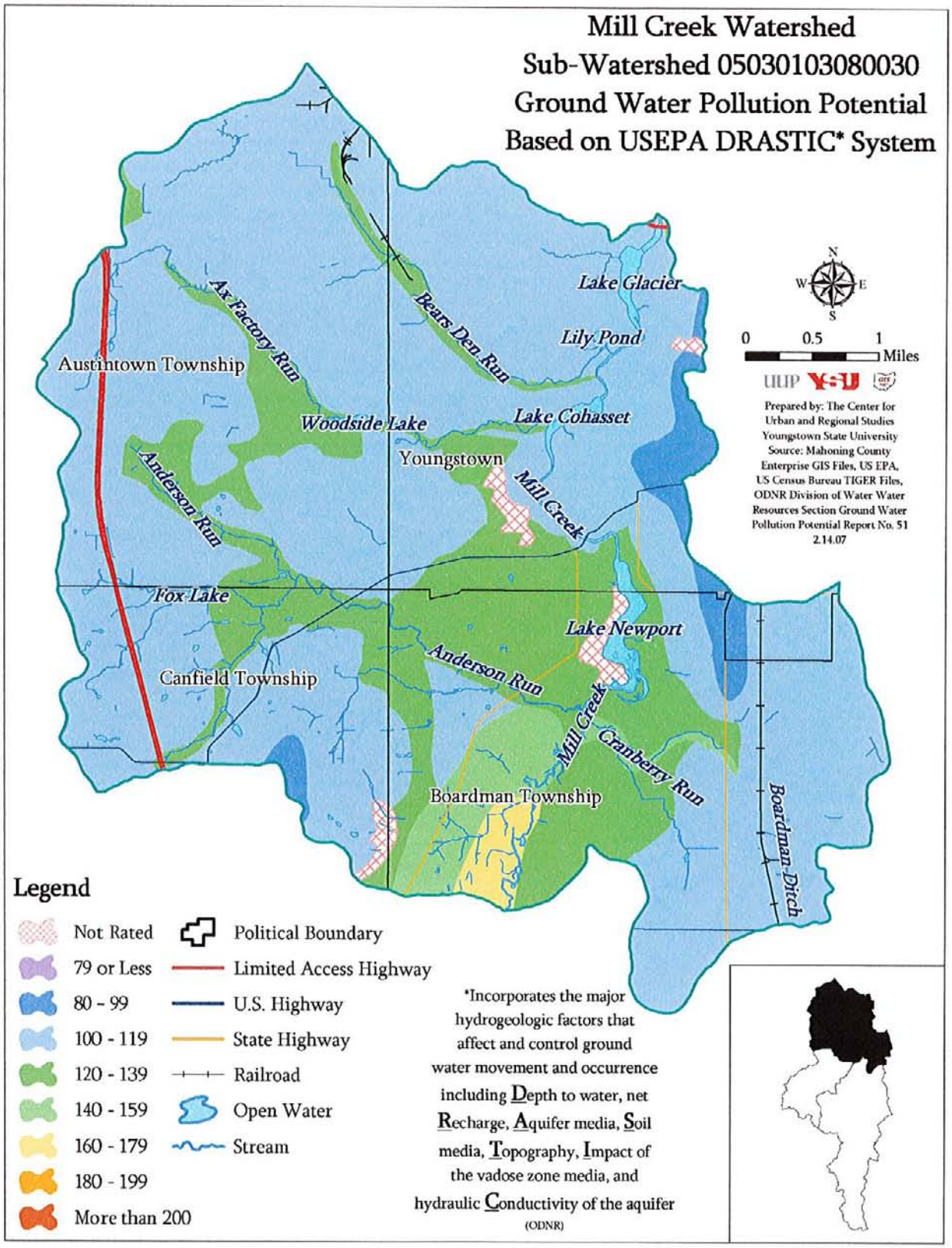

Mill Creek Watershed
Sub-Watershed 05030103080030
Ground Water Pollution Potential
Based on USEPA DRASTIC* System
Lake Glacier
Lily Pond
Bears Den Run
Ax Factory Run
Austintown Township
Woodside Lake
Lake Cohasset
Youngstown
Mill Creek
Anderson Run
Fox Lake
Lake Newport
Anderson Run
Canfield Township
Mill Creek
Cranberry Run
Boardman Township
Boardman Ditch
N
W
E
S
0
0.5
1
Miles
UUP
Y=U
Prepared by: The Center for Urban and Regional Studies Youngstown State University Source: Mahoning County Enterprise GIS Files, US EPA, US Census Bureau TIGER Files, ODNR Division of Water Water Resources Section Ground Water Pollution Potential Report No. 51 2.14.07
Legend
Not Rated
79 or Less
80 - 99
100 - 119
120 - 139
140 - 159
160 - 179
180 - 199
More than 200
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad
Open Water
Stream
*Incorporates the major hydrogeologic factors that affect and control ground water movement and occurrence including Depth to water, net Recharge, Aquifer media, Soil media, Topography, Impact of the vadose zone media, and hydraulic Conductivity of the aquifer
(ODNR)

Figure 12

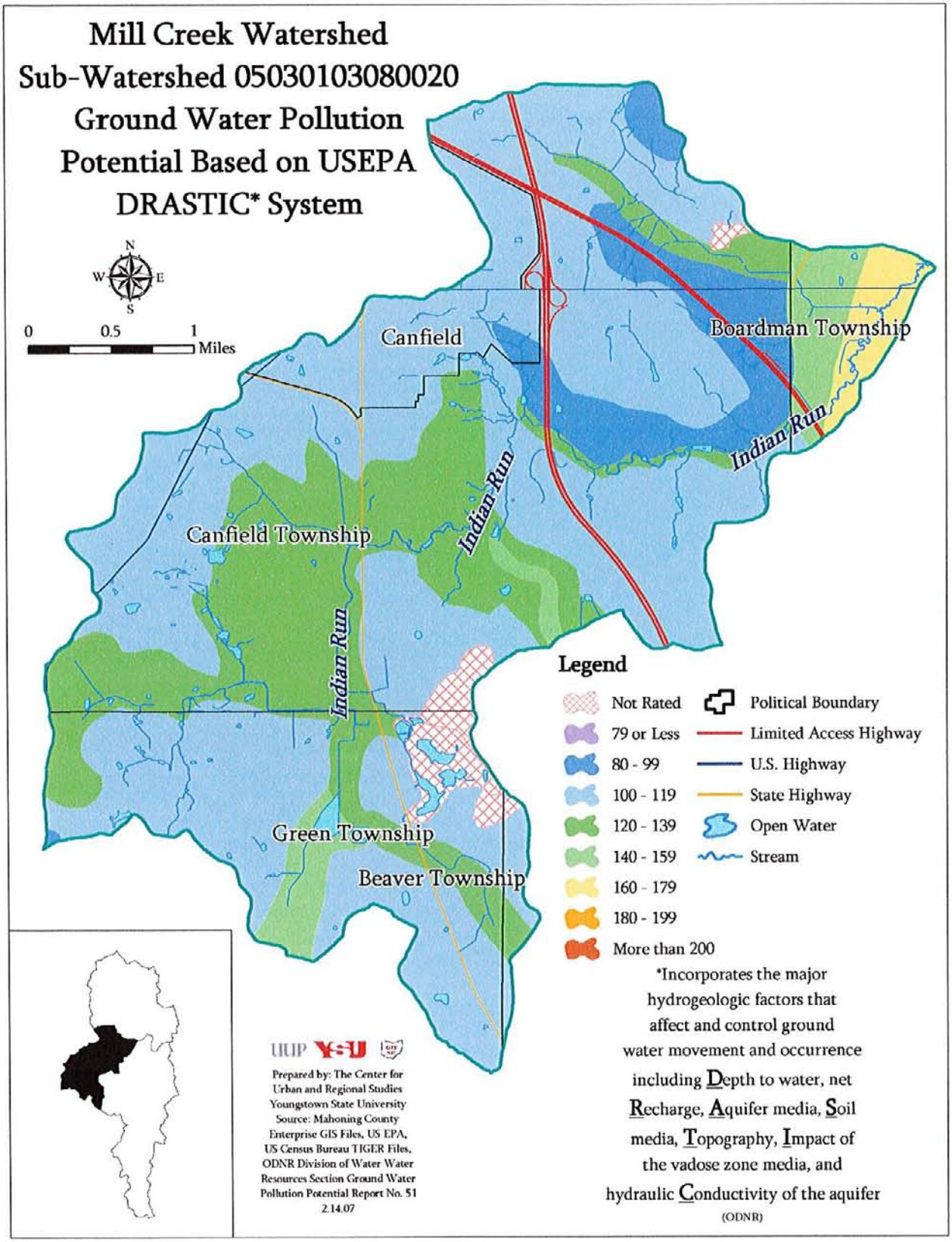
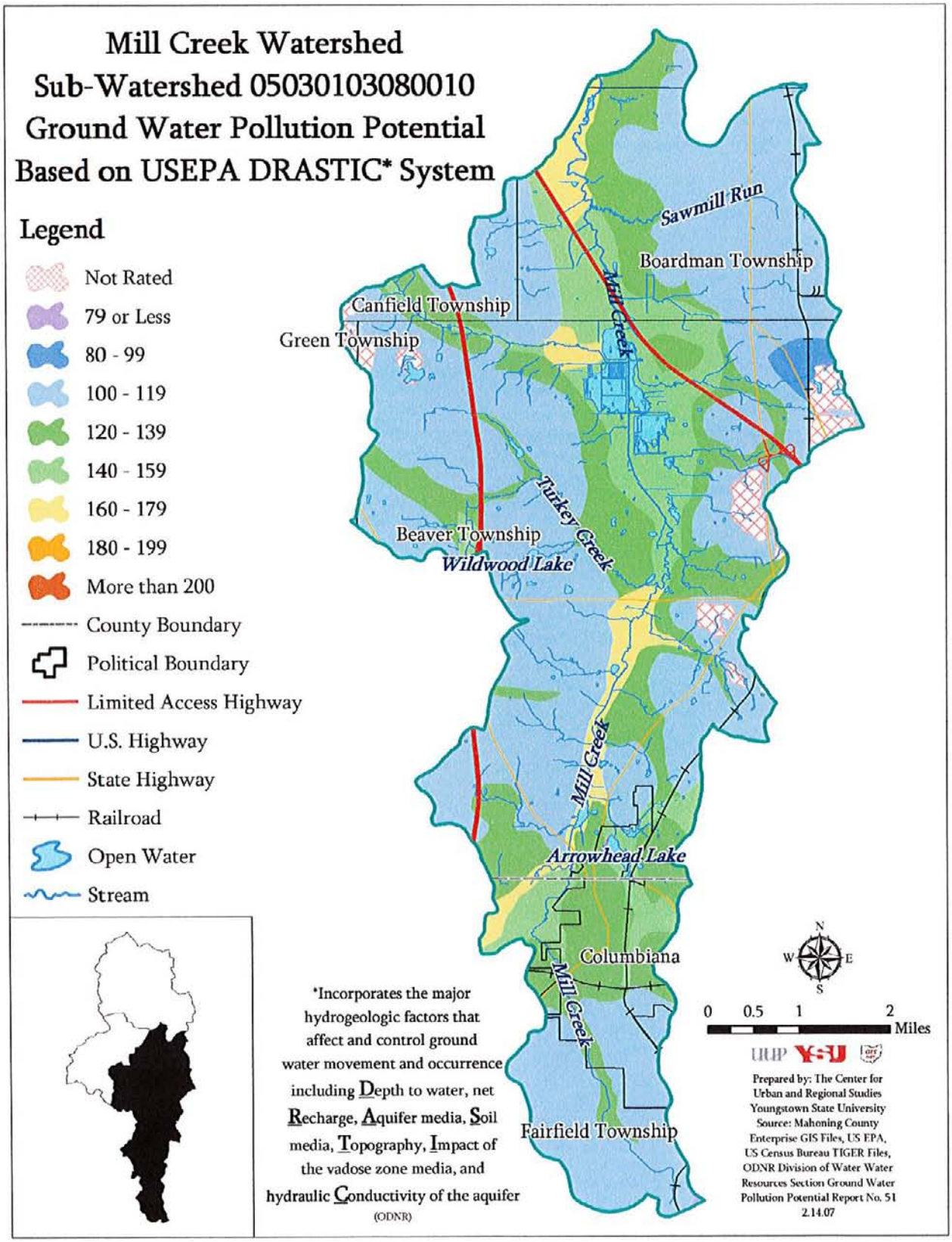

Mill Creek Watershed
Sub-Watershed 05030103080020
Ground Water Pollution
Potential Based on USEPA
DRASTIC* System
N
W
E
S
0
0.5
1
Miles
Canfield
Boardman Township
Indian Run
Indian Run
Canfield Township
Indian Run
Green Township
Beaver Township
Legend
Not Rated
79 or Less
80 - 99
100 - 119
120 - 139
140 - 159
160 - 179
180 - 199
More than 200
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Open Water
Stream
*Incorporates the major hydrogeologic factors that affect and control ground water movement and occurrence including Depth to water, net Recharge, Aquifer media, Soil media, Topography, Impact of the vadose zone media, and hydraulic Conductivity of the aquifer
(ODNR)
UIUP
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, US Census Bureau TIGER Files, ODNR Division of Water Water Resources Section Ground Water Pollution Potential Report No. 51
2.14.07

Figure 13


Mill Creek Watershed
Sub-Watershed 05030103080010
Ground Water Pollution Potential
Based on USEPA DRASTIC* System
Legend
Not Rated
79 or Less
80 - 99
100 - 119
120 - 139
140 - 159
160 - 179
180 - 199
More than 200
County Boundary
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad
Open Water
Stream
Sawmill Run
Boardman Township
Canfield Township
Green Township
Mill Creek
Turkey Creek
Beaver Township
Wildwood Lake
Mill Creek
Arrowhead Lake
Columbiana
Mill Creek
Fairfield Township
*Incorporates the major hydrogeologic factors that affect and control ground water movement and occurrence including Depth to water, net Recharge, Aquifer media, Soil media, Topography, Impact of the vadose zone media, and hydraulic Conductivity of the aquifer
(ODNR)
N
W
E
S
0 0.5 1 2 Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, US Census Bureau TIGER Files, ODNR Division of Water Water Resources Section Ground Water Pollution Potential Report No. 51
2.14.07

According to Table 11 below, approximately 1.2 percent of the northern portion of the watershed (HUC 05030103080030), 2.1 percent of the mid-western portion of the watershed (HUC 05030103080020) and 4.5 percent of the southern portion of the watershed (HUC 05030103080010) possess a higher vulnerability to groundwater pollution potential with a rating of 160-179, which are depicted as yellow areas on the maps that are located in Appendix E. Any activities taking place within these vulnerable areas should follow precautionary measures to help protect the groundwater resources.

Table 10. Groundwater Pollution Potential Acreage for Mill Creek Watershed.

HUC Watershed No.	Acreage-GW Pollution Pot. Index [160-179]	Total Acreage	Percent of Total [160-179]
05030103080010	1,060.9	23,554.8	4.5%
05030103080020	195.3	9,237.1	2.1%
05030103080030	205.1	17,322.7	1.2%

Sources: ODNR Ground Water Pollution Potential - Mahoning/Columbiana County shapefiles

5.0 Land Use

"You could write the story of man's growth in terms of his epic concerns with water."- Bernard Frank

Overall, the Mill Creek watershed's land use consists of single, two or three family residential lots, multi-family residential lots, business, heavy industrial, light industrial, institutional, agriculture, recreational/open space, and "other."

The northern half of the watershed in characterized by densely populated urban and suburban areas, mostly devoted to residential use, with much smaller areas of commercial land use. The southern portion of the watershed is much more rural, with a mixture of agriculture, low-density residential use, and forest.

The way in which land is used in a watershed is one of the primary determinants of the water quality in that watershed. Land use in the Mill Creek watershed overall is varied on a north south axis. The headwaters area (HUC 05030103-080-010), and the Indian Run watershed (05030103-080-020) are still largely agricultural, but the northern portion of the watershed (HUC 05030103-080-030), has seen much of the land once devoted to agriculture converted into residential and commercial land use. A complete listing and maps of the land use for Mill Creek watershed is provided in Appendix B.

Table 11. Land Use for Mill Creek Watershed

SUB-WATERSHED 05030103080030		
Land Use Class	**Parcel Acreage**	**Percentage of Total**
Agriculture	793.6	5.2%
Business	1,235.7	8.1%
Industrial Heavy	54.7	0.4%
Industrial Light	199.4	1.3%
Institutional	925.2	6.1%
Multi-Family Residential	390.6	2.6%
Other	593.9	3.9%
Recreation/Open Space	1,531.9	10.0%
Single, Two and Three Family Residential	9,531.9	62.5%
SUB-WATERSHED 05030103080020		
Land Use Class	**Parcel Acreage**	**Percentage of Total**
Agriculture	3,546.9	40.0%
Business	575.5	6.5%
Industrial Heavy	0.0	0.0%
Industrial Light	89.3	1.0%
Institutional	979.9	11.1%
Multi-Family Residential	87.3	1.0%
Other	797.9	9.0%
Recreation/Open Space	308.3	3.5%
Single, Two and Three Family Residential	2,472.8	27.9%
SUB-WATERSHED 05030103080010		
Land Use Class [Mahoning County]	**Parcel Acreage**	**Percentage of Total**
Agriculture	9,789.2	51.9%
Business	1,742.9	9.2%
Industrial Heavy	5.9	0.0%
Industrial Light	338.3	1.8%
Institutional	435.6	2.3%
Multi-Family Residential	110.2	0.6%
Other	464.6	2.5%
Recreation/Open Space	909.5	4.8%
Single, Two and Three Family Residential	5,063.9	26.8%
USGS Land Use [Columbiana County]	***Total Acreage***	
Agriculture	2,104.2	
Business	130.1	
Industrial Light	216.8	
Single, Two and Three Family Residential	1,190.5	

Source: USEPA, USGS Geographic Information Retrieval and Analysis System (GIRAS) Anderson Level II Classification,Mahoning County Enterprise GIS Files, Mahoning County Auditor Land Use Codes

Land cover is differentiated from land use, as being a reflection of what is present on the ground surface as observed from a satellite. The figures shown for land cover should be considered questionable, since the maps for land cover show the residential suburb of

Boardman Township as "wooded" due to the older neighborhoods with extensive tree canopy. Land cover maps are also provided also in Appendix B.

Table 12. Land Cover for Mill Creek Watershed (1994)

SUB-WATERSHED 05030103080010		
Land Cover Type	**Acreage**	**Percent of Total**
Agriculture/Open Urban Areas	9,613.4	40.8%
Barren	1.7	0.0%
Non Forested Wetlands	281.8	1.2%
Open Water	216.4	0.9%
Shrub/Scrub	246.7	1.0%
Urban	1,539.3	6.5%
Wooded	11,655.4	49.5%
SUB-WATERSHED 05030103080020		
Land Cover Type	**Acreage**	**Percent of Total**
Agriculture/Open Urban Areas	4,037.5	43.7%
Non Forested Wetlands	84.1	0.9%
Open Water	22.1	0.2%
Shrub/Scrub	109.0	1.2%
Urban	504.6	5.5%
Wooded	4,479.8	48.5%
SUB-WATERSHED 05030103080030		
Land Cover Type	**Acreage**	**Percent of Total**
Agriculture/Open Urban Areas	1,584.0	9.1%
Barren	0.2	0.0%
Non Forested Wetlands	418.0	2.4%
Open Water	99.0	0.6%
Shrub/Scrub	48.7	0.3%
Urban	2,761.3	15.9%
Wooded	12,411.6	71.6%

5.0.1 Urban

a. Impervious surface

There is no category in either land use or land cover data for "impervious surface." Therefore, the "Urban" category has been used to estimate the amount of impervious surface in the watershed. Urban areas for the Mill Creek watershed consist of approximately 15.9 percent of the northern sub-watershed (HUC 05030103080030), approximately 5.5 percent of the mid-western sub-watershed (HUC 05030103080020) and 6.5 percent of southernmost sub-watershed (HUC 05030103080010). Please see Appendix B for the location of urban areas within the watershed.

b. Home Sewage Treatment Systems (HSTS) Locations

The source of the following information concerning Sewage Treatment System Area Review has been produced by The Mahoning County District Board of Health, Wes Vins, Director of Wastewater Programs, on March 15, 2007.

Sub-Watershed 05030103080010 (Mill Creek, Turkey Creek)

This area is largely serviced by septic systems and not sanitary sewer; there is an estimated 400 septic systems. The area served by sanitary sewer includes the properties North of Calla Road and East of Sharrott/Hitchcock Roads, most subdivisions on Sharrott Road, the homes and businesses along Route 7 and those in the City of Columbiana sewer district. The homes along Sharrott Road currently serviced by septic systems can connect to the force main sewer line, but are not mandated at this time.

The area is serviced mostly by on-lot, non-discharging septic systems. Some off-lot* systems have been installed in this area, but at a minimum number. The ability to stay on-lot with septic system design is due largely to suitable soil types and adequate lot sizes.

Generally, this area is of only limited concern for impact to health and environment from the remaining septic systems. Isolated areas that may be the focus of this limited concern should include: Sharrott Creek Drive, Sharrott Creek Court, Sharrott Run, and other individual failing septic systems present throughout the sub-watershed. When failing systems are identified, they are ordered to make repairs or complete replacements.

** Off-lot septic systems installed since 1997 (repairs for existing homes only) are inspected and sampled annually by the Mahoning County Board of Health as part of a continuing Operations & Maintenance Program.*

Sub-Watershed 05030103080020 (Indian Run)

This area is largely serviced by septic systems and not sanitary sewer, with an estimated 350 systems. The limited area served by sanitary sewer includes the properties northeast of Route 11, along Route 224 and those in the City of Canfield sewer district. Generally, this area would include the watershed north of Leffingwell Road.

The area is serviced mostly by on-lot, non-discharging septic systems. Some off-lot* systems have been installed in this area, but at a minimum number. The ability to stay on-lot with septic system design is due largely to suitable soil types and adequate lot sizes.

This area is of only limited concern for impact to health and environment from septic systems. When individual failing septic systems are identified, they are ordered to make repairs or complete replacements.

** Off-lot septic systems installed since 1997 (repairs for existing homes only) are inspected and sampled annually by the Mahoning County Board of Health as part of a continuing Operations & Maintenance Program.*

Sub-Watershed 05030103080030 (Anderson Run, Bears Den Run, Axe Factory Run, Lake Newport)

This area is largely serviced by sanitary sewer and not septic systems, with an estimated 600 systems. But, due to the age of the community that makes up this watershed, some small isolated areas of homes with septic systems have been discovered in areas believed to be connected to sewer. These isolated homes are required to connect when they are identified and if sanitary sewer is available. The large areas that are serviced by a mix of on-lot and off-lot* septic systems would include:

Route 62 from Tippecanoe South West to Shields Road.
Raccoon Road from Mellinger South to Shields Road.
Shield Road from Messerly Road to a point ~8oo ft. West of Tippecanoe
Most of Messerly, Alladin, Alvacardo, Clearview, Fox Haven, McCartney, Joyce Ann, Fawn, Burgett, Orlando, Adeer and parts of Pleasant Valley

The septic areas listed above have received several complaints over the past few years and some septic systems have been replaced or upgraded. An area wide Public Health Nuisance investigation was conducted by the Mahoning County Board of Health in 2004 and 2005. The investigation did **not** identify a Public Health Nuisance as described in OAC 3745. Several failing septic systems were identified and ordered to be repaired as a result of the investigation and the associated complaints. This area remains a focus for the eventual extension of sanitary sewer when resources become available.

Recently, the West Glen area that had been historically partially serviced by septic systems that were discharging into Newport Lake was made accessible to a new sanitary sewer line and connections to the sanitary sewer were mandated.

** Off-lot septic systems installed since 1997 (repairs for existing homes only) are inspected and sampled annually by the Mahoning County Board of Health as part of a continuing Operations & Maintenance Program.*

The Mahoning County District Board of Health does possess addresses for all HSTS installed. There is currently an effort to convert the data to a GIS layer. Though the addresses of homes with HSTS's do not pinpoint the locations of systems themselves, however it does identify the homes to which the systems are attached.

The general percentage of failing septic systems is about 25% for the entire county. According to Wes Vins a failing system does not always mean that is discharging into a creek or the road ditch. The systems discharging to a creek or ditch may only represent 5% of all failing systems.

There is an average of 300 septic permits issued each year. This would include new homes, complete replacements of old systems or repairs to existing systems. The majority of the Mahoning Distric Board of Health's work is monitoring existing discharging systems installed since 1997 (~400), Inspections of systems for real estate transfers, additions, property splits and of course, complaints.

Soils and HSTS

Soils are an essential part of having a functional septic system. Among the soils identified as common in Section 3.1, all except the Wooster soil are rated with a severe limitation for septic tank absorption fields, according to the Soil Survey of Mahoning County, Ohio. The gravely layers in Bogart, Chili, and Jimtown soils are a poor filter for effluent. Rittman, Wadsworth, Frenchtown, Canfield, Ravenna, Sebring, and Fitchville soils have restricted permeability in the subsoil. A seasonal high water table is a limitation for all of the soils except Wooster, Chili, Loudonvillle, Muskingum, and Dekalb. Bedrock within 40 inches of the surface is a limitation for septic tank absorption fields in Loudonville, Muskingum, and Dekalb soils.

208 Plan and HSTS

In the early 1970's, the Governor of Ohio under the provisions of the Clean Water Act, designated Eastgate, then known as Eastgate Development and Transportation Agency (EDATA), as the planning agency for Mahoning and Trumbull Counties. Under Section 208 of the Clean Water Act, each designated planning agency was to create and submit a plan identifying alternatives to wastewater management. Eastgate submitted their first 208 Water Quality Management Plan (WQMP) 1977.

Since the inception of the 208 Plan its purpose to protect water quality has remained steady, but the focus of the plan has expanded. In the past, the 208 Plan focused on the construction of wastewater treatment plants and control methods for industrial, municipal and nonpoint source pollution. Today's 208 Plan continues to focus on controlling nonpoint source pollution, but expands to include discussions on home and state regulated sewage treatment systems, population and economic trends, and the protection of our area's critical resources such as drinking water sources, floodplains, and wetlands. Eastgate collaborated with its designated counties, municipalities, sewer agencies, county health departments and planning commissions, conservation and watershed groups, and representatives from the Ohio EPA to gather and incorporate relative, chapter specific information and recommendations for the plan.

The Clean Water Act (CWA) addresses water pollution in the United States and provides measures for protecting our nation's surface waters. The main goal of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's Waters"1. It is within Section 208 of the CWA that water quality management planning is addressed and requirements are set forth to achieve the goal of the CWA on a state by state basis. Section 208 has established shared responsibilities for water quality management planning for areawide and state agencies. Water quality management plans are created under this section and used to address municipal waste treatment issues and

nonpoint source pollution management and control measures. These management plans direct local and regional implementation by defining implementation responsibilities specific to agencies with municipal waste treatment or nonpoint source management responsibilities who have been designated to perform specific control.

An areawide water quality management plan is one of many tools set forth by the CWA and utilized by the State of Ohio to combat water pollution and restore the water quality of the state's waters. Other components of the CWA utilized include water quality monitoring and assessments, the administering of the National Pollution Discharge and Elimination System (NPDES) permit program to control discharges, financial assistance for wastewater treatment management facilities, and enforcement. Water quality assessments are the responsibility of the State of Ohio and help the state determine at what capacity a water body can receive pollutant loads without degrading its intended use. The Ohio EPA established the Total Maximum Daily Load (TMDL) program and other water quality effluent limits for streams to provide the foundations for permit issuance. Because of the collaboration among numerous resource agencies and governmental entities, the management plan has utilized all of the aforementioned programs to collect background information and data to mold and support Eastgate's 208 plan update efforts that will be an essential tool to address local and regional environmental needs.

EastGate Regional Council of Governments states in the 208 Water Quality Management Plan- October, 2005 that the following areas are "known septic system failure hot spots."

- Austintown Township - Burkey Road/Axe Faxtory
- Beaver Township – Woodworth Road, Callawoods, Haus/Granview/Paradise
- Boardman Township – West Glenn, Hitchcock/Lockwood
- Canfield Township – Revere Run, Sugarbrush/Spring Lake, Meadowwood/Briarwood/Lydia, Fox Haven

The wastewater treatment planning prescriptions and options are a major piece of the 208 Puzzle. They prescribe every inch of the region with a wastewater treatment option that is consistent with the goal of protecting water quality and consistent with the governing agency's (i.e. sanitary engineer and health department) regulations. The prescriptions are what the Ohio EPA utilizes when reviewing Permits-To -Install (PTIs) for sanitary sewer. The Director fo the Ohio EPA cannot permit sanitary sewer extensions or projects that are inconsistent with the 208 Plan (namely the prescriptions).

A 201 Facility Planning Area (FPA) is an area in which wastewater treatment is accounted for within a treatment system, whether it is via sanitary sewer or a home sewage treatment system. Each 201 FPA should have their own 201 Plan (a piece of the larger 208 Plan picture) that paralles and is consistent with the goals of the region's 208 Plan.

To view the 208 Water Quality Management Plan please go to the website http://www.eastgatecog.org/env-regional_modernize208water.asp for updates.

Figure 14

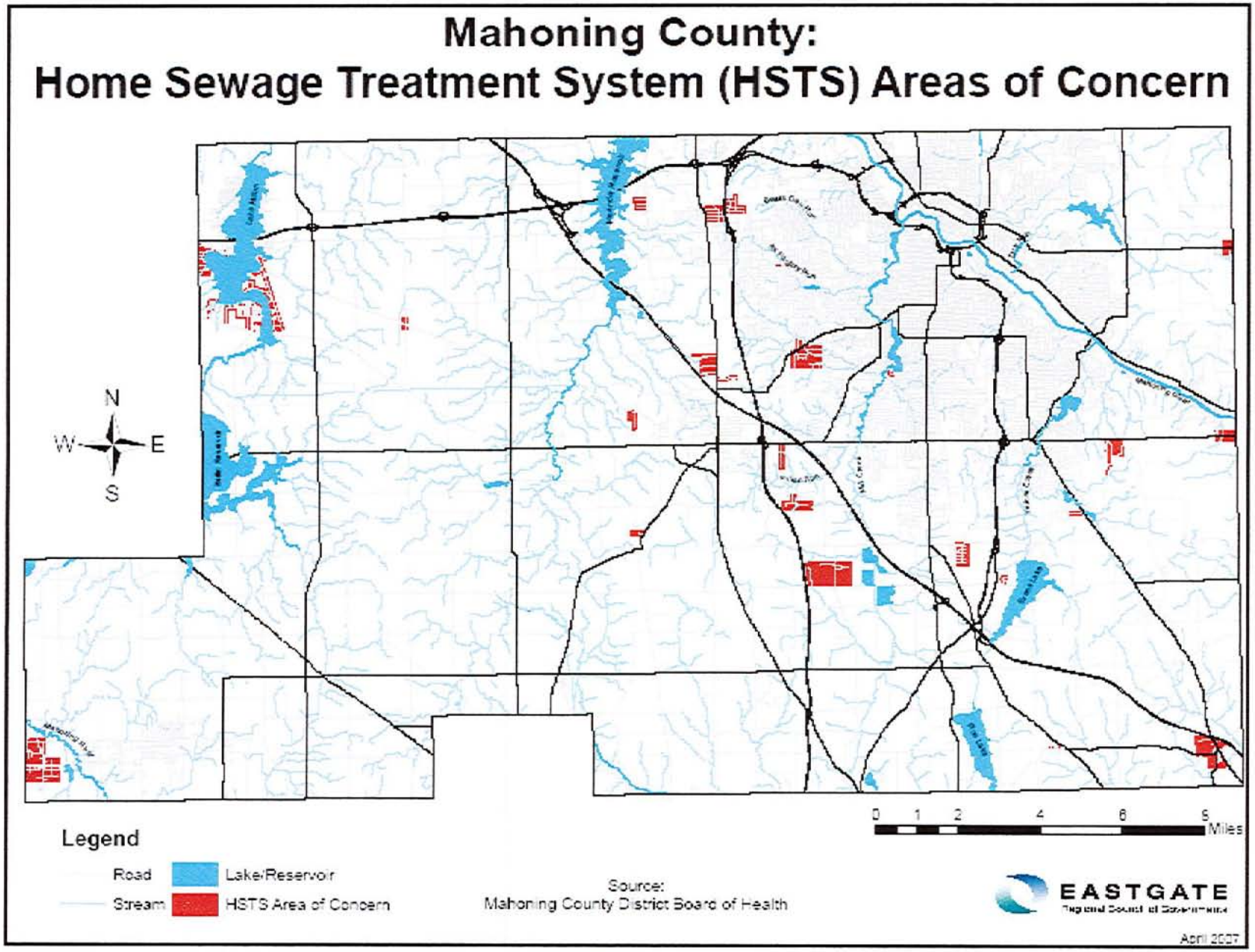

Mahoning County:
Home Sewage Treatment System (HSTS) Areas of Concern
N
W
E
S
0 1 2 4 6 8 Miles
Legend
Road
Stream
Lake/Reservoir
HSTS Area of Concern
Source:
Mahoning County District Board of Health
EASTGATE
April 2007

Figure 15

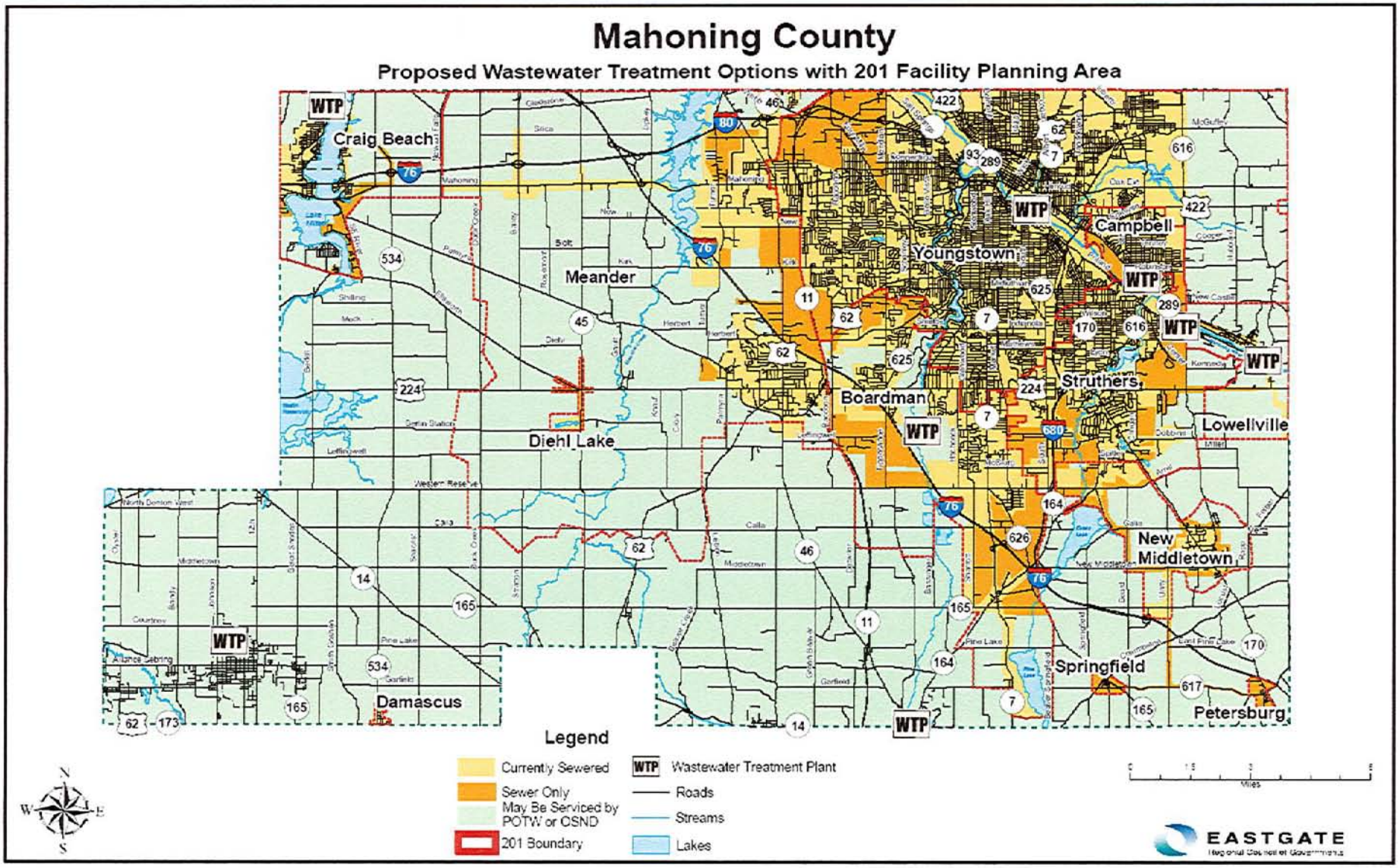

Mahoning County
Proposed Wastewater Treatment Options with 201 Facility Planning Area
Craig Beach
Meander
Youngstown
Campbell
Boardman
Struthers
Lowellville
Diehl Lake
New Middletown
Springfield
Damascus
Petersburg
WTP
Legend
Currently Sewered
Sewer Only
May Be Serviced by POTW or CSND
201 Boundary
Wastewater Treatment Plant
Roads
Streams
Lakes
Miles
EASTGATE

Figure 16

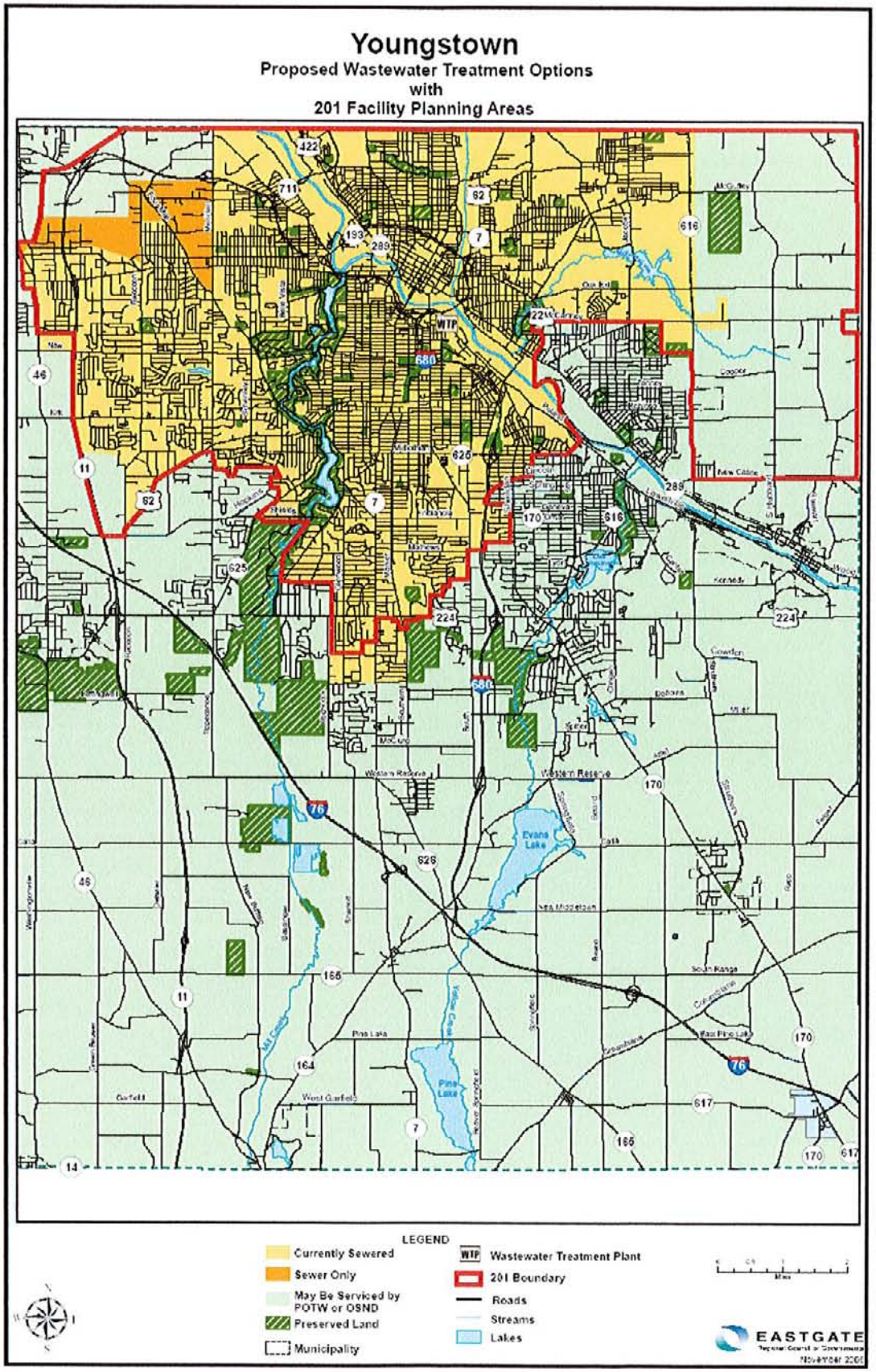

Youngstown
Proposed Wastewater Treatment Options
with
201 Facility Planning Areas
WTP
Evans Lake
Pine Lake
LEGEND
Currently Sewered
Sewer Only
May Be Serviced by POTW or OSND
Preserved Land
Municipality
Wastewater Treatment Plant
201 Boundary
Roads
Streams
Lakes
EASTGATE

Figure 17

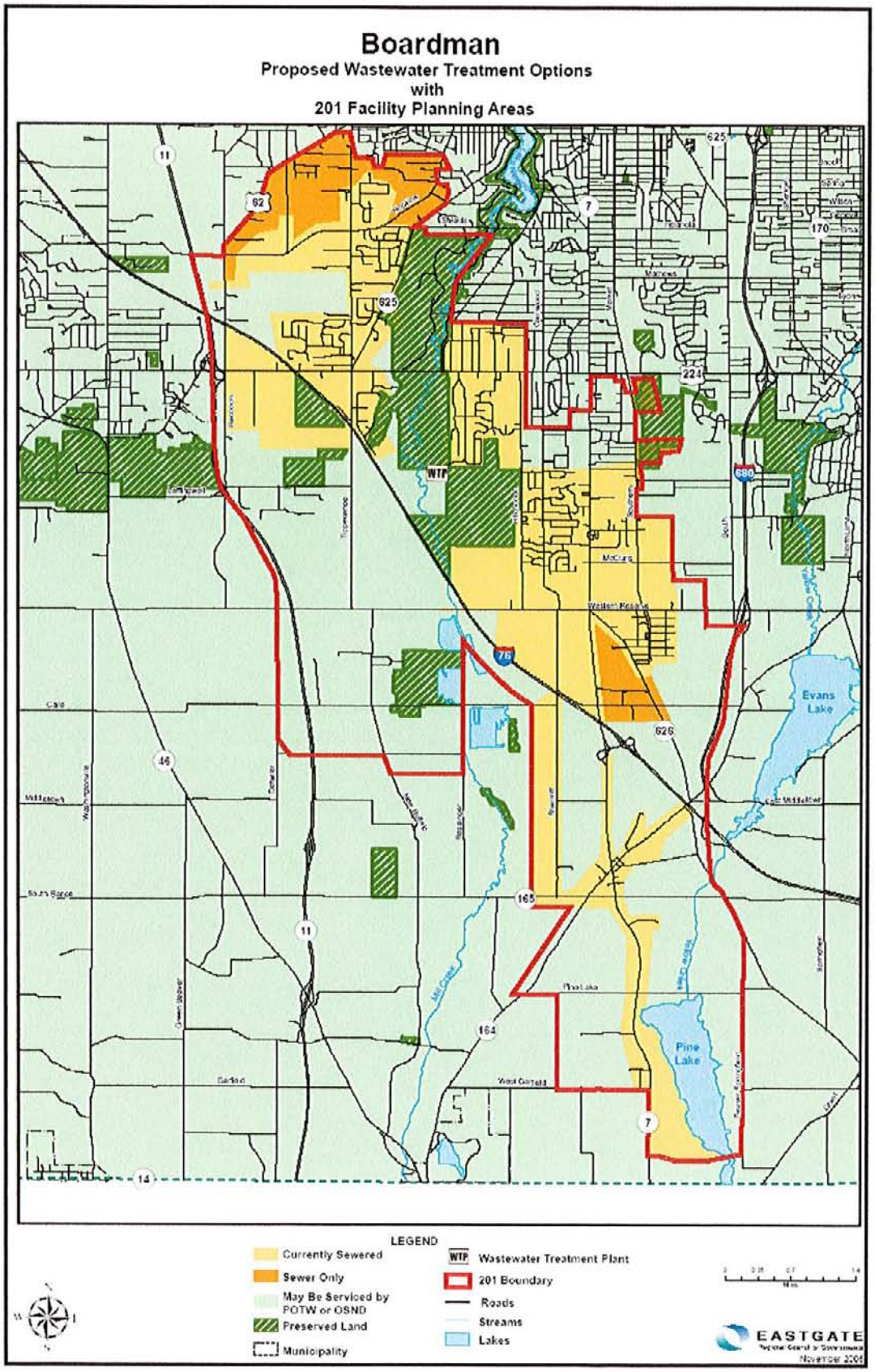
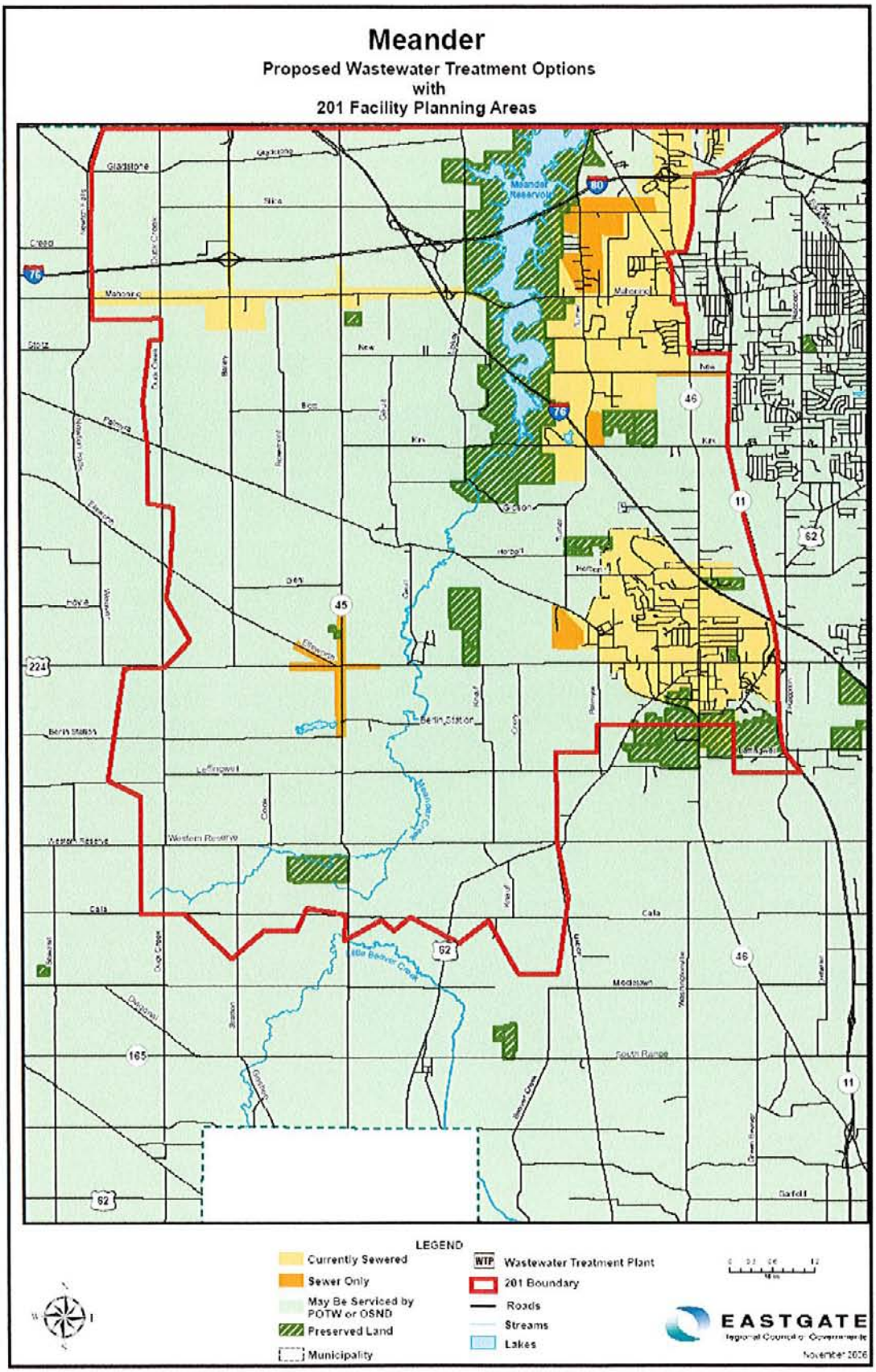

Boardman
Proposed Wastewater Treatment Options
with
201 Facility Planning Areas
WTP
Evans Lake
Pine Lake
LEGEND
Currently Sewered
Sewer Only
May Be Serviced by POTW or OSND
Preserved Land
Municipality
Wastewater Treatment Plant
201 Boundary
Roads
Streams
Lakes
EASTGATE

Figure 18


Meander
Proposed Wastewater Treatment Options
with
201 Facility Planning Areas
LEGEND
Currently Sewered
Sewer Only
May Be Serviced by POTW or OSND
Preserved Land
Municipality
WTP Wastewater Treatment Plant
201 Boundary
Roads
Streams
Lakes
EASTGATE
November 2006

Another additional area of concern has been identified by Mill Creek MetroParks and is located in the area west of Tippecanoe Road to Raccoon Road.

5.0.2 Forest

The climax plant communities typical of this area are mixed mesophytic forest, mixed oak forest, beech forest, oak sugar maple forest, and elm-ash swamp forests [v]. According to the land cover data, 71.6 percent of the northern sub-watershed (HUC 05030103080030), 48.5 percent of the mid-western sub-watershed (HUC 05030103080020) and 49.5 percent of southernmost sub-watershed (HUC 05030103080010) are classified as wooded. It should be noted that because this information is based on 1994 data, the percentages should be lower because of recent developments occurring within the watershed, and also because the highly urbanized area of Boardman Township shows up as mostly wooded, which in reality it is not.

5.0.3 Agriculture

The southern portion of the Mill Creek watershed is still predominately used for agriculture. According to the land use data, 5.2 percent of the northern sub-watershed (HUC 05030103080030), 40 percent of the mid-western sub-watershed (HUC 05030103080020) and 51.9 percent of southernmost sub-watershed (HUC 05030103080010) are classified as being used for agriculture. The land cover data percentages differ slightly from the land use percentages. The land cover percentages were classified so that agriculture and open urban areas were combines and the percentages are as follows: 9.1 percent of the northern sub-watershed (HUC 05030103080030), 43.7 percent of the mid-western sub-watershed (HUC 05030103080020) and 40.8 percent of southernmost sub-watershed (HUC 05030103080010).

a. Crop Type

The primary crops in the Mill Creek watershed are corn, soybean, wheat and hay. According to the National Agricultural Statistics Service 1997 Census of Agriculture there were just over 46,000 acres of crop land harvested in Mahoning County in 1997[vi]. No data was available for Columbiana County. Information based in townships, watershed, or by sub-watershed is not available. GIS data from the Ohio Department of Natural Resources (1994) shows 38.9% of the land in the watershed to be in agricultural use.

b. Tillage

According to Gary Gray, District Conservationist for Mahoning County NRCS most producers in the Mill Creek Watershed employ conservation tillage methods. Corn planted after soybeans in rotation may be done with no-till, but the more typical pattern in the watershed is minimum tillage.

c. Rotations

According to Gary Gray, District Conservationist for Mahoning County NRCS typical crop rotation in the watershed is corn/soybeans/wheat. In some portions of the watershed, hay is included in the rotation.

d. Livestock inventory

There is an estimated two hundred-fifty (250) to three hundred (300) head of cattle and sixty (60) to one hundred (100) horses in the Mill Creek watershed. No figures are currently available for other livestock types (such as chickens or hogs). There are no permitted Concentrated Animal Feeding Operations (CAFO's) in the Mill Creek Watershed.

e. Grazing

According to the United States Census Bureau Mahoning County is comprised of 272,000 cares of land. The 2002 Census of Agriculture reports there are 76,543 acres of land in farms in Mahoning County, or 28% of the total county acreage. Approximately 13,500 acres is utilized for forage- hay and haylage, grass silage, and greenchop. The Ohio State University Extension Office publishes a Livestock and Stream Series of fact sheets detailing the effects of livestock grazing on riparian areas.

f. Chemical Use Patterns

There is no real data for available to document the amount of chemical use in the watershed. According to Mr. David Goerig of the Ohio State University Extension Office, chemical use by farmers is virtually negligible. He feels that the greater source of chemical contamination originates with the urbanized areas where residents often misuse and overuse plant care products.

The majority of the farmers within the watershed incorporate "No Till" into their farming practices. There is an estimated 100,000 acres of farmland that currently being tilled within Mahoning County. In conservation tillage, the crops are grown with minimal cultivation of the soil. When the amount of tillage is reduced, the stubble or plant residues are not completely incorporated, and most or all remain on top of the soil rather than being plowed or disked into the soil. The new crop is planted into this stubble or small strips of tilled soil. Weeds are controlled with cover crops or herbicides rather than by cultivation.

g. Irrigation

The Ohio Department of Natural Resources Division of Water permits for surface water withdrawals, has identified three (3) entities using water from Mill Creek for irrigation.

Those are Vic-nor Farms (the sod farm) at Western Reserve Road, McMaster Farms near Columbiana, and Mill Creek MetroParks (at the Golf Course).

5.0.4 Water

"For many of us, water simply flows from a faucet, and we think little about it beyond this point of contact. We have lost a sense of respect for the wild river, for the complex workings of a wetland, for the intricate web of life that water supports." Sandra Postel, Last Oasis: Facing Water Scarcity, 1993

The large water supplies are located outside of the Mill Creek watershed boundaries within the Meander Creek and Yellow Creek watersheds. Listed below is information on Transient Non-Community Water Systems, Mahoning County water systems, and water supplies for schools. Some of these supplies serve people outside of the watershed boundary and there is not a map available showing these locations at this time.

Each drinking water source should have a source water protection plan in place and is regulated and tested to ensure that the water is safe for human consumption. For more detailed information contact the individual supplier. Most other sources of drinking water come from private wells.

Table 13. Transient Non-Community Water Systems

Water System Name	Population Served	Primary Water Source Type	System Status	Water System ID
FLYING B GOLF CLUB CLUBHOUSE	100	Groundwater	Active	OH5046212
GREEN ACRES NORTH WELL PWS	200	Groundwater	Active	OH5043312
GREEN ACRES-SOUTH WELL PWS	130	Groundwater	Active	OH5043322
GREENFORD CHRISTIAN CHURCH	600	Groundwater	Active	OH5047112
GREENFORD CHRISTIAN LIFE CENTER	500	Groundwater	Active	OH5049912
GREENFORD EVAN LUTHERAN CHURCH PWS	100	Groundwater	Active	OH5043012
HERITAGE BAPTIST CHURCH	50	Groundwater	Active	OH5048812
HIGH POINTE ASSEMBLY OF GOD PWS	200	Groundwater	Active	OH5053912
HOWARD HANNA BLDG PWS	50	Groundwater	Active	OH5053612
HYDE-A-WAY GOLF CLUB	50	Groundwater	Active	OH5045412
KINGS MOTEL	200	Groundwater	Active	OH5031212
LAKE FRONT GOLF COURSE	250	Groundwater	Active	OH5048012
LAKE MILTON BAPTIST TEMPLE	200	Groundwater	Active	OH5046612
TRIPLE D CAMPGROUND	100	Groundwater	Active	OH5043512
USACE-BERLIN LAKE	500	Groundwater	Active	OH5040612
VFW POST 7600 PWS	25	Groundwater	Active	OH5044112
VICTORY CHRISTIAN CENTER ADMIN BLDG PWS	100	Groundwater	Active	OH5052012
WEE PLAZA	25	Groundwater	Active	OH5044312
WENDYS RESTAURANT PWS	50	Groundwater	Active	OH5053312
WESTERN RESERVE PARK BATHHOUSE PWS	100	Groundwater	Active	OH5043412
WESTERN RESERVE PARK CAMP PWS	100	Groundwater	Active	OH5043422
WHITEHOUSE FRUIT FARM	19	Groundwater	Active	OH5042712
YELLOW DUCK LAKE PARK	450	Groundwater	Active	OH5043812
YOUNGS RESTAURANT PWS	75	Groundwater	Active	OH5032512
YOUNGSTOWN-ELSER AIRPORT	50	Groundwater	Active	OH5052712
ZION HILL CHURCH OF THE BRETHREN	85	Groundwater	Active	OH5048112

Table 13 Continued. Transient Non-Community Water Systems

Water System Name	Population Served	Primary Water Source Type	System Status	Water System ID
ADVANTAGE SPINAL & REHAB CENTER	25	Groundwater_under_infl_of_surface_water	Active	OH5047612
AMERICAN LEGION POST 737	75	Groundwater	Active	OH5045312
ARNOLDS LOUNGE	50	Groundwater	Active	OH5040112
AUT MORI GROTTO (SHANGRI-LA)	249	Groundwater	Active	OH5043912
BAILEY RD BAPTIST CHURCH	200	Groundwater	Active	OH5046812
BARBARAS COZY CORNER	150	Groundwater	Active	OH5033812
BEDFORD TRAILS GOLF COURSE	200	Groundwater	Active	OH5040912
BENS RESTAURANT & BAR INC PWS	200	Groundwater	Active	OH5033012
BERLIN CENTER UNITED METHODIST CHURCH	250	Groundwater	Active	OH5049312
BISTRO 62 PWS	50	Groundwater	Active	OH5051012
BOARDMAN PARK-EDGEWOOD PWS	150	Groundwater	Active	OH5045812
BOARDMAN PARK-MAIN WELL PWS	600	Groundwater	Active	OH5045912
BUNKER HILL METHODIST CHURCH	100	Groundwater	Active	OH5047012
CAMP STAMBAUGH BSA MAIN	120	Groundwater	Active	OH5033112
CAMP STAMBAUGH BSA PARKING	25	Groundwater	Active	OH5051512
CANFIELD JEHOVAH WITNESS	85	Groundwater	Active	OH5046712
CHAPARRAL FAMILY CAMPGROUND PWS	400	Groundwater	Active	OH5034712
CHRISTIAN LIFE CENTER PWS	200	Groundwater	Active	OH5053412
COMMUNITY BIBLE CHURCH - BELOIT	175	Groundwater	Active	OH5052312
COUNTRYSIDE GOLF COURSE	250	Groundwater	Active	OH5033512
DEPOT LOUNGE	35	Groundwater_under_infl_of_surface_water	Active	OH5033712
DIAMOND BACK GOLF COURSE	75	Groundwater	Active	OH5036212
DOGWOOD COUNTRY CLUB	100	Groundwater	Active	OH5044912
EAST GOSHEN FRIENDS CHURCH	100	Groundwater	Active	OH5048612
ELLSWORTH PRESBYTERIAN CHURCH	60	Groundwater	Active	OH5050012
FLIGHT DECK RESTAURANT PWS	100	Groundwater	Active	OH5039512
LAKE MILTON CHURCH OF CHRIST	30	Groundwater	Active	OH5046512
LAKE MILTON RV RESORT	40	Groundwater	Active	OH5034912
LAKESIDE CAMPGROUND	100	Groundwater	Active	OH5035812
LAKESIDE GOLF COURSE	100	Groundwater	Active	OH5045012
LAKESIDE INN PWS	25	Groundwater	Active	OH5036012
LOCUST GROVE BAPTIST CHURCH	55	Groundwater	Active	OH5047812
MASTROPIETRO WINERY PWS	50	Groundwater	Active	OH5054012
MIDWAY MENNONITE CHURCH	120	Groundwater	Active	OH5052412
N.E. OH CHURCH OF GOD CAMP	75	Groundwater	Active	OH5036612
NORTH BENTON UNITED PRESBYTERIAN CHURCH	75	Groundwater	Active	OH5046912
ODOT-REST AREA 4-43 PWS	200	Groundwater	Active	OH5030012
ODOT-REST AREA 4-44 PWS	200	Groundwater	Active	OH5041012
OLD SPRINGFLD CHURCH OF CHRIST	125	Groundwater	Active	OH5050612
PARADISE UNITED CHURCH OF CHRIST	90	Groundwater	Active	OH5047712
PETERSBURG INN	30	Groundwater	Active	OH5037412
PETERSBURG PRESBYTERIAN	45	Groundwater	Active	OH5043112
PICOS CAMPGROUND	45	Groundwater	Active	OH5043612
PINE MEADOWS GOLF COURSE	60	Groundwater	Active	OH5045512
PJS COUNTRY CAFE PWS	100	Groundwater	Active	OH5053012
PONDEROSA PARK	200	Groundwater	Active	OH5037812
SALEM HILLS GOLF & CC	180	Groundwater	Active	OH5051412
SHILLING MILL TAVERN	50	Groundwater	Active	OH5034112
SOCIETY OF ST PAUL	212	Groundwater	Active	OH5050211
ST JOHNS LUTHERAN CHURCH - PETERSBURG PWS	100	Groundwater	Active	OH5043212
TIC TOC FOOD MART-CLEARWATER CAFE	100	Groundwater	Active	OH5031812
TJ BP & CARRY OUT	100	Groundwater	Active	OH5045612

Table 14. Mahoning County Water Systems

Water System Name	Population Served	Primary Water Source Type	System Status	Water System ID
AQUA OHIO - STRUTHERS	45000	Surface_water	Active	OH5001611
CAMPBELL CITY PWS	9650	Surface_water	Active	OH5000411
CANFIELD CITY PWS	7800	Purch_surface_water	Active	OH5000503
COLONIAL VILLA ESTATES	350	Groundwater	Active	OH5000612
DEER MEADOW ESTATES	130	Groundwater	Active	OH5001212
ISLAND CREEK HOMEOWNERS	60	Groundwater	Active	OH5001812
J & H MOBILE HOME PARK	75	Groundwater	Active	OH5000712
JACKSON/MILTON SERVICE AREA PWS	3400	Purch_surface_water	Active	OH5054212
LAKE MILTON M.H.P.	100	Groundwater	Active	OH5001012
M & C MOBILE HOME PARK	75	Groundwater	Active	OH5000912
SEBRING VILLAGE PWS	8100	Surface_water	Active	OH5001911
ST. MARYS ALZHEIMERS CENTER	240	Groundwater	Active	OH5003012
STATE LINE MHP 1 PWS	25	Groundwater	Active	OH5002812
STATE LINE MHP 2 PWS	35	Groundwater	Active	OH5002112
YOUNGSTOWN CITY PWS	175000	Purch_surface_water	Active	OH5002303

Table 15. Water Supplies for Schools.

Water System Name	Population Served	Primary Water Source Type	System Status	Water System ID
BAIRD BROTHERS SAWMILL	100	Groundwater	Active	OH5052512
BEEG-BRO LTD	42	Groundwater	Active	OH5053112
DAMASCUS ELEMENTARY PWS	475	Groundwater	Active	OH5054112
ELLSWORTH ELEMENTARY SCHOOL	275	Groundwater	Active	OH5034212
LINDE HYDRAULICS, CORP.	54	Groundwater	Active	OH5050112
NASHBAR DIRECT PWS	50	Groundwater	Active	OH5051812
REAL LIFE DAY CARE	90	Groundwater	Active	OH5038012
SOUTH RANGE WEST SCHOOL	565	Groundwater	Active	OH5038712
TIP PLUS CORP PWS	34	Groundwater	Active	OH5051912
WESTERN RESERVE HIGH SCHOOL	250	Groundwater	Active	OH5040012
WESTERN RESERVE MIDDLE SCHOOL	260	Groundwater	Active	OH5039912

5.0.5 Non-forested Wetlands

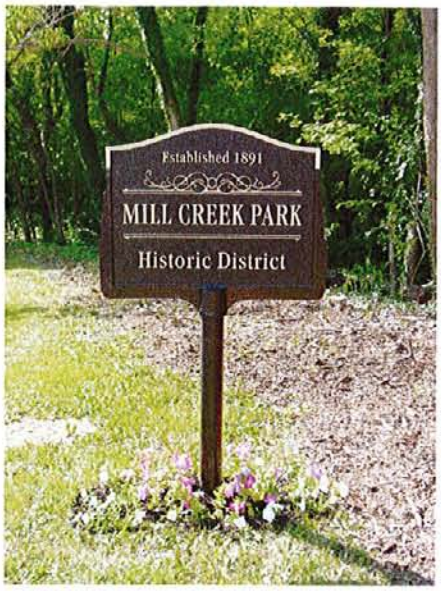
There are approximately 1,475 acres of non-forested wetlands identified within the watershed. Approximately 262 acres are scrub/shrub, 384 acres of shallow marsh, 87 acres of wet meadow, 39 acres of farmed wetlands, and 703 acres of open water wetlands.

5.0.6 Barren

Land Cover data shows 0% Barren land in any of the sub-watersheds of Mill Creek.

5.1 Protected Lands

There is currently over 4,619.94 acres of protected lands within the Mill Creek watershed. For maps of protected areas please see Appendix A.



"Every lover of nature, every man who appreciates the majesty and beauty of the wilderness and of wildlife, should strike hands with the far-sighted men who wish to preserve our material resources, in the efforts to keep our forests, game beasts, and game birds and game fish-indeed, all the living creatures of prairie and woodland and seashore- from wanton destruction." Theodore Roosevelt

a. City, County, District State or National Public Forests and/or Parks

- **Bancroft Park,** 151 Wychwood Lane, Youngstown, Ohio

  Bancroft Playground is property of the Youngstown Park and Recreation Commission. It was purchased in 1931 from Carrie Hood, and occupies 1.24 acres along the Boardman Township boundary adjacent to the Youngstown Christian Academy. A re-plat of the property was done in 2001, and the Park and Recreation Commission no longer own the tennis courts. The park is well maintained and is used extensively. Bancroft Playground facilities include a storage building, standard playground equipment, two basketball courts, and a modular deck system.

- **Camp Stambaugh ,** 3712 Leffingwell Road., Canfield, Ohio
  Camp Stambaugh occupies 225 acres along Leffingwell Rd. Camp facilities include a Cub Scout resident camp, family camping, outside community organizations, overnight accommodations, cabins, nature trails, a dining hall, camporees, training activities, venturing programs, adirondacks, patrol cooking, weekend usage, a lake, a pool, boating, and archery.

- **Canfield Fairgrounds**, Fairground Blvd., Canfield, Ohio

  The Canfield Fairgrounds occupy 353 acres south of Fairground Blvd. and east of State Route 46 in Canfield Township, and are the home of the annual Canfield Fair. Besides the fair, the Fairgrounds are host to a variety of events and activities. Those include, but are not limited to, walking, State Highway motorcycle testing, driver training, roller blading, roller hockey, track training, dog walking, dog training for law enforcement, horse shows, dog shows, and a car show.

- **Fair Park,** Oak St., Canfield, Ohio

  Fair Park occupies just over 40 acres along the southern Canfield city boundary. The park was purchased by the City of Canfield in 1979, when greenhouses on the

property were closed. Fair Park facilities include an enclosed meeting building, children's play equipment, nature trails, two ponds, picnic tables, a basketball hoop, and a sand volleyball court.

- **Fosterville Park**, 600 W. Indianola Ave.,Youngstown, Ohio

  Fosterville Park is property of the Youngstown Board of Education and occupies 1.5 acres in Youngstown's south side. Its facilities are in good condition and a new fence was recently constructed around the tennis courts. Fosterville Park facilities include a utility building, a tennis court, a modular deck system, standard playground equipment, and a basketball court.

- **Kirkmere Park** ,Kirk Rd. & Brunswick Rd., Youngstown, Ohio

  The Kirkmere Park property was sold to the Youngstown Park and Recreation Commission on October 14, 1949 and occupies 5 acres in the city's lower west side adjacent to Kirkmere Elementary School. The park has been well maintained, receives plenty of use and features new playground equipment. Kirkmere Park facilities include standard playground equipment, a modular deck system, a basketball court, a football field, outdoor grills, and a utility building.

- **Kyle Woods State Game Preserve** , Tippecanoe Rd., Canfield, Ohio

  The Kyle Woods State Nature Preserve is located along the Turnpike access road, off of Tippecanoe Rd., in Canfield Township. It was a 1977 gift to the Ohio Department of Natural Resources Division of Natural Areas and Preserves from Josephine Kyle, in memory of her father, Judge Arthur Kyle. It has been virtually undisturbed by humans since 1903, has many large trees and is an excellent birding location for songbirds.

- **Mill Creek Park** , 7574 Columbiana-Canfield Rd. (Offices) Canfield, Ohio

  By far the largest park in the watershed, Mill Creek Park, established in 1891, encompasses approximately 2,700 acres, 20 miles of roads and 15 miles of trails in Youngstown and Boardman. Mill Creek, which runs through the park to the Mahoning River in Youngstown, is the source for three man-made lakes: Lake Newport, Lake Glacier and Lake Cohasset. Gardens, picnic areas, fishing, golfing, boating, baseball, cross-country skiing, and sledding are just a few of the activities at Mill Creek Park. Mill Creek Park also provides access to many natural areas including deciduous and evergreen mixed forests, wetlands, waterways, riparian areas, transitional areas and many additional forms of diverse habitat. Park facilities include the following:

  Lanternman's Mill and Covered Bridge, one of Mahoning County's most historic landmarks Drives, foot trails and the East Golf Hike/Bike Trail, with the East Golf Hike/Bike Trail providing joggers/walkers/bikers/skaters and, in the winter season, cross country skiers, a rubberized asphalt surface. Picnic facilities are scattered throughout the park, with the Lower Bears Den Picnic Area providing restrooms,

tables and grills, asphalt trails, and a playground. The Lily Pond where migrating waterfowl and goldfish make this a popular attraction. Lake Cohasset provides a secluded area to view wildlife and Lake Glacier is used for boating and fishing. Lake Newport is also used for boating and fishing and includes the Newport Wetlands, which is situated at the southern end of Lake Newport.

Volney Rogers Field, an 18 acre facility offering a playground, tennis courts, basketball courts, softball fields, baseball fields, football fields, and a shelter house. Walter H. Scholl Recreation Area is an18 acre facility with a playground, spray pool, tennis courts, basketball courts, softball fields, picnic areas, and a picnic pavilion. James L. Wick Recreation Area is an 65 acre area that includes a playground, picnic facilities, an 18-hole par-3 golf course, a fitness station, softball fields, baseball fields, tennis courts, sand volleyball courts, horseshoe courts, batting cages, sled riding slopes, and a picnic pavilion. Mill Creek Park Golf Course, a 36-hole course open to the public. Pioneer Pavilion features a kitchen and dining room with seating for 60 people and a timbered ballroom. Chestnut Hill Pavilion features a stove and sink, an open fireplace, seating for 100 people, and a playground. The Slippery Rock Pavilion features a stove and sink, seating for 150 people, and a playground. The Walter C. Stitt Pavilion features a stove and sink, a fireplace, seating for 100 people, and a playground. The Bears Den Cabin, offers an air-conditioned cabin with a fully-equipped kitchen, fireplace, seating for 48 people, a deck, and a grill. Birch Hill Cabin, also an air-conditioned cabin with a fully-equipped kitchen, a fireplace, seating for 48 people, a deck, and a grill. The Log Cabin has been remodeled for party use, features a stove, sink, fireplace, and seating for 30 people.

Ford Nature Education Center houses exhibit rooms, a classroom and the naturalist offices. The Vickers Memorial Library, the Teacher's Resource Center, a gift shop, wildlife gardens, and walking trails are all located at the Fellow Riverside Gardens, a public display garden that attracts over 200,000 visitors each year.

- **Mill Creek MetroParks Bikeway**, Western Reserve Rd to County Line Rd. Canfield & Austintown, Ohio

The MetroParks Bikeway is one constructed section of the Great Ohio Lake to River Greenway, a proposed 100-mile bikeway stretching from Lake Erie in Ashtabula County to the Ohio River in Columbiana County. It runs from Western Reserve Rd. in Canfield Township to County Line Rd. in Austintown Township, covering 10.6 miles in length. The paved trail offers riders a variety of scenery, including farmland, forests and wildlife habitat. The Bikeway offers numerous opportunities for nature hikes, trail rides and community events. There are several proposed or constructed links that will or currently provide access to surrounding residential areas. Handicap access is provided, and the Bikeway is also open to walkers, skaters and cyclists; cross-country skiing is permitted in the winter. The Kirk Road trail head in Austintown Township features several facilities, including a 45-stall parking lot, a picnic pavilion, restroom facilities, a depot structure with bench seating, vending machines, and information kiosks.

- **Schenley Park**, 310 S. Schenley Ave., Youngstown, Ohio

  The Schenley Park property was purchased by the Youngstown Park and Recreation Commission from G.W. and Jane Williams in 1952 and occupies 9 acres in the city's west side. The city owns one-half of the property, while the other half is owned by the Youngstown Board of Education. The park features a variety of facilities. Schenley Park facilities include standard playground equipment, a modular deck system, a soccer field, a basketball court, picnic tables, and a utility building.

- **Stambaugh Field**, 1030 Glenwood Ave., Youngstown, Ohio

  Stambaugh Field is property of the Youngstown Park and Recreation Commission and occupies 7.2 acres in the city's south side adjacent to Mill Creek Park. The park's facilities include a softball diamond and concrete bleachers.

- **Trustee's Park**, Raccoon Rd., South of Mahoning Ave., Austintown, Ohio

  Trustee's Park is located on Raccoon Rd. across from the new Austintown Library, and occupies approximately 14 acres, with 5 of the acres devoted to wildlife development. Trustee's Park includes, along with wildlife development, a baseball field.

- **Woodworth Park**, Luther St., Beaver Township, Ohio

  Woodworth Park is located on Luther St. near the intersection of Southern Blvd. and Western Reserve Rd. in Beaver Township. The park features a summer concert series on Wednesday nights at 7:00 p.m. Park facilities include a baseball field, a basketball court, a playground with swings, and a performance pavilion with seating.

- **Mill Creek MetroParks Farm**, Route 46, Canfield, Ohio

  Located on Route 46 across from the Canfield Fairgrounds, this 399-acre working farm is leased from the county and operated by the MetroParks. This facility is multifaceted and offers many recreational and educational opportunities. Educational facilities consist of classrooms, farm animal display barns, the hands-on AgVenture Barn, the Children's Vegetable Garden, and McMahon Hall – an all-purpose room. Farm tours, special events and other educational opportunities also occur throughout the year. The Farm facility also includes the MetroParks' Administrative Office, a 2-mile hiking trail and phenology garden. The MetroParks Bikeway traverses the site and can be accessed by a spur trail. The Farm has several ponds, wetland areas, significant forested areas (over 70 acres), two tributaries to Indian Run and several additional habitats.

- **Beaver Township Nature Preserve**. Route 165, Beaver Township, Ohio

Eighty (80) acres was acquired by Beaver Township in 2004 through the Clean Ohio Conservation Fund. A historically farmed area, the Preserve is also densely forested and surrounds a tributary to Turkey Creek. A pavilion allows school children and groups to utilize the facility for educational and programming purposes.

- **Mill Creek Wildlife Sanctuary,** West Calla Road, Beaver Township, Ohio

  The facility consists of 264 acres that is owned and operated by Mill Creek MetroParks is located along West Calla Road, adjacent to Mill Creek in Beaver Township. Much of the property is located in the floodplain of Mill Creek. The property exhibits diverse, natural habitat with various plant and animal species that provide significant functions throughout the community. The facility serves as an ideal environment for the numerous species of birds listed as Ohio threatened and endangered species. Of the over 240 species of birds documented on the site throughout the past 20 years, 16 species are categorized as endangered (10) or threatened (6) by the Ohio Department of Natural Resources of the United States Fish and Wildlife Service. Over 159 acres have been identified as wetlands, and preservation of these wetlands, floodplains, mudflats, pond areas and established vegetation supports resident and migrating birds at this site.

- **Mill Creek Preserve,** Tippecanoe Road, Boardman Township, Ohio

  This117 acre facility is owned and operated by Mill Creek MetroParks. Located adjacent to Mill Creek, this facility has a tributary that feeds approximately 42 acres of Category 3 wetlands along the floodplains of Mill Creek. These wetlands are part of a complex that extends over 100 acres. The intact riparian corridor along the tributary and Mill Creek, scrub-shrub areas, wetlands, forested region and other habitat areas create a diverse facility. Mill Creek MetroParks acquired the facility in 2005 through the Clean Ohio Conservation Fund.

- **McCune Field,** Shields Rd., Canfield, Ohio

  McCune Field occupies just over four acres just north of Interstate 76 in Canfield Township. It is considered a children's playground, but is open for public walking. Facilities include nine baseball and softball fields, to be used only by permission. Over 700 children use the park and its facilities.

- **Wedgewood Park,** Lancaster Drive, Austintown Township, Ohio

  Recently acquired by Austintown Township, consist of 17 acres. With Axe Factory Run flowing through the majority of the site, the numerous acres of wooded area provide hiking and passive recreation opportunities. A pavilion and baseball field provide the community with opportunities for outings and gatherings.

- **Sheridan School Park,** Sheridan Road, Youngstown, Ohio

  This 2-acre facility consists of a large open green space, owned by the Board of Education, provides recreational opportunities for school children and the surrounding community. A large lawn space can be used for soccer, football, baseball, Frisbee and many other opportunities

b. Private Foundations or Land

- **Yellow Duck Park**, 10590 Columbiana-Canfield Rd., Canfield, Ohio

  Occupying 42 acres south of Canfield, Yellow Duck Park offers many unique recreational activities to people of all ages. The park offers family season passes for the entire summer, as well as group picnic rates for companies, churches and others. Throughout the Easter, Halloween and Christmas seasons, Yellow Duck Park becomes a thematic drive-through of sorts. Holiday themes include the Holiday Bunny Trail for Easter, Ghost Lights of Halloween and the Festival of Lights for Christmas.

  Attractions include Little Tykes Beach, the Yellow Duck Waterslide, the Jackrabbit Waterslide, and the Funland Arcade. Other recreational activities also include paddleboats, a playground, volleyball, horseshoe courts, a diving area, a swimming beach, mini putt golf, bumper golf, a bocce court, a rec. room, basketball, ping pong, a Tarzan rope, a dunk tank, a shaded picnic area with tables and grills, and maze tag.

- **Mahoning County Duck Club**, E. Calla Road in Beaver Township, Ohio

  A 128-acre facility is located within the floodplains of Mill Creek and has numerous acres of wetlands, ponds and lakes.

Easements (All easements are held jointly by Mill Creek MetroParks and the Mahoning Soil and Water Conservation District)

- **Mill Creek Wildlife Sanctuary** *(Calvin)* – 157 acres; acquired in 1999; Beaver Township; Riparian easement on Mill Creek
- **Camp Stambaugh** – 65 acres; acquired in 2002; Canfield Township; Riparian easement on Indian Run
- **Burbick Property** – 12 acres; acquired in 2003; Beaver Township; Riparian Easement on tributary to Mill Creek
- **The Lakes at Beaver** *(Beaver Development)* – 21 acres; acquired in 2004; Beaver Township; Riparian easement on Mill Creek
- **Beaver Township Nature Preserve** – 11 acres; acquired in 2004; Beaver Township; Riparian easement on tributary to Turkey Run
- **The Landings** (*Sharrott Road, LTD.)* – 38 acres; acquired in 2004; Beaver Township; Riparian easement on Mill Creek

- **Cranberry Run Headwaters** – 25 acres; acquired in 2004; Boardman Township; Riparian easement on Cranberry Run

5.2 Status and Trends

Suburban growth is a serious factor in the Mill Creek watershed. The Mahoning County townships in the watershed with the most land in agriculture in the early 1990's are also the townships that have experienced the greatest increases in growth from 1990 – 2000. (Beaver and Canfield Townships)[14]. Fairfield Township in Columbiana County has also experienced residential growth, mostly in the area directly adjacent to the City of Columbiana, which is the portion of the township that drains to Mill Creek.

Beaver Township in Mahoning County has created a comprehensive land use plan (adopted by the Beaver Township Trustees in July 2003). The plan identifies the northeastern portion of the township as the primary corridor for residential development. This is the area at the edge of the Mill Creek valley and the portion of Beaver Township that drains to Yellow Creek. Fortunately, the township has emphasized easements along stream corridors, and is considering incorporating riparian setbacks in their zoning resolution[16].

Most of the Mill Creek watershed in Youngstown, northeastern Canfield Township, eastern Austintown, and northern Boardman Township has been developed to capacity. The remaining portion of Boardman Township (within the Mill Creek watershed) that has not been developed is the southwest corner of the township, which is the west side of the Mill Creek valley.

Protected land within the watershed continues to grow through the vision of the Mill Creek MetroParks, the largest landowner of the protected lands in the watershed. Mill Creek MetroParks shares its vision of protecting land within the watersheds of Mahoning County with AWARE. The procurement of funding to acquire lands for protection within the watershed is dependent on available grant funding, private monetary donations and property donations by landowners.

In 2003 areas were identified as "priority riparian corridor areas" for acquisition, easements or restoration projects. Table 16 below identifies these areas within the Mill Creek watershed. Efforts are being made to ensure that the headwater streams in this area are protected as it develops.

Table [illegible]arian Corridor Areas Identified as a Priority for Land Preservation, Ease[illegible]or Restoration.

Stream	Location details	Acres (total parcel)	Lineal Feet	Inside or within one mile of NPDES phase II area?	Sewer Available?	Headwater streams?	Forested Corridor?	Adjacent to other protected areas?	Adjacent to other parcels identified for protection?	Degree of Channel Alteration *	Priority Ranking**
05030103-080-020											
Indian Run	Canfield Township, Timberbrook Dr.	24	1330	Y	N	Y	Y	N	Y	2	8
Indian Run	Canfield Township, SR46	78.27		Y	N	N	Y	N	Y	2	6
Indian Run	Canfield Township near leffingwell	16.92		Y	N	N	Y	N	Y	2	6
UNT to Indian Run	Green Township	84		Y	N	Y	Y	N		2	6
UNT to Indian Run	Green Township	80		Y	N	Y	Y	N		2	6
Indian Run	Canfield Township, Leffingwell	varies		Y	N	N	Y	N		2	5
Indian Run	Canfield Township, Leffingwell	varies		Y	N	N	Y	N		2	5
Indian Run	Canfield Township, fairground	65.64	1910	Y	N	Y	Y	N		3	5
Indian Run	Canfield Township, fairground	47.73	970	Y	N	N	Y	N		3	4
Indian Run	Canfield Township , at Leffingwell and Tippi	39		Y	Y	N	Y	Y	N	2	5
UNT to Indian Run	Canfield Township, Timberbrook Dr.	5.3		Y	N	Y	Y	N		2	6
UNT to Indian Run	Canfield Township, Timberbrook Dr.	14.6		Y	N	Y	Y	N		2	6
Little Indian Run	Canfield Township	4.79	130	Y	Y	Y	Y	N	Y	2	8
Little Indian Run	Canfield Township	11.99	670	Y	Y	Y	Y	N	Y	2	8
Little Indian Run	Canfield Township	18.73	750	Y	Y	Y	Y	N	Y	2	8
Little Indian Run	Canfield Township	48.79	3640	Y	Y	Y	N	N	Y	3	6
Little Indian Run	Canfield Township	24.55	575	Y	Y	Y	Y	N	Y	2	8
Little Indian Run	Canfield Township	25.02	849	Y	Y	Y	Y	N	Y	2	8
05030103-080-030											
Anderson Run	Canfield Township, West of OH11			Y	N	Y	Y (partial)	N	Y	2	6(-)
Anderson Run	Canfield Township, West of OH11			Y	N	Y	Y	N	Y	2	6
Anderson Run	Canfield Township, East of OH 11			Y	N	Y	Y	N	Y	3	4
Anderson Run	Canfield Township, East of OH 11		2450	Y	N	Y	Y	N	Y	2	5
05030103-080-010											
Mill Creek	Beaver Township, north of Renckenbeger	12.75	750	N	N	N		N		2	
Mill Creek	Beaver Township, north of Renckenbeger	36.94	340	N	N	N		N	N	2	
Mill Creek	Beaver Township, near Blosser			N	N	N		N	Y	2	
Mill Creek	Beaver Township, near Blosser		990	N	N	N		N	Y	1	
Mill Creek	Beaver Township, near Blosser		1330	N	N	N	Y	N	Y	1	4
Mill Creek	Beaver Township, near Blosser		1500	N	N	N	Y	N	Y	1	4
Mill Creek	Beaver Township @ OH165		1655	N	N	N	Y	N	Y	1	5
Mill Creek	Beaver Township @ OH165		600	N	N	N	Y	N	Y	2	3
Mill Creek	Beaver Township @ OH165	26	2066	N	N	N	Y	N	Y	1	4
Mill Creek	Beaver Township (duck club)			Y	N	N	wetland	Y	Y	4	2
Mill Creek	Beaver Township (Calvins)			Y	N	N	wetland	Y	Y	4	2
Mill Creek	Beaver Township (Calvins)			Y	N	N	wetland	Y	Y	4	2
Raccoon Creek	Beaver Township, near OH46/New Buffalo			N	N	Y	Y	N		2	
Raccoon Creek	Beaver Township, near OH46/New Buffalo			N	N	Y	Y	N		1	
Raccoon Creek	Beaver Township, near OH46/New Buffalo			N	N	Y	Y	N		2	

** 1-None 2-Slight 3-Moderate 4-Dramatic, **HUC 020=5 points 030=4 points 010=3 point, plus one point for each Y, minus "degree of alteration"*

5.3 Cultural Resources

"Cultural Resources" include prehistoric and historic archaeological sites, historic bridges, and historic buildings, sites, and districts that are of significant value to the history/cultural heritage of an area.

5.3.1 Sites of Historical, cultural or recreational significance

The Mill Creek watershed includes several sites of historic significance. Listed on the National Register of Historic Places are:

b. Historic Districts

- **Forest Glen Estates Historic District**
  (added 1998 - Mahoning County - #98000565)
  Roughly bounded by Homestead Dr., Glenwood Ave., Alburn Dr., and Market St., Boardman Township (1300 acres, 106 buildings)
- **Idora Park**
  (added 1993 - Mahoning County - #93000895)
  SE of the jct. of McFarland and Parkview Aves., Youngstown
  (270 acres, 12 buildings, 3 structures)
- **Mill Creek Park Historic District**
  (added 2005 - Mahoning County - #05000178)
  Mahoning Ave. to Boardman-Canfield Rd., Mill Creek, 960 Bears Den Rd., Youngstown. (15500 acres, 34 buildings, 24 structures, 1 object)

c. Historic Sites

- **Austintown Log House**
  (added 1974 - Building - #74001566)
  West of Youngstown on Raccoon Rd., Youngstown, Ohio
- **Idora Park Merry-Go-Round**
  (added 1985 - Structure - #75001482)
  Idora Park on Canfield Rd., Youngstown, Ohio
- **Lanterman's Mill**
  (added 1974 - Building - #74001568)
  Also known as Old Mill
  Canfield Rd. (U.S. 62) in Mill Creek Park, Youngstown, Ohio
- **Mill Creek Park Suspension Bridge**
  (added 1976 - Structure - #76001482)
  Mill Creek Park, Youngstown
- **Southern Park Stable**
  126 Washington Blvd., Boardman Township, Ohio
  (listed 7/10/1986)

Historical societies within the area that possess additional resources include the Fairfield Township and Columbiana Historical Society, The Mahoning Valley Historical Society, Boardman Historical Society, and the Western Reserve Historical Society.

5.4 Previous and Complementary Efforts

Efforts have been made over the last several years to expand the participation of private residents and local private business and industry in AWARE in order to educate them on conservation practices. Riparian management training workshops and onsite demonstrations were conducted at Youngstown State University, the Canfield Fair, Mill Creek MetroParks facilities and at local garden clubs.

A Landscaper's Workshop was completed in January of 2007 in order to educate landscapers and businesses on invasive species, riparian corridors and pollution prevention techniques.

5.4.1 History of Watershed Efforts

Several studies, management plans and other types of programs have been completed within the Mill Creek watershed.

- **Mahoning County, Mill Creek MetroParks and the Townships of Austintown, Beaver, Boardman, Canfield, Coitsville, Poland, and Springfield Final Storm water Management Plan**. URS Corporation. March 3, 2003.
- **Mahoning County Land use Plan**, Mahoning County Planning Commission. January 2001.
- **Preliminary Stream Restoration Plan for Mill Creek, Yellow Creek, and Meander Creek Watersheds.** Martin, Scott, C. Civil and Environmental Engineering Program, Youngstown State University. November, 2003.
- **Wetland Mitigation Plan for Mill Creek, Yellow Creek, and Meander Creek Watersheds.** Martin, Scott, C, and others. Civil and Environmental Engineering Program, Youngstown State University.
- **Riparian Area Protection Plan for the Mill Creek and Yellow Creek Watersheds.** Martin, Scott, C. Civil and Environmental Engineering Program, Youngstown State University.
- **Beaver Township Comprehensive Land use Management Plan**
- **Recreation Plan for the Mill Creek, Yellow Creek and Meander Creek Watersheds-** Recreation and Greenways Committee, November 2003.
- **"Youngstown 2010"** - City of Youngstown and Youngstown State University - ~2003

- **Boardman Township Storm water Study** - MS Consultants - ~2004
- **US 224 Corridor Study** - ODOT – 2002
- **208 Plan, EastGate Regional Council of Governments**
- **GIS Based Procedure to Identify Weyland Mitigation Opp, in Mill Creek , Yellow and Meander Creek Watersheds.** Scott Airato, YSU, October 2002
- **Mahoning County Erosion and Sediment Control Rules**, Mahoning County Board of Commissioners, Feb 2007.
- **Application of Techniques to identify wetland mitigation and stream restoration opportunities.** YSU, Susheel R. Kolwalkar, August 2003.

5.4.2 Current Watershed Efforts

Austintown Township is currently working on adopting a riparian setback ordinance. Meetings were held with the Zoning Inspectors Association of Mahoning County on August 4, 2006 in order to attempt to implement the riparian setback ordinance.

a. Agricultural Programs

Conservation Operation Program

The Conservation Operation Program is the largest agricultural program in the Mill Creek Watershed. This program allows the Natural Resource Conservation Service (NRCS) and Mahoning Soil and Water Conservation District (SWCD) to provide technical assistance and conservation planning for landowners. This program assists over 20 landowners in the Mill Creek Watershed each year.

Conservation Reserve Program

The Conservation Reserve Program (CRP) provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and ranchers in complying with Federal, State, and tribal environmental laws, and encourages environmental enhancement. The program is funded through the Commodity Credit Corporation (CCC). CRP is administered by the Farm Service Agency, with NRCS providing technical land eligibility determinations, Environmental Benefit Index Scoring, and conservation planning.

The Conservation Reserve Program reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filter strips, or riparian buffers. Farmers

receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover practices.

The predominant CRP practice that has been installed in the Mill Creek Watershed in the last five years is Grassed Water Ways (see picture x.0). Grassed waterways function to prevent gully erosion in agricultural fields.

b. Wetlands Reserve Program

The Wetlands Reserve Program is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection. WRP easements can also be placed on riparian corridors, though it is required that those corridors contain wetlands.

Seventy-eight (78) acres of riparian wetland surrounding the mainstem of Mill Creek was enrolled in the WRP program in 1998. This confers a permanent conservation easement, and restricts development of that acreage, hence preserving the wetlands and riparian area.

c. Rural Abandoned Mine Program

The Rural Abandoned Mine Program (RAMP) is authorized by Section 406 of the Surface Mining Control and Reclamation Act (SMCRA) of 1977 as amended by the "Abandoned Mine Reclamation Act of 1991" as subtitled under the Budget Reconciliation Act (Public Law 101-508; 30 U.S.C. 1236).

It is authorized for the purpose of reclaiming the soil and water resources of rural lands adversely affected by past coal mining practices. There were approximately 1.1 million acres of abandoned coal-mined land needing reclamation in 1977. The U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), formally the Soil Conservation Service (SCS) administers the program, and funding is provided from money deposited in the Abandoned Mine Reclamation Fund. The program provides technical and financial assistance to land users who voluntarily enter into 5- to 10-year contracts for reclamation of up to 320 acres of eligible abandoned coal-mined lands and waters. The land user with NRCS technical assistance involved prepares a reclamation plan.

All active coal mining operators pay into the Abandoned Mine Reclamation fund at a rate of 35 cents per ton of coal produced from surface mining and 15 cents per ton of coal produced by underground mining. The fees are deposited in the interest-bearing

fund, which is used to pay reclamation costs of AML projects. RAMP was established to protect people and the environment from pre-1977 coal mining activities. RAMP is no longer an active program of the USDA.

There have been 3 RAMP projects completed in the Mill Creek Watershed. The earliest RAMP project in the Mill Creek Watershed was on a 13 acre site south of State Route 165 in the Village of North Lima, re-grading to alleviate the hazards associated with a high wall remaining from past mining operations. Another project involved re-grading and the establishment of vegetation on approximately 55 acres also near the Village of North Lima. The final RAMP project in the area was to mitigate hazards from an abandoned mineshaft at the site of the former Ohio Valley Mushroom Farm.

d. Mine Drainage Programs

The Ohio Department of Natural Resources Divisions of Mineral Resource Management issues permits for mining activities, monitors active mine sites, and assists residents and local governments in mitigating the after effects of mining activity.

Since 1998 ODNR has drilled new drinking water wells for 8 residents in Beaver and Springfield Townships, after their wells had been affected by mine drainage.

ODNR has also been a vital partner with AWARE in studying the problems caused by Mine Drainage in the Mill Creek Watershed.

e. Urban Water Pollution Control Programs

Mahoning SWCD has reviewed Storm Water Pollution Prevention Plans since 1995 for subdivisions and development sites covered by NPDES permits.

The Mahoning County Planning Commission also invites other agencies (including Mahoning SWCD, Mahoning County Engineers, and Natural Resource Conservation Service) to comment on subdivisions prior to re-plat. These resource meetings give local agencies the opportunity to express any specific concerns, including wetland and stream issues that have not been addressed previously.

6.0 Physical Attributes of Mill Creek and Tributaries

The current status of Mill Creek is defined by historical Ohio Environmental Protection Agency (OEPA) 305(b) reports. According to a report issued by the OEPA in 1998, "The State of Aquatic Ecosystem; Ohio Rivers and Streams" Mill Creek was a fully attaining stream based on data collected between 1978 and 1987. OEPA has since assigned a stream assessment status for Mill Creek as point source and non-point source impaired and not attaining. Data collected for Mill Creek between 1988 and 1996 classify the stream as not attaining. According to the OEPA's Lower Mahoning River

Stream Segment Data (OEPA 305(b) report) for Mill Creek, 11.3 miles of the stream have been classified as not attaining and 9.6 miles have not been assessed.

Mill Creek is categorized as very poor under aquatic life use attainment. The major sources of known or suspected impacts are agriculture, urban runoff, storm sewers, construction sites and surface runoff. The aquatic life designated use is warmwater. The major known sources of impairment to Mill Creek are major municipal point sources, urban runoff/storm sewers (NPS), agriculture, flow regulation/modification, channelization, dam construction and overflow from combined sewers. The known causes of impairment are organic enrichment/D.O., siltation, flow alteration, nutrients, metals and ammonia.

Based on the trends revealed in the historical OEPA 305(b) reports for Mill Creek the water quality of the stream has been declining over the last 25 years. The trend in declining water quality can be attributed to many variables. Encroaching development is the major source of known impacts to the stream's water quality as well as the entire Mill Creek watershed.

6.1 Early Settlement Conditions

It is likely that the Mill Creek valley was dominated by Elm-Ash swamp forest types prior to European settlement. The prehistoric period in Ohio began at least 15,000 years ago when humans entered the region near the end of the last Ice Age. The period ended around 350 years ago when French explorers in Canada began to record information about the lands along the south shore of Lake Erie.

From journals kept by missionaries, historians know that the tribes of Delaware (in eastern Ohio) and Wyandot (in northern Ohio) possibly resided within the Mill Creek watershed. French land surveyors and fur traders had contact with the American Indians for many years, trading guns and weapons for furs and other supplies to send back to Europe. Native Americans of this area eventually began to disappear by forced relocation or intermarriage.

During the 18th century the Ohio Country (sometimes called the Ohio Territory) consisted of the regions of North America west of the Appalachian Mountains and in the region of the upper Ohio River south of Lake Erie. This area is one of the first frontier regions of the United States, and encompassed the present-day states of Ohio, eastern Indiana, western Pennsylvania, and northwestern West Virginia. The issue of settlement in the region is considered by historians to have been a primary cause of the French and Indian War and a contributing factor to the American Revolutionary War.

Early settlement structures were built primarily of logs. Schools were funded through parents paying tuitions and donating wood and for fuel. Settlers were most likely from New England and western Pennsylvania. They were also joined by Irish immigrants (Ulster and Catholic) who were then followed by the Welsh. Europeans also arrived from Germany and by the late 1800's from nearly every southern and eastern European

country. Information provided by the 1850 census, approximately 90 African Americans were residents of this area.

Youngstown was founded in 1796 and the first industries in Youngstown consisted of a sawmill and gristmill that were located on Mill Creek, and were the first mills built in the Western Reserve.

During the Great Depression, Volney Rogers purchased what is known as Mill Creek Park, which is considered one of the "beauty spots" in the Western Reserve. Predating the Ohio State Park System, Mill Creek Park became the first Park District in the state of Ohio in 1891.

6.2 Channel and Floodplain Conditions

"The forests are natural reservoirs. By restraining the streams in flood and replenishing them in drought they make possible the use of waters otherwise wasted. They prevent the soil from washing, and so protect the storage reservoirs from filling up with silt. Forest conservation is therefore an essential condition of water conservation". President Theodore Roosevelt, State of the Union Message, Dec. 3, 1901

Mill Creek is entrenched to some degree for most of its length. No entrenchment ratios have been established. Most of the tributaries to Mill Creek are also entrenched to some degree. Watershed wide development of entrenchment ratios is a recommendation of the watershed management plan for Mill Creek.

a. Forested Riparian Corridor Assessment

In 1999 YSU graduate student Robert Williamson, and in 2001 Joseph Warino (Eastgate Regional Council of Governments) completed work that analyzed the riparian cover width and floodplain quality of Mill Creek and its tributaries. The information collected shows an overall high quality, however, there are known areas where the score(s) assigned to stream segment(s) does not match visually observed conditions. Because of the discrepancy (ies) and the understanding that there was not a follow up survey to validate and concur with the original scores set to the Mill Creek watershed, the information that is available should be updated with a more detailed study in the future.

b. Miles of Riparian Corridor with Forested Natural Riparian Buffer

According to the Mahoning County Enterprise GIS Files, ODNR Land Coverage data, there is approximately 302 miles of streams within the Mill Creek watershed. One hundred eighty-nine (189) miles are riparian forested miles.

Table 17. Stream Miles with Forested Riparan Buffer within the Mill Creek Watershed.

Watershed HUC Code	Total Length of Streams with Forested Riparian Zone [feet]	Total Length of Streams in Watershed [feet]	Total Length of Streams with Forested Riparian Zone [miles]	Total Length of Streams in Watershed [miles]	Percent of Total [Forested Riparian]
05030103080010	487,042.4	826,396.4	92.2	156.5	58.9%
05030103080020	211,792.5	342,029.6	40.1	64.8	61.9%
05030103080030	299,410.8	430,122.2	56.7	81.5	69.6%

Sources: Mahoning County Enterprise GIS Files, ODNR 1994 Land Cover coverage

Maps and tables were created by Youngstown State University, using GIS technology to identify areas within the watershed that possess a forested riparian corridor. The extent of riparian forested areas in the Mill Creek Watershed sub-watersheds was determined by combining two digital data layers, hydrology and 1994 land cover, acquired from the Mahoning County Enterprise GIS and the Ohio Department of Natural Resources Geographic Information Management System, respectively.

The land cover inventory was produced for Ohio by the processing of Landsat Thematic Mapper data, at a 30 meter resolution. This data was acquired during September and October 1994, and included, among other categories, wooded land cover. Originally created in raster format, the data was geo-referenced and converted to an ArcInfo coverage (ODNR metadata). The hydrology layer was digitized in ArcInfo coverage format from Mahoning County Enterprise GIS orthophotos, at a scale of 1:1,200. This data was acquired during April 2004.

For the purpose of the analysis, each coverage was converted to an ESRI shapefile, and clipped to fit within the Mill Creek Watershed sub-watershed boundaries. The wooded land cover data was then extracted from the land cover inventory and written to a separate shapefile. The hydrology layer was then placed on top of the wooded land cover layer to ascertain forested riparian areas within the watershed. Any wooded land cover that intersected hydrology was added to the map as a forested riparian area.

Because of the differing scales and timing of the data, the accuracy and reliability of the analysis cannot be guaranteed without a thorough field survey.

Figure 19

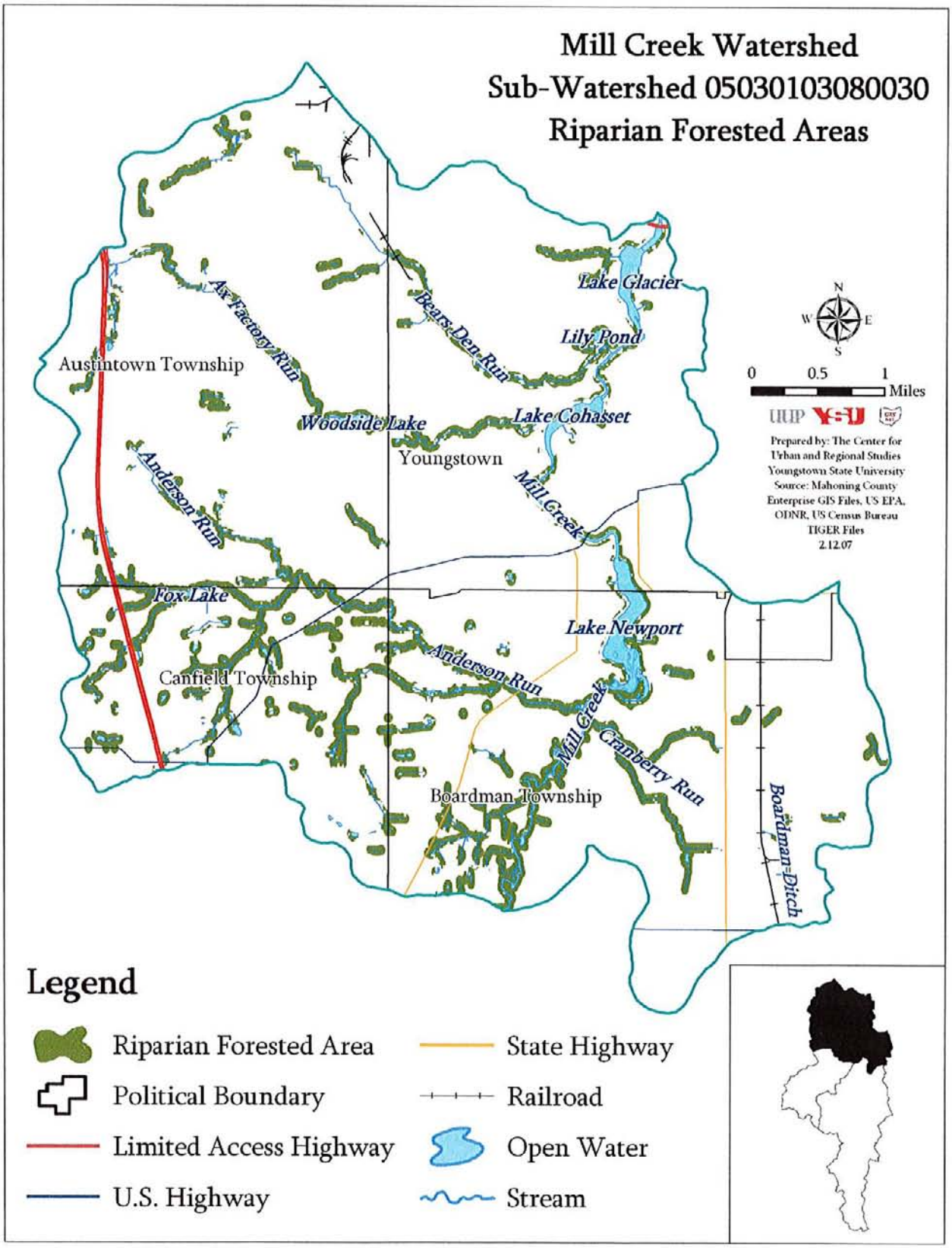

Mill Creek Watershed
Sub-Watershed 05030103080030
Riparian Forested Areas
Lake Glacier
Lily Pond
Bears Den Run
Ay Factory Run
Austintown Township
Woodside Lake
Lake Cohasset
Youngstown
Anderson Run
Mill Creek
Fox Lake
Lake Newport
Anderson Run
Canfield Township
Mill Creek
Cranberry Run
Boardman Township
Boardman Ditch
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.12.07
Legend
Riparian Forested Area
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad
Open Water
Stream

Figure 20

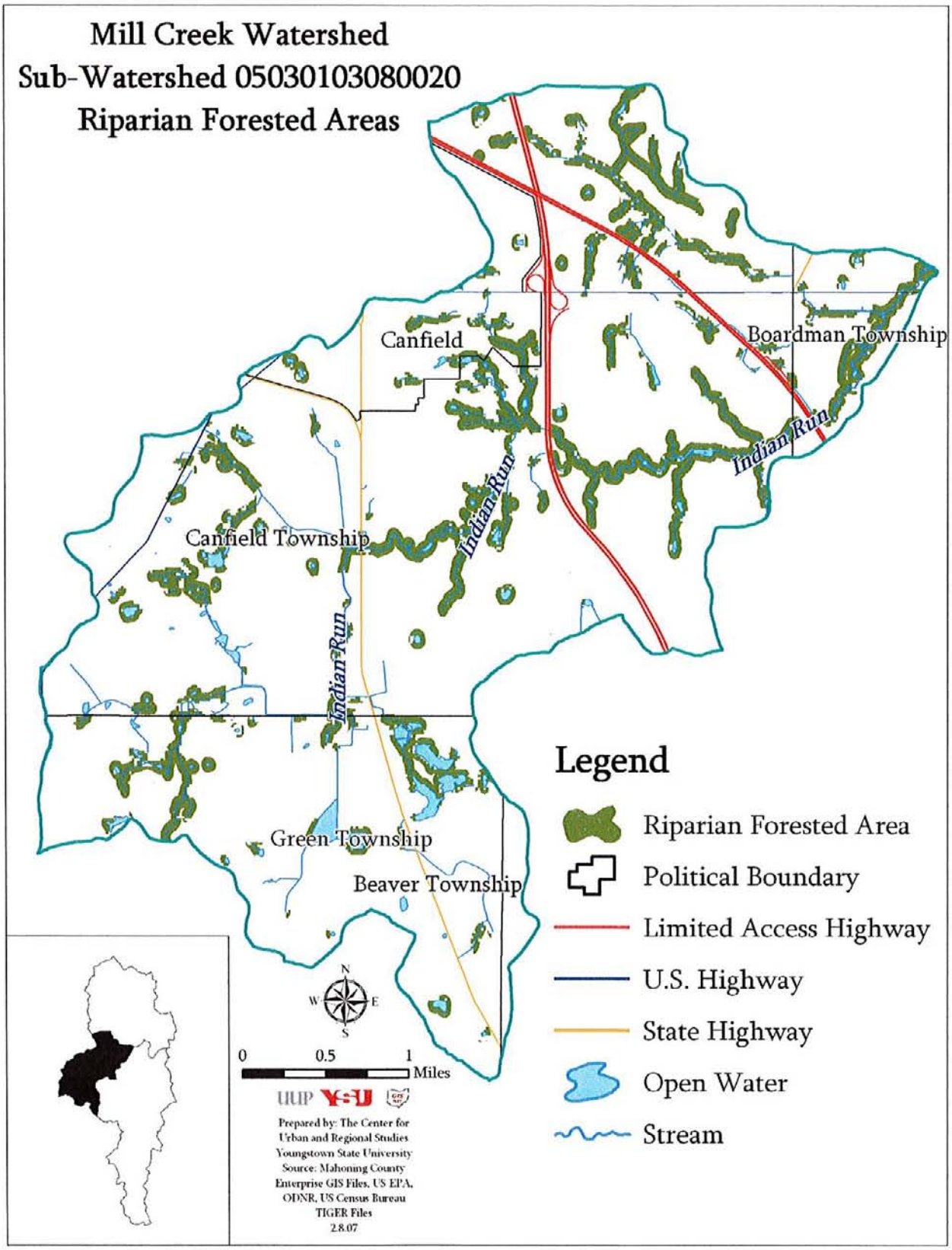
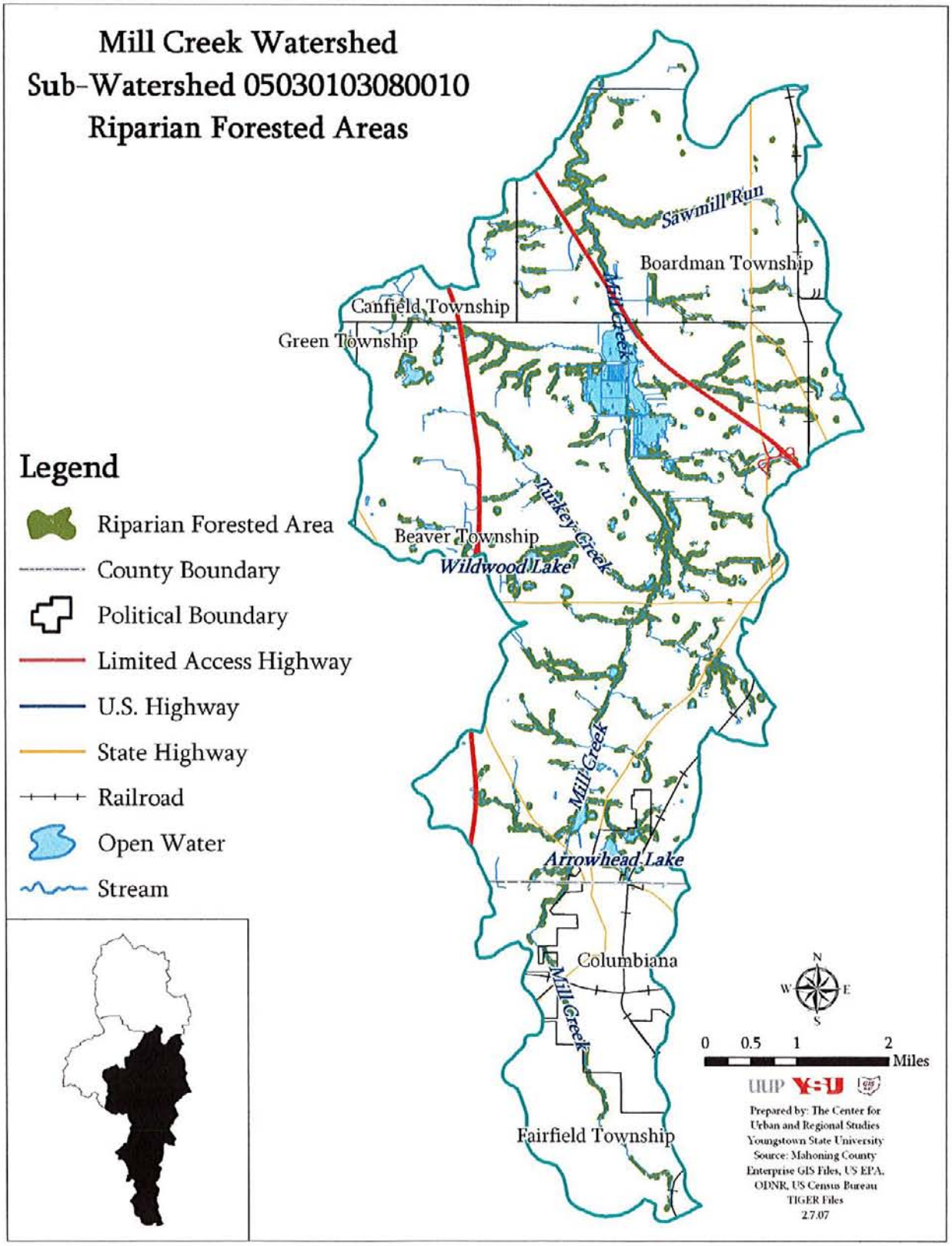

Mill Creek Watershed
Sub-Watershed 05030103080020
Riparian Forested Areas
Canfield
Boardman Township
Indian Run
Indian Run
Canfield Township
Indian Run
Green Township
Beaver Township
Legend
Riparian Forested Area
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Open Water
Stream
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.8.07

Figure 21


Mill Creek Watershed
Sub-Watershed 05030103080010
Riparian Forested Areas
Legend
Riparian Forested Area
County Boundary
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad
Open Water
Stream
Sawmill Run
Boardman Township
Canfield Township
Green Township
Mill Creek
Turkey Creek
Beaver Township
Wildwood Lake
Mill Creek
Arrowhead Lake
Columbiana
Mill Creek
Fairfield Township
N
W
E
S
0 0.5 1 2
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

c. Number of Miles with Permanent Protection

Mill Creek MetroParks in partnership with the Mahoning Soil and Water Conservation District has made it a priority to establish conservation easements along riparian corridors within the county. As of 2006, ten (10) conservation easements have been established within the Mill Creek Watershed, Mahoning County. Currently, there are two additional areas within the Mill Creek watershed that are going to have easements placed on them in 2007. The easements that are currently in the works are part of monies have been allocated through a 319 grant to secure a total of 111 acres of riparian easements within the watershed.

The lower 10.7 miles of the Mill Creek mainstem are permanently protected by the ownership of the Mill Creek MetroParks. Although this area is permanently protected, roads that parallel the stream are present in some areas of the park.

Table 18. Conservation Easements as of 2006 Within Mill Creek Watershed, Mahoning County, Ohio

Description/ Name	Owner	Location	Easement Description (RE = Riparian Easement)	Size (Acres)	Stream Length (Lin. Feet)	Year Acquired (Deed Recorded)
Calvin Property	Timothy R. & Richard A. Calvin	Beaver Twp.	RE on Mill Creek	157.36	2900 Mill Creek, 2400 UNT to Mill Creek	1999
Camp Stambaugh	Greater W.R. Council Boy Scouts of America Inc.	Canfield Twp.	RE on Indian Run	65.27	4650 Indian Run, 960 UNT to Indian Run	2002
Burbick	Gregory and Brenda J. Burbick	Beaver Twp.	RE UNT to Mill Creek	5.85	670	2003
Burbick	Gregory and Brenda J. Burbick	Beaver Twp.	RE UNT to Mill Creek	6.24	1000	2003
The Lakes at Beaver	The Lakes at Beaver Development Co., LLC.	Beaver Twp.	RE on Mill Creek	21.05	Wetlands, no stream length	2004
Beaver Township Nature Preserve	Beaver Township Board of Trustees	Beaver Twp.	RE UNT to Turkey Creek	10.64	1180	2004
The Landings- 11018 Sharrott Road	11018 Sharrott Road, LTD.	Beaver Twp.	RE on Mill Creek	9.75	1120 on Mill Creek, 4000 UNT to Mill Creek	2004
The Landings- 11018 Sharrott Road	11018 Sharrott Road, LTD.	Beaver Twp.	RE on Mill Creek	27.9		2004
Cranberry Run Headwaters /Sarantopoulos	Mill Creek MetroParks	Boardman Twp.	RE on Cranberry Run	24.63	Wetlands, no stream length	2004

d. Miles with Natural Channel

Based on cursory GIS analysis approximately 7.4 miles of the mainstem of Mill Creek appear to have relatively natural sinuosity. No comprehensive listing miles of natural channel have been determined for its tributaries. However, tributaries with notably natural sinuosity include:

- Turkey Run (lower 7000 feet, just prior to confluence with Mill Creek)
- Sawmill Run (lower 3000-4000 feet, just prior to confluence with Mill Creek)
- Indian Run (lower 6000 feet, just prior to confluence with Mill Creek)

Much of Mill Creek and most of its tributaries were straightened or dredged at some point in its history, either as part of agricultural operations, or as areas were developed

e. Miles and Location of Modified Channel

Due to the history of the watershed numerous streams have been channelized, piped or modified in some way. Channelization and ditching streams used to be a common practice within the watershed and throughout the state. Currently there is not a comprehensive list available identifying modified areas, however some streams within the watershed that possess significant modification include:

- **Mill Creek mainstem** immediately south of Western Reserve Road, where the stream follows a section line for over one mile (6300 feet).
- **Indian Run and headwater tributaries**, channelized from Calla Road to Leffingwell Road. (9,200 feet and 10,000 feet of headwater tributaries).
- **Little Indian Creek**, channelized from Pebble Beach to confluence with Indian Run (7,700 feet).
- **Bears Den Run**, channelized from the headwater to near the intersection of Bears Den Road, and Industrial Road (12,00 feet).
- **Cranberry Run/Boardman ditch**, channelized from near its headwaters to Glenwood Avenue (7,500 feet).
- **Sawmill Creek headwaters/Charles ditch**, channelized in the headwaters area (3 streams- approximately 2500 feet each).
- **Turkey Run headwaters 1**, channelized-headwaters to Calla Woods Drive (4,700 feet).
- **Turkey Run headwaters 2**, channelized-headwaters to Lincoln Road (confluence with TR 3) (5,200 feet).
- **Turkey Run headwaters 3**, channelized-headwaters to Lincoln Road (confluence with TR 2) (6,400 feet).

6.3 Dams

Three (3) dams are present on the Mill Creek mainstem to form Lake Newport, Lake Cohasset, and Lake Glacier. The Lake Cohasset dam was constructed in 1896-97, Lake Glacier in 1904-05, and the Lake Newport Dam in 1928. The three (3) lakes were constructed for recreational use by the Mill Creek MetroParks. The dams are considered by many to be local historical landmarks and important resources of Mahoning Valley culture and are maintained by the MetroParks.

There is a small concrete dam (approximately a 10 foot drop) on Indian Run in Canfield Township at the Camp Stambaugh Boy Scout Camp. The lake there was created for recreational use.

Several small earthen dams (ponds) are present on the headwater streams of Turkey Run. The ponds were created for miscellaneous farming use(s). A small stone dam creating a lake (Meridian Lake or Woodside Lake) on Axe Factory Run is located west of Meridian Road, Austintown Township. Please see Appendix C for a map locating these areas.

There are numerous small dams on unnamed tributaries throughout the watershed, many of which are headwater impoundments to create ponds. A comprehensive list and existing data on the ponds is not available at this time. It is recommended that water impoundments within the watershed be identified and a list be compiled in the future.

Table 19. Lowhead Dams Within the Mill Creek Watershed

ID	Waterway	Description	Long	Lat	Township	ODOT District	HYUN
1211	MILL CREEK	Lake Newport Dam. Located in Mill Creek Park, upstream of Canfield Rd. Bridge. Sandstone, good condition.	-80.68	41.06	CITY OF YOUNGSTOWN	4	5030103
1212	MILL CREEK	Lake Glacier Dam. Located in Mill Creek Park, upstream of the Price Rd. Bridge. Sandstone, good condition.	-80.67	41.1	CITY OF YOUNGSTOWN	4	5030103
1213	MILL CREEK	Lake Cohasset Dam. In Mill Creek Park, upstream of Old Furnace Rd Bridge. Sandstone, good condition.	-80.68	41.08	CITY OF YOUNGSTOWN	4	5030103

6.4 Channelization

See Mile and Locations of Modified Channel (above).

6.5 Streams with Unrestricted Livestock Access

The mainstem of Mill Creek near Renckenberger Road still has some livestock access, though some cattle have now been fenced out of the stream. Moff Run in Beaver Township has several sites where cattle have unrestricted stream access. This is by far the stream with the most concentrated livestock access issues. There are several other operations where livestock has access to streams, mostly small tributaries. All are identified in the Mill Creek project table as areas to be targeted for assistance.

6.6 Eroding Banks

- **Mill Creek** from Western Reserve Road north to Lake Newport
- **Anderson Run**-from near the end of Lake Macachee Drive to confluence with Mill Creek (approximately 5,500 feet of stream)
- **Axe Factory Run**-from New Road. to the former Wedgewood Swim Club (approximately 300 feet of stream)

Mill Creek MetroParks identified "erosion problem areas" within the park that suffered from significant storm damage during the summer of 2003. The degraded streams include: Axe Factory Run, Anderson Run, Calvary Run and Kreiders Entrance (UNT21012).

6.7 Floodplain Connectivity

There is no comprehensive data on this point, however based on local knowledge it seems that very few streams or stream segments in the Mill Creek watershed have natural floodplain connectivity in anything more than small and often isolated areas.

6.8 Riparian Levees

There are no levees on Mill Creek or its tributaries.

6.9 Entrenched Miles

Mill Creek is entrenched to some degree for most of its length. All the locations listed as channelized can be presumed to be entrenched. There has been no comprehensive inventory of entrenchment ratios, but this data could be gathered at some point in the future.

6.10 Status and Trends

Suburban and commercial development in the watershed is occurring at a high rate in several areas. Most notably, the southern portion of the watershed including Beaver Township, Canfield Township and Green Township in Mahoning County and Fairfield Township and the City of Columbiana in Columbiana County is experiencing the most dramatic expansion. New housing developments throughout these regions reflect the issue of urban sprawl plaguing this region over the last three decades. The planning and construction in these areas mimics the trends of development in recent decades in the townships surrounding the City of Youngstown, most notably Boardman and Austintown. The areas of these townships within the watershed, along with the City of Youngstown, are commonly agreed to be 'built-out' with little room for additional development. These commercial and residential cores of the county can only be redeveloped of revitalized from their current use designation.

In recent years, numerous programs have been proposed to would look into current land use trends throughout the county and the watershed. These programs and resultant projects take an intense look into the current conditions throughout the watershed and propose solutions to the problems. The programs range from commercial corridor analysis, land use trends, preservation and restoration of greenspace, protection of habitat and changes in zoning that reflect these needs.

In the City of Youngstown, the "Youngstown 2010" plan is a citywide plan for the City of Youngstown, Ohio. "Youngstown 2010 began as a process to engage and educate the community about the importance of planning and the planning process, as well as create a vision and plan to help revitalize Youngstown well into the future. The City of

Youngstown and Youngstown State University coordinated this planning process with help from nearly 200 volunteers, neighborhood organizations and businesses." Currently, departments within the city and YSU are conducting projects identified through this plan, with coordination with other city, county and private agencies and industries.

The Ohio Department of Transportation has developed and is currently in the process of completing the US Route 224 Corridor Study. As identified by ODOT, "The US 224 corridor through Canfield and Boardman Townships has been a chronic area for congestion and safety concerns. In an effort to improve traffic conditions in the area, the Ohio Department of Transportation (ODOT) and the Eastgate Regional Council of Governments have undertaken a joint project to study the US 224 corridor between SR 11 and I-680. The goal of the study is to identify deficiencies and develop conceptual alternatives to improve US 224." This study and the resultant projects will help to alleviate the traffic congestion, visual pollution and storm water issues throughout this corridor that bisects the Mill Creek Watershed. The study will devise solutions to create a sustainable environment for commercial use, the surrounding residential community and natural environmental features and functions.

A model ordinance identifying prohibited uses within the riparian areas of streams and waterways in the watershed has been developed and adopted by several communities within the watershed. Developed by the Alliance for Watershed Action and Riparian Easements (AWARE) through the guidance of the Eastgate Regional Council of Governments (Eastgate), the Mahoning County Engineer, Mahoning Soil and Water Conservation District and local zoning officials, the Riparian Setback Ordinance outlined the required distances for any development/redevelopment proposed within the area of a riparian corridor. To date, the ordinance has received the blessing of the Mahoning County Planning Commission and has been officially adopted by Boardman Township. The ordinance within Austintown Township will become official in the next few weeks and a similar ordinance has been proposed in Canfield Township.

Another trend throughout the watershed has been the acquisition and preservation of sensitive and natural lands in various communities. A pivotal component in land acquisition has been the Clean Ohio Conservation Fund. Several townships including Boardman, Beaver and Austintown, the City of Youngstown, the Mahoning River Consortium and Mill Creek MetroParks have utilized this program to acquire dollars to preserve natural areas throughout the watershed. To date, approximately 600 acres of land in the Mill Creek Watershed have been preserved through this grant program. Mill Creek MetroParks has also utilized other grant programs to acquire land. The Nature Works program and Land and Water Conservation Fund through the Ohio Department of Natural Resources, the Water Resource Restoration Sponsor Program through the Ohio Environmental Protection Agency and funding from local private foundations has provided the MetroParks with the opportunity to preserve hundreds of acres of land within the watershed.

The MetroParks along with Mahoning SWCD have also protected over 400 acres of land by placing conservation easements on the property. Funded through the 319 grant from

the Ohio EPA, these acres along Mill Creek and its tributaries will be protected from development in perpetuity.

a. Residential and Commercial Development

Based on the information provided above it is apparent that encroaching development near and within the Mill Creek Watershed is the main problem/issue regarding habitat integrity. The effects of residential housing development have already been identified by area agencies through water sampling within the Mill Creek Watershed. It has been recorded by the Ohio Environmental Protection Agency, the Mahoning County Soil and Water Conservation District and the local watershed alliance group, AWARE, that Mill Creek and its tributaries contain high levels of fecal coliform bacteria, excessive siltation, and impairments including nutrients, unionized ammonia, metals, organic enrichment, flow alteration and other habitat alterations. The presence of these bacteria and pollutants are caused by failing Home Sewage Treatment Systems (HSTS's), urban run-off, storm sewers, construction site activities, hydrologic modifications and agricultural activities. The presence of bacteria and pollutants inhibits in-stream habitat and therefore compromises habitat integrity for the entire Mill Creek Watershed. The following narrative includes data that suggests ongoing development in the Mill Creek Watershed is inevitable.

Mill Creek Watershed is comprised of the following census tracts located within five townships and two cities in Mahoning County and one township and one village in Columbiana County.

Table 20. Census Data for Mill Creek Watershed

Municipality/Subdivision	Census Tract	% Change in Population; 1990 to 2000	% Change in Housing Units; 1990 to 2000
Austintown Township	8123.01	+3.58%	+27.64%
	8123.02		
	8124		
	8126.01		
	8126.02		
	8126.03		
Beaver Township	8135	+19.01	+33.26
Boardman Township	8113	+1.97	+10.17
	8114		
	8115		
	8116		
	8117		
	8118		
	8119		

	8120.01		
	8120.02		
Canfield Township	8121	+35.02	+37.08
Canfield City	8122		
Green Township	8134	+8.12	+10.44
Youngstown City	8019	-14.53	-6.29
	8020		
	8021		
	8024		
	8025		
	8026		
	8027.01		
	8027.02		
	8028		
Columbiana Village & Fairfield Township	9502	+5.30	+9.45
	9503		
	TOTAL	+3.04	+10.29

The combined population and housing data recorded for the census tracts that comprise the Mill Creek Watershed reveal that since 1990 there has been a 3 percent increase in population and a 10 percent increase in the number of housing units. These percentages are not representative of many of the individual township's growth records during the same time period. Canfield Township and City's combined population increased 35 percent between 1990 and 2000 while the number of housing units increased by 37 percent. In contrast, the City of Youngstown lost 14.5 percent of its population during the same time period as well as 9.4 percent of its housing stock through demolition.

According to the Boardman Zoning Inspector a planned development containing 50 new housing units is to be constructed just east of Interstate 76. This trend is evidenced throughout the Mahoning Valley which has experienced a faster rate of increase for housing compared to the rate of increase and/or decrease in population. Some areas continue to experience an increase in housing units while at the same time record a loss of population.

The percentage of designated rural housing units has also declined over the last 15 years. According to Census 2000 only 17 rural housing units or less than 1 percent of the total housing units counted in census tract 8120.01 and 8120.02 remain in the southern quadrant of Boardman Township. The same trends are occurring in Beaver

Township where approximately 88 percent of the housing units are designated as rural compared to 1990 when 100 percent of the housing units were designated as rural.

Beaver Township experienced a 19 percent increase in population between 1990 and 2000. The increase is even more dramatic in terms of housing units with a 33 percent increase over the ten-year period. While estimates and projections on housing and population data are not available at the census tract level between 2000 and 2006 local knowledge of the area supports the hypotheses that continued development in this area is ongoing and inevitable.

Beaver Township has been very proactive in their efforts to implement a *Smart Growth* approach to development. The township has adopted a Comprehensive Land Use Plan that outlines requirements for planned unit developments. One of the requirements dictates that all new developments dedicate at least 20 percent of the land to open-space. Beaver Township cites in their Land Use Plan that the Mill Creek floodplain located in the north central portion of the township is a critical and environmentally sensitive area. They are proposing that only low-density developments, open space recreation and agricultural activities be permitted in the areas of the Township that are within the Mill Creek floodplain. The Beaver Township Zoning Inspector informed the Mill Creek MetroParks that five new housing developments have been constructed just south of Western Reserve Road off of Sharrot Road since 2004. Several more developments were constructed between 2000 and 2004. One of the two newest developments, the Landing, has set aside 22-acres in the form of a conservation easement. The second development, the Lakes at Sharrot Hill, has dedicated a 34-acre conservation easement. Beaver Township works closely with the Mahoning County Soil & Water Conservation District on securing conservation easements in the township. Appendix G provides maps on residential structures that were built between 1990-2000 by census block group.

b. Road, Highway and Bridge Construction

Mahoning County Engineers identified two roadway projects and they are as follows:

- **Western Reserve Rd. Phase 2**
  Year: 2004
  Cost: $2.5 Million
  Scope: Hitchcock Road to Tippecanoe Road.

- **Western Reserve Rd. Phase 3**
  Year: 2010
  Cost: $6 Million
  Scope: Tippecanoe Road. to SR 46

From the years of 2004 to 2009 there have been six identified projects within Mill Creek Park and they are as follows:

- **Old Mill Drive (Mill Creek Park, City of Youngstown)**
  Year: 2005
  Cost: $168,500
  Length: 1,475 LF or 0.28 mile
  Scope:replacement of catch basins and storm drainage pipe; replacement of guardrail posts; asphalt paving courses; construction of stone masonry headwalls; and concrete & stone curbing.

- **Mahoning Avenue Overpass (MetroParks Bikeway, Austintown Twp.)**
  Year: 2005
  Estimated Cost: $1,522,000
  Scope: Construction of a Bikeway bridge over Mahoning Avenue in Austintown Township; construct earthen-filled concrete retaining wall ramps and asphalt approach work; install prefabricated steel truss bridge with concrete deck

- **West Glacier Drive (Mill Creek Park, City of Youngstown)**
  Year: 2007
  Estimated Cost: $202,330
  Length: 4,084 LF or 0.77 mile
  Scope: replacement of storm drainage pipe; replacement of guardrail; asphalt paving courses; construction of stone masonry headwalls; and linear grading.

- **Suspension Bridge (Mill Creek Park over Mill Creek, Y-town)**
  Year: 2007
  Estimated Cost: $730,000
  Scope: Replacement of structural steel; repairs to steel superstructure; surface preparation & painting of superstructure; rehabilitation of concrete/stone abutments; and asphalt paving courses.

- **Slippery Rock Bridge (Mill Creek Park over Mill Creek, Youngstown)**
  Year: 2009
  Estimated Cost: $304,106
  Scope: Repairs to stone fascia; surface preparation & painting of ornamental steel railings; rehabilitation of concrete/stone abutments; and asphalt paving courses.(not sure if this is relative since it is a pedestrian/bicycle bridge)

- **Calvary Run Drive (Mill Creek Park, Youngstown)**
  Year: ~ 2009
  Estimated Cost: $120,910
  Length: 3,800 LF or 0.72 mile

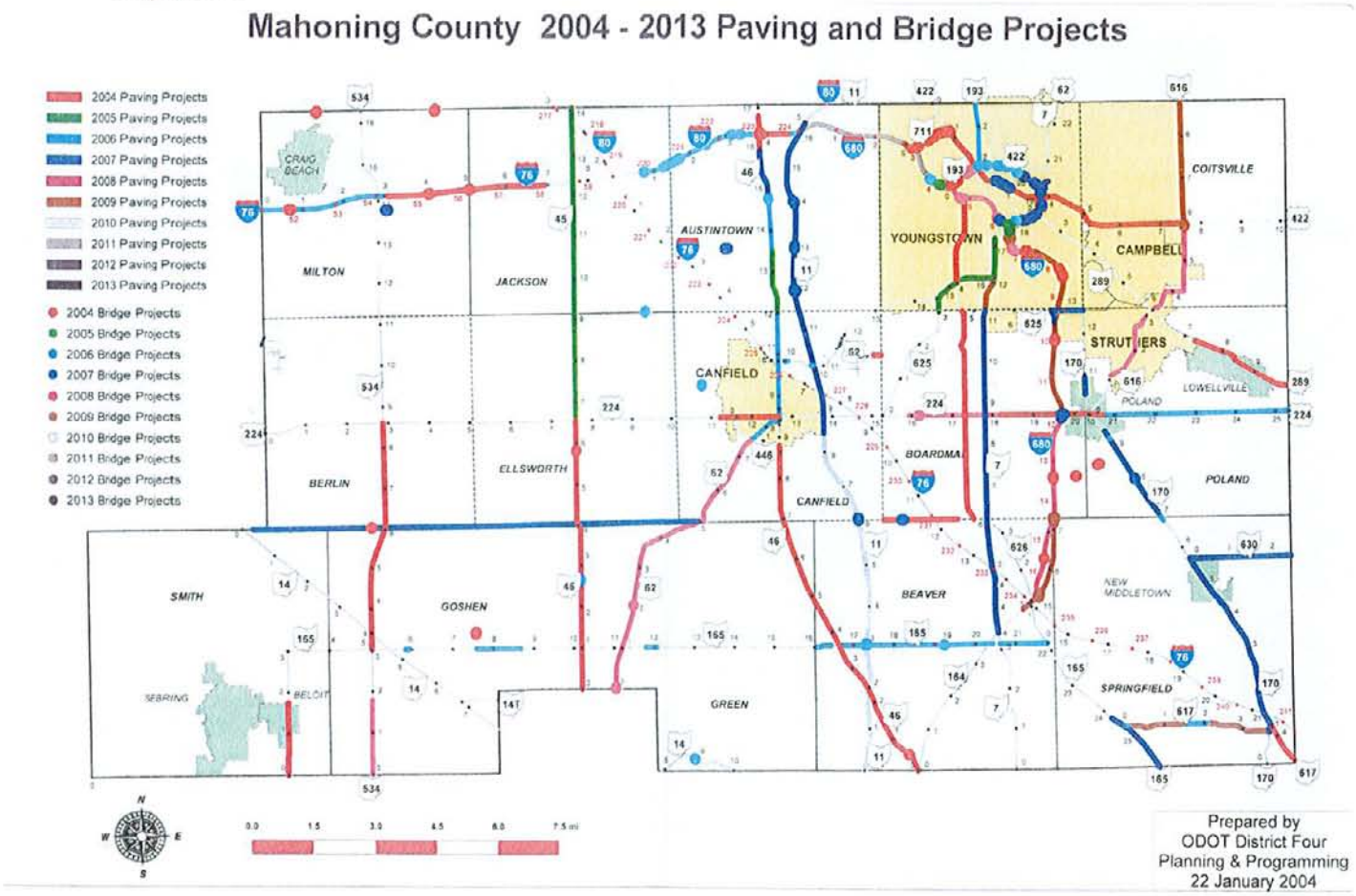
  Scope: Replacement of catch basins; replacement of guardrail posts; asphalt paving courses; and concrete & stone curbing.

ODOT Based Projects

ODOT has provided information on bridge and road projects that have been selected for Mahoning County through the years of 2004-2013. These projects are shown on Figure 22 below and also are listed as to what type of a project is to occur within Appendix H.

There are 79 identified projects to occur within the 2004-2013 time frame.

Figure 22



7.0 Water Resource Quality

"A river is the report card for its watershed." - Alan Levere

The information below is found in the 208 Plan Update completed by Eastgate Regional Council of Governments.

Since the passage of the 1972 Federal Water Pollution Control Act, the Ohio EPA has seen substantial improvement in the overall quality of water in its inland streams and rivers. Driven by the growing concern for ecosystem stability, Ohio's water quality

standards are based on a set of criteria concentrating on beneficial use designations and biological indices found in Ohio Administrative Code (OAC) section. Beneficial use designations are based on how humans use a particular water system and how well the water system is able to nourish a dependant biological community. These designations are made up of two broad groups: Non-Aquatic Life Habitat and Aquatic Life Habitat. Non-Aquatic Life Habitat uses are broken down into two categories:

1) Water Supply:

- **Public Water Supply** (PWS) are waters that, with conventional treatment, are suitable for human consumption and meet federal regulations for drinking water;
- **Agricultural Water Supply** (AWS) are waters that are suitable for irrigation and livestock watering without treatment; and
- **Industrial Water Supply** (IWS) are those waters suitable for commercial and industrial uses, with or without treatment.

2) Recreation (uses in effect only during the recreation seasons, May 1st through October 15th):

- **Bathing Waters** (BW) are waters that are suitable for swimming where a lifeguard and/or bathhouse facilities are present, and include any additional such areas where the water quality is approved by the director; and
- **Primary Contact Recreation** (PCR) are waters that are suitable for full-body contact recreation such as, but not limited to, swimming, canoeing, and scuba diving; and
- **Secondary Contact Recreation** (SCR) includes those waters that are suitable for partial body contact recreation such as, but not limited to, wading.

7.1 Use Designations and Attainment

Prior to July 2003 a third Non-Aquatic Life Habitat category, State Resource Waters (SRW), was used to describe those waters that flowed through park systems, wetlands, preserves, and wildlife areas. In July 2003, the SRW designation became obsolete with the revision of the Antidegradation Rule (OAC 3745-1-05). The revised rule further categorizes rivers as either General High Quality Waters, Superior High Quality Waters, Outstanding State Waters, or Outstanding National Resource Waters. A **General High Quality Waters** are category 2 or 3 wetlands in accordance with Ohio EPA rule 3745-1-54 of the Administrative Code and surface waters not categorized as one of the following three categories:

- **Superior High Quality Waters** are water systems that have exceptional ecological values. Ecological values are based upon the combination of the presence of federal and/or state threatened or endangered species and a high level of biological integrity;

- **Outstanding State Waters** are water systems that have special significance for the state due to their exceptional ecological and/or recreational values; and

- **Outstanding National Resource Waters** are water systems that have a national ecological or recreational significance. National ecological significance may include providing habitat for populations of federal endangered or threatened species or displaying some unique combination of biological characteristics. National recreation significance may include designation in the national wild and scenic river system.

Formerly considered a State Resource Water, Mill Creek, a waterway traversing through Mahoning County's largest metropolitan park, is recognized as a General High Quality Water based on the fact that it is not found within the Superior High Quality Waters, Outstanding State Waters, or Outstanding National Resource Waters tables that are found in the OAC Chapter 3745-1-05 (tables 5-4 through 5-7).

Warmwater Habitat (WWH) - these are waters capable of supporting and maintaining a balanced, integrated, adaptive community of warmwater aquatic organisms;

Mill Creek is designated as Warm Water Habitat for approximately half of its length, however from the headwaters to mile 11.2 there is no official designation. Bears Den Run, Axe Factory Run, Anderson Run, and Indian Run are all designated as Warm Water Habitat. None are in attainment of the WWH designation. All other tributaries are undesignated. There is only one segment of Mill Creek that is in even partial attainment, that being between river mile 1.3 and 3.9, in the area between Bears Den Run and Axe Factory Run. This area does meet the standards for Warm Water Habitat in the Invertebrate Community Index (ICI), though Ohio EPA still lists the segment as **not** in attainment in the Technical Support Document for the Mahoning River Basin[20] In much of the Mainstem (as well as many tributaries) the in-stream habitat is so lacking that it is difficult to discern what other causes of impairment may be contributing to the poor quality of the stream. The lack of in-stream habitat is due to channel modification as well as siltation. It is largely due to lack of suitable habitat that few volunteer macroinvertebrate monitors have been assigned to the Mill Creek Watershed, as it has been difficult to find riffles to sample. The Ohio EPA year 2000 305(b) lists causes of impairment for Mill Creek (mainstem) as Nutrients, Unionized Ammonia, Organic Enrichment, Siltation, Flow Alteration, Other Habitat Alterations, Metals, and Nutrients. The Ohio EPA year 2000 305(b) lists Causes of impairment for Bears Den Run and Axe Factory Run as Metals and Nutrients.

The Ohio EPA year 2000 305(b) lists Causes of impairment for Anderson Run and Indian Run as Organic Enrichment and Metals.

Work done locally determined that Mill Creek was impaired by sediment, and had relatively high levels of fecal coliform bacteria throughout. Ohio EPA does not list any data for wetlands or (other than Lake Newport, Lake Cohasset, and Lake Glacier which are actually on the mainstem of Mill Creek). There has not been any locally coordinated effort to collect data on the wetlands or numerous lakes in the Mill Creek watershed.

Appendix L provides additional information, mapping data collected within the watershed.

Figure 23

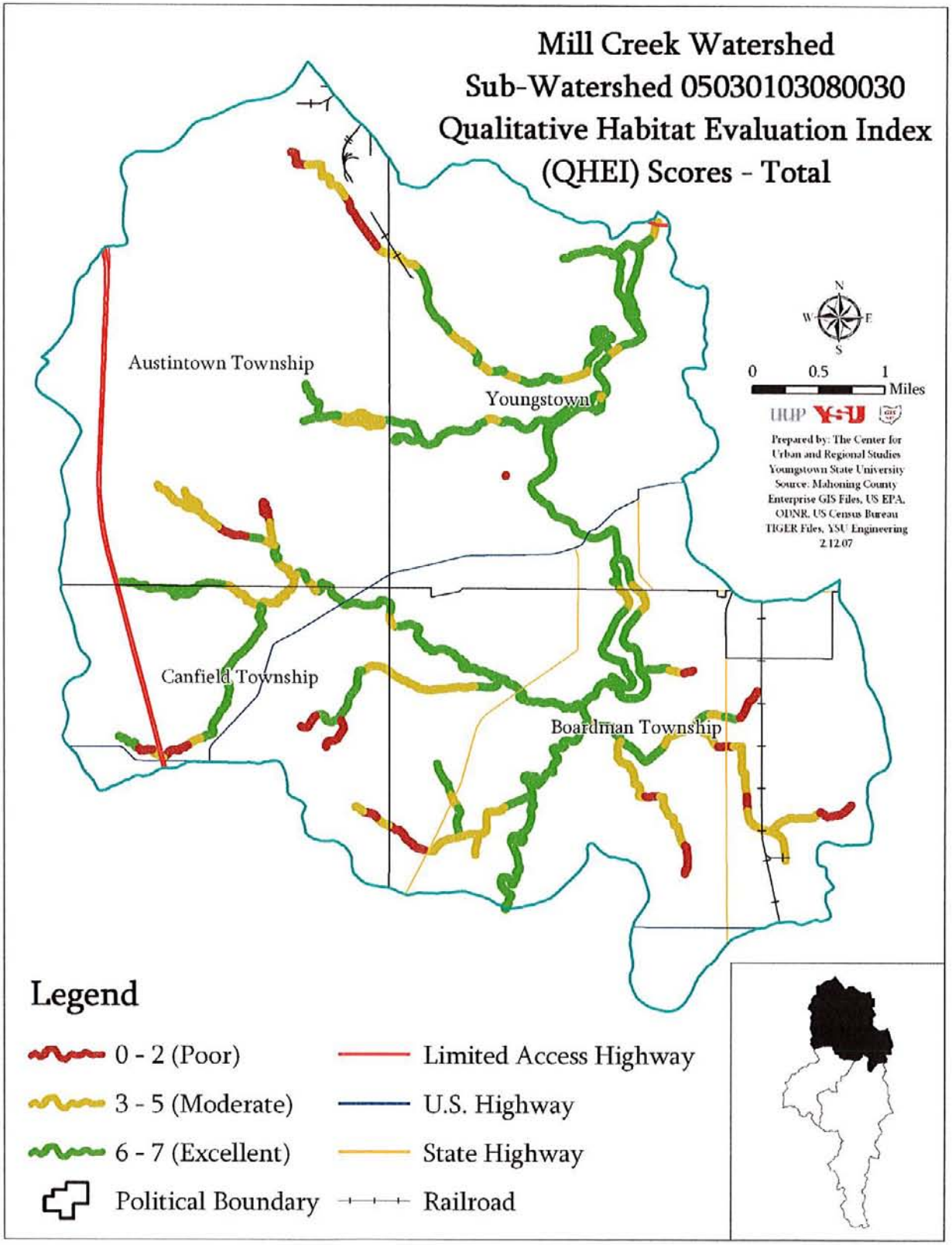

Mill Creek Watershed
Sub-Watershed 05030103080030
Qualitative Habitat Evaluation Index
(QHEI) Scores - Total
Austintown Township
Youngstown
Canfield Township
Boardman Township
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files, YSU Engineering
2.12.07
Legend
0 - 2 (Poor)
3 - 5 (Moderate)
6 - 7 (Excellent)
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad

Figure 24

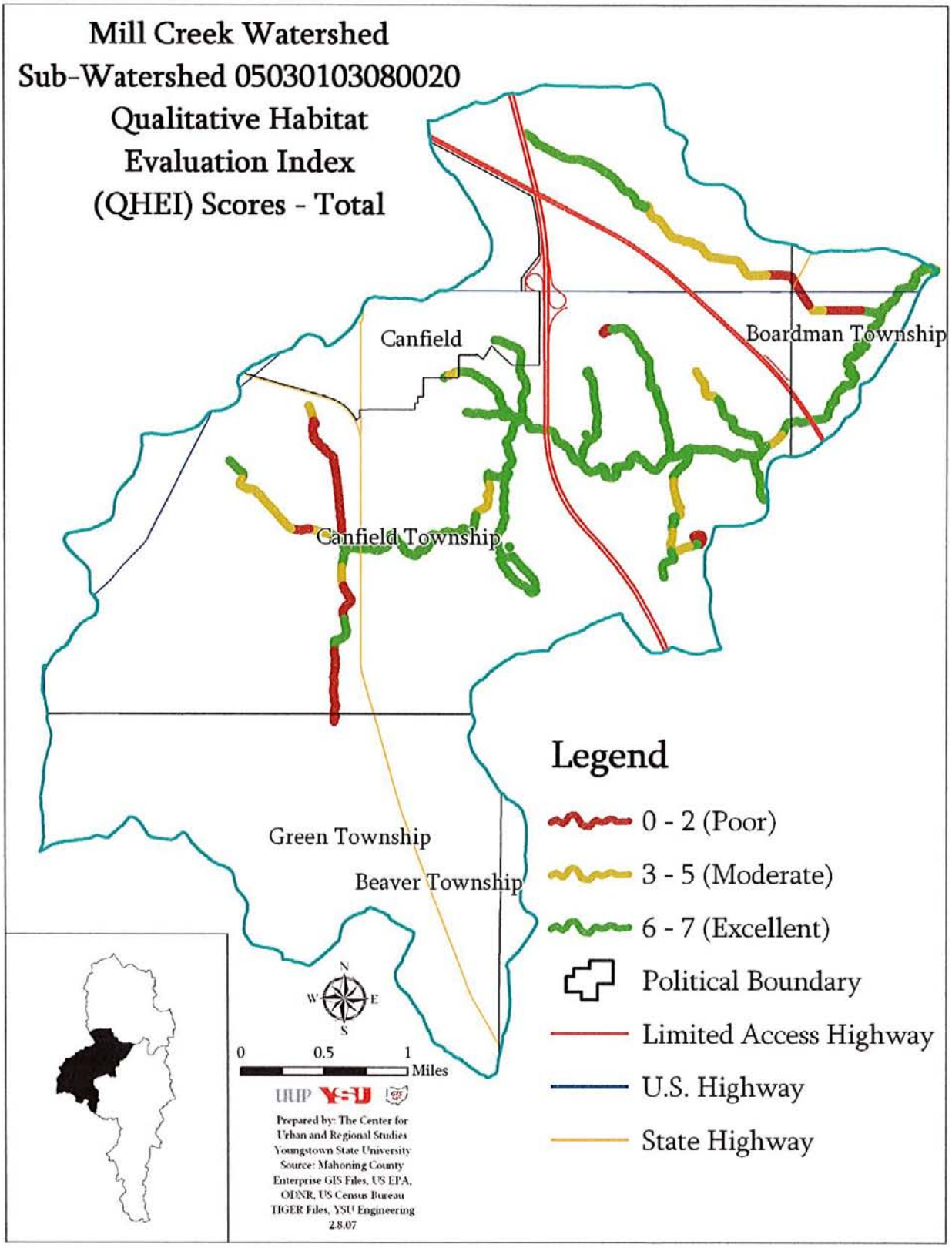
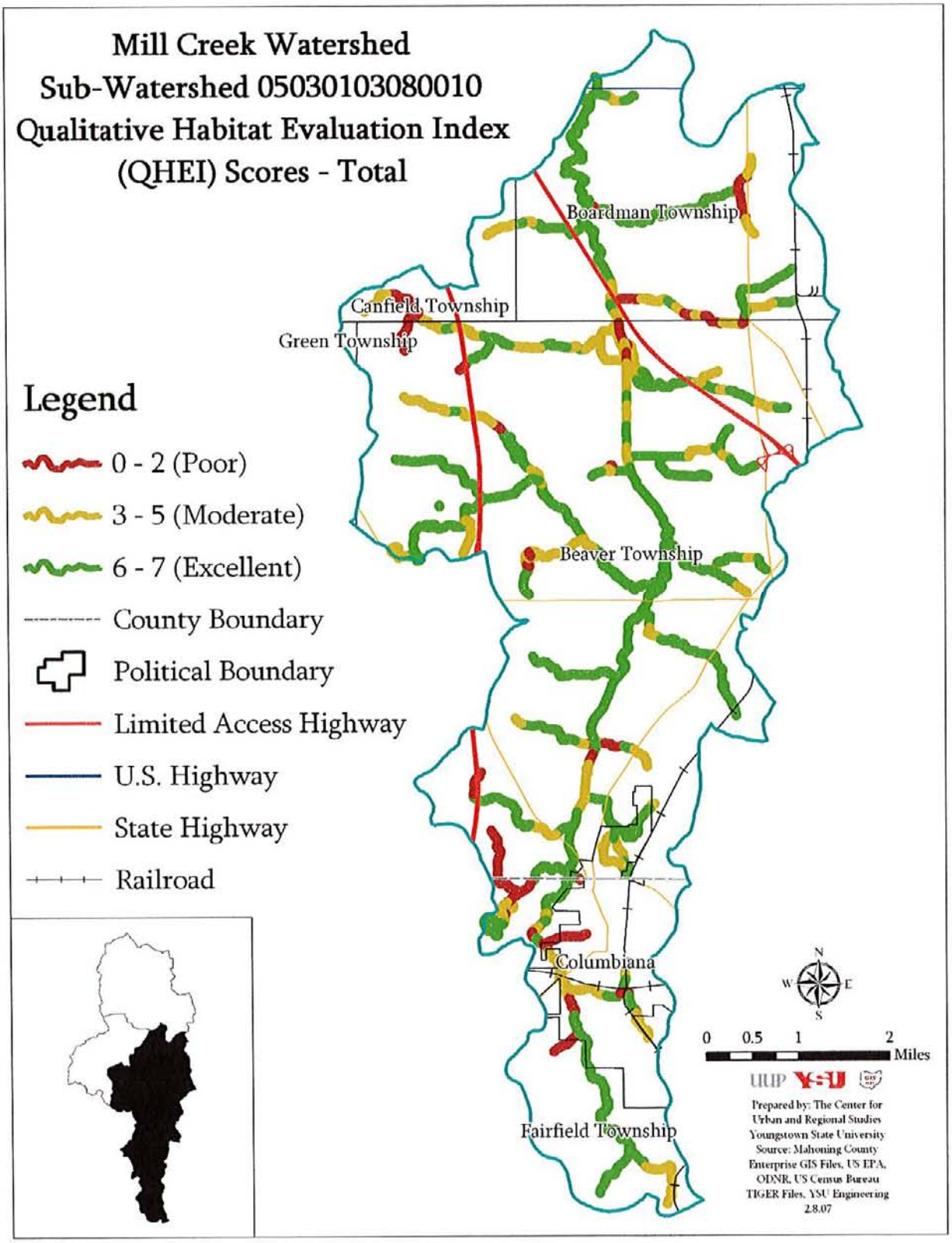

Mill Creek Watershed
Sub-Watershed 05030103080020
Qualitative Habitat
Evaluation Index
(QHEI) Scores - Total
Canfield
Boardman Township
Canfield Township
Green Township
Beaver Township
Legend
0 - 2 (Poor)
3 - 5 (Moderate)
6 - 7 (Excellent)
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files, YSU Engineering
2.8.07

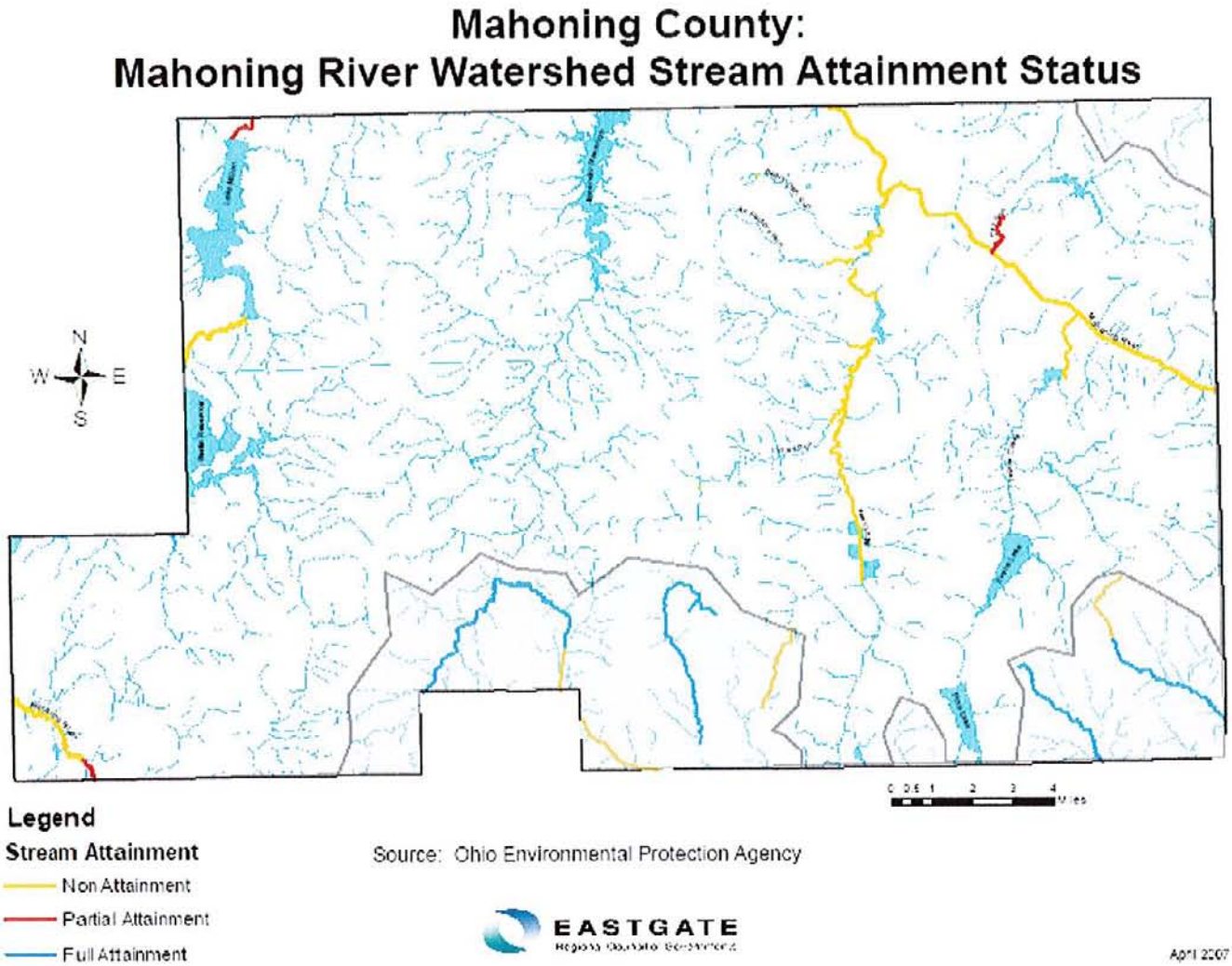
Figure 25


Mill Creek Watershed
Sub-Watershed 05030103080010
Qualitative Habitat Evaluation Index
(QHEI) Scores - Total
Boardman Township
Canfield Township
Green Township
Beaver Township
Columbiana
Fairfield Township
Legend
0 - 2 (Poor)
3 - 5 (Moderate)
6 - 7 (Excellent)
County Boundary
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad
N
W
E
S
0 0.5 1 2
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files, YSU Engineering
2.8.07

7.1.0 Number of Waterbodies/Miles in Partial Attainment

The Mill Creek mainstem is in partial attainment of the WWH between river mile 1.3 and 3.9, located between Bears Den Run and Axe Factory Run. This area does meet the standards for Warm Water Habitat in the Invertebrate Community Index (ICI). Ohio EPA still lists the segment as not in attainment in the Technical Support Document for the Mahoning River Basin. The map below was provided by EastGate, and shows areas defined in the 208 Plan as not being in attainment.

Figure 26



7.1.1 Number of Threatened Miles

The Figures 12-14 show the streams within Mill Creek watershed that have been assessed using the Qualitative Habitat Evaluation Index (QHEI) method. For more information on areas that are being developed please see Section 6.10.a and also Appendix B.

According to the map above, the northernmost portion of the Mill Creek watershed (HUC 050301013080030) streams were assessed within the excellent range. Few moderate sections and smaller areas of poorly rated streams are also present within this section of the watershed.

The westerly portion of the Mill Creek watershed (HUC 050301013080020) the majority of the assessed streams fell within the excellent range; however there seems to be an equal amount of stream that is within the moderate and poor range.

The southern portion of the Mill Creek watershed (HUC 050301013080010) is dominated also by the scores that fell within the excellent range however, there seems to be an increased amount of stream that is within the moderate range and few segments fall within the poor range.

a. Number of Segments/Miles in Partial and in Non-Attainment

The tributaries of Bears Den Run, Axe Factory Run, Anderson Run, and Indian Run are designated as WWH; however, none are in attainment of the WWH designation. All other tributaries within the watershed are undesignated.

According to the Preliminary Stream Restoration Plan for Mill Creek, Yellow Creek, and Meander Creek Watersheds, Martin, Scott. 2003. The following are stream segments with impaired riparian and/or floodplain conditions.

- **Indian Run,** Canfield Township; (Headwaters west of SR 14/46 between Leffingwell and Western Reserve Roads) is channelized; moderate riparian width; agriculture in floodplain.
- **Tributary to Indian Run** also in Canfield Township (North of I-76 and SR 224 between S. Raccoon and Tippecanoe Roads, then continuing south of 224 and east of Tippecanoe Road has a narrow riparian width; channelization; urbanized flood plain.

b. Number of Streams Designated but not Monitored

Monitoring in the Mill Creek watershed does not take place on a yearly basis. Any data that is available is over ten years old and the next round of sampling within the watershed is scheduled for the year of 2013 by the Ohio EPA. Maps of existing sampling locations included in Appendix C and are described below.

There are have been sixteen (16) identified sampling sites that Ohio EPA monitors within sub-watershed HUC 050301013080030. Two (2) sampling sites have been identified that volunteers have monitored.

There were only two (2) identified sampling sites that Ohio EPA has or continues to monitor within sub-watershed HUC 050301013080020. One (1) sampling site have been identified that volunteers have monitored.

Seven (7) sites have been identified as locations that Ohio EPA has monitored or continues to monitor within sub-watershed HUC 050301013080010). Two (2) sampling sites have been identified that volunteers have monitored.

There has been recent interest in monitoring water quality within the Mill Creek watershed by several volunteer groups. Efforts to get these groups involved in sampling are being coordinated by the Mill Creek MetroParks. These efforts which include (identification of accessible sampling locations (riffles), provide basic introduction of macroinvertebrate sampling techniques (rock-pick, RBP or other simple methods) and macroinvertebrate identification training to the order and/or family level will be provided by Erin McCracken, Environmental Planner). The Mahoning Soil and Water Conservation District's Stream Specialist (Rebecca Crinic) will provide training on proper methods for water quality sampling as it relates to the monitoring equipment that will be provided to the group on loan from the MSWCD.

At this time, the groups are not interested in submitting collected data to the Ohio EPA, utilizing the information in the classroom for education and awareness of the students is the main objective therefore QDC certification from Ohio EPA is not needed. Data collected by volunteer monitors is included in Appendix L.

7.2 Lakes/Quality

No coordinated efforts to collect data on the wetlands or lakes (other than Lake Newport, Lake Cohasset, and Lake Glacier) have been completed in the Mill Creek Watershed. There is no Ohio EPA data for wetlands or lakes listed (except those formed by impoundments on Mill Creek).

7.3 Wetlands/Quality

Using the Ohio Wetlands Inventory (OWI) data 2,951.5 acres of wetlands have been identified within the Mill Creek watershed. The Center of Urban and Regional Studies, (GIS Department at Youngstown State University provided the information contained in Table 21 below. In addition to the information provided below, it is highly possible that additional wetlands do exist within the watershed that were not included in the OWI inventories.

Table 21. Ohio Wetlands Inventory for Mill Creek Watershed

SUB-WATERSHED 05030103080010		
OWI Type	**Acreage**	**Percent of Total**
Farmed Wetland (wet meadow in agricultural areas)	33.8	2.2%
Shallow Marsh (emergent vegetation in water <3 ft)	200.6	13.2%
Shrub/Scrub Wetland (emergent woody veg. in water <3 ft)	27.3	1.8%
Upland Woods	551.1	36.3%
Wet Meadow (grassy vegetation in water <6 inches)	26.4	1.7%
Woods on Hydric Soils	680.0	44.8%
Total	**1,519.1**	
SUB-WATERSHED 05030103080020		
OWI Type	**Acreage**	**Percent of Total**
Farmed Wetland (wet meadow in agricultural areas)	5.6	1.4%
Shallow Marsh (emergent vegetation in water <3 ft)	57.6	14.0%
Shrub/Scrub Wetland (emergent woody veg. in water <3 ft)	5.9	1.4%
Wet Meadow (grassy vegetation in water <6 inches)	11.1	2.7%
Woods on Hydric Soils	331.1	80.5%
Total	**411.3**	
SUB-WATERSHED 05030103080030		
OWI Type	**Acreage**	**Percent of Total**
Shallow Marsh (emergent vegetation in water <3 ft)	125.1	12.2%
Shrub/Scrub Wetland (emergent woody veg. in water <3 ft)	228.7	22.4%
Wet Meadow (grassy vegetation in water <6 inches)	49.8	4.9%
Woods on Hydric Soils	617.5	60.5%
Total	**1,021.1**	

According to the Wetland Mitigation Plan for Mill Creek, Yellow Creek, and Meander Creek Watersheds, Dr. Scott Martin, Youngstown State University.

"Large wetlands areas are found along the riparian corridor of Mill Creek between the Columbiana-Mahoning County line and SR 224. These riparian wetlands total about 1,750 acres and are a mixture of forested, scrub/shrub, emergent, and open water wetlands. Smaller (20 acres or less) isolated wetlands are scattered around the watershed. The NWI maps show several wetlands near the intersection of Raccoon and Western Reserve Roads south of the City of Canfield. Some of theses are open water wetlands resulting from former strip mining operations. Others are natural forested, scrub/shrub, or emergent wetlands. The wetlands of the Mill Creek watershed perform the functions of storm and floodwater retention and cleansing; removal of excess nutrients and herbicides from agricultural runoff; groundwater, stream and saturation zone recharge; natural wildlife habitats and corridors; and preservation and conservation of threatened and endangered species."

According to the Riparian Area Protection Plan for the Mill Creek and Yellow Creek Watersheds, the Natural Resource Conservation Service has placed sixty-five (65) acres of wetlands within the Mill Creek watershed in the Wetland Reserve Program.

Figure 27

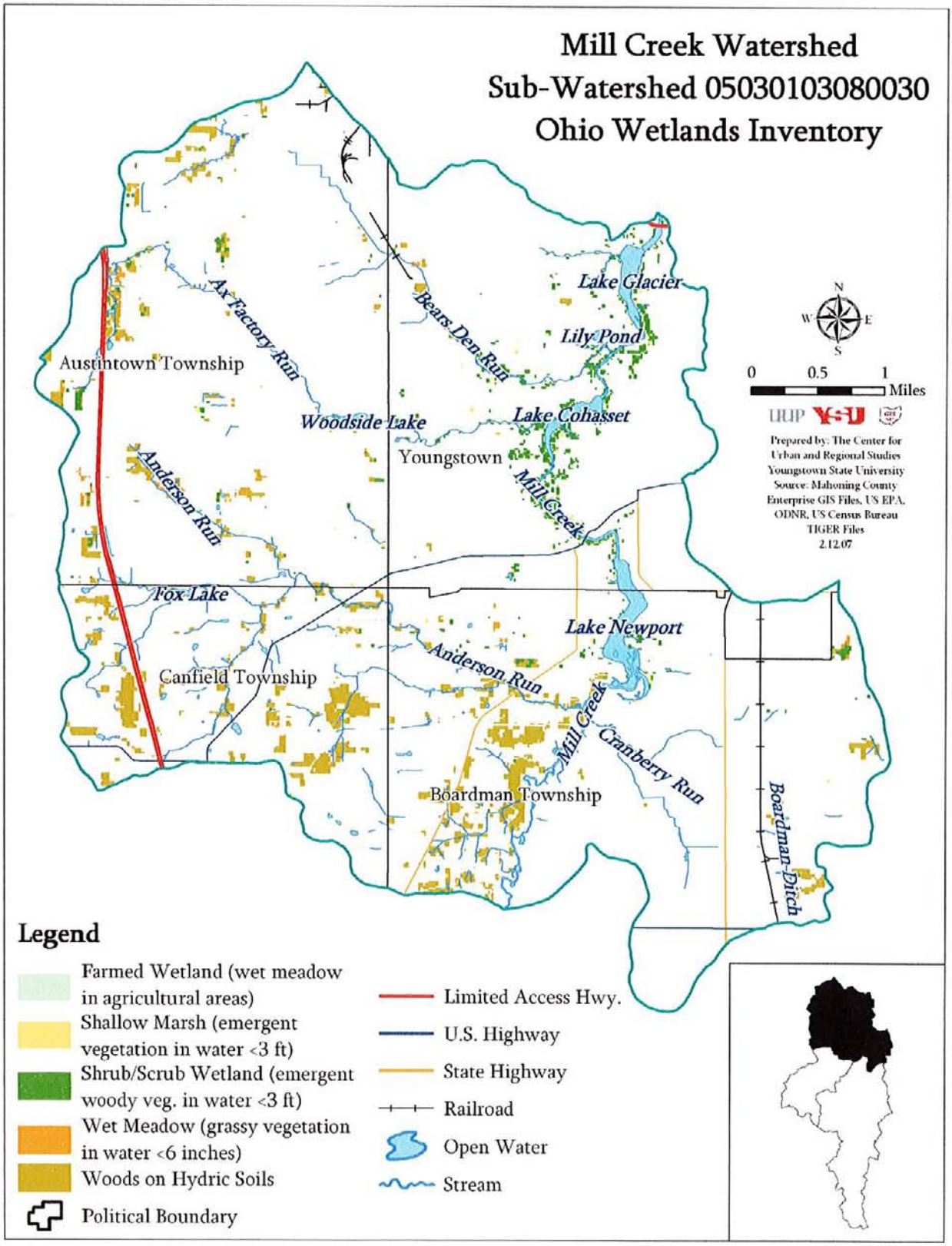

Mill Creek Watershed
Sub-Watershed 05030103080030
Ohio Wetlands Inventory
Lake Glacier
Lily Pond
Ax Factory Run
Bears Den Run
Austintown Township
Woodside Lake
Lake Cohasset
Youngstown
Anderson Run
Mill Creek
Fox Lake
Lake Newport
Anderson Run
Canfield Township
Mill Creek
Cranberry Run
Boardman Township
Boardman Ditch
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.12.07
Legend
Farmed Wetland (wet meadow in agricultural areas)
Shallow Marsh (emergent vegetation in water <3 ft)
Shrub/Scrub Wetland (emergent woody veg. in water <3 ft)
Wet Meadow (grassy vegetation in water <6 inches)
Woods on Hydric Soils
Political Boundary
Limited Access Hwy.
U.S. Highway
State Highway
Railroad
Open Water
Stream

Figure 28

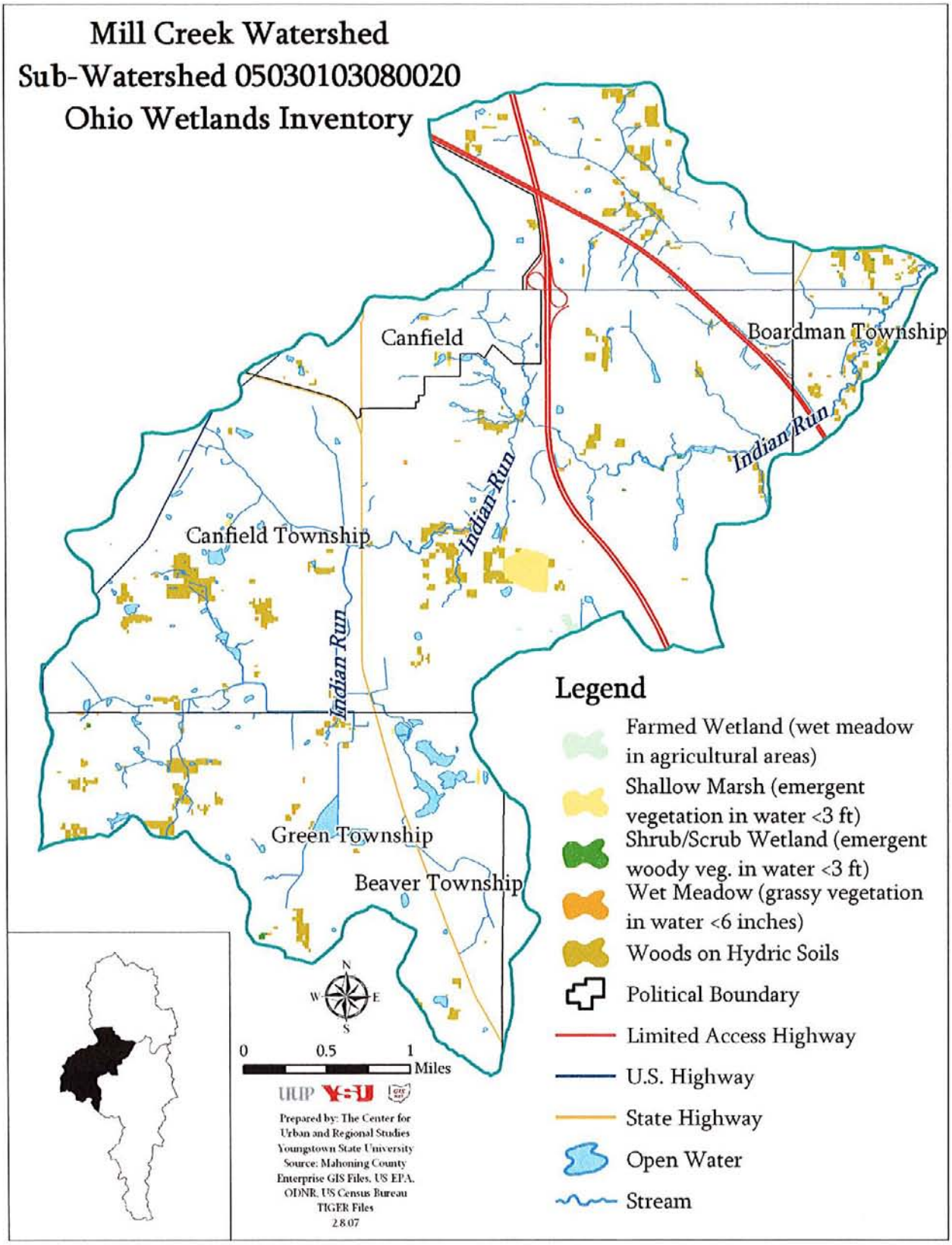
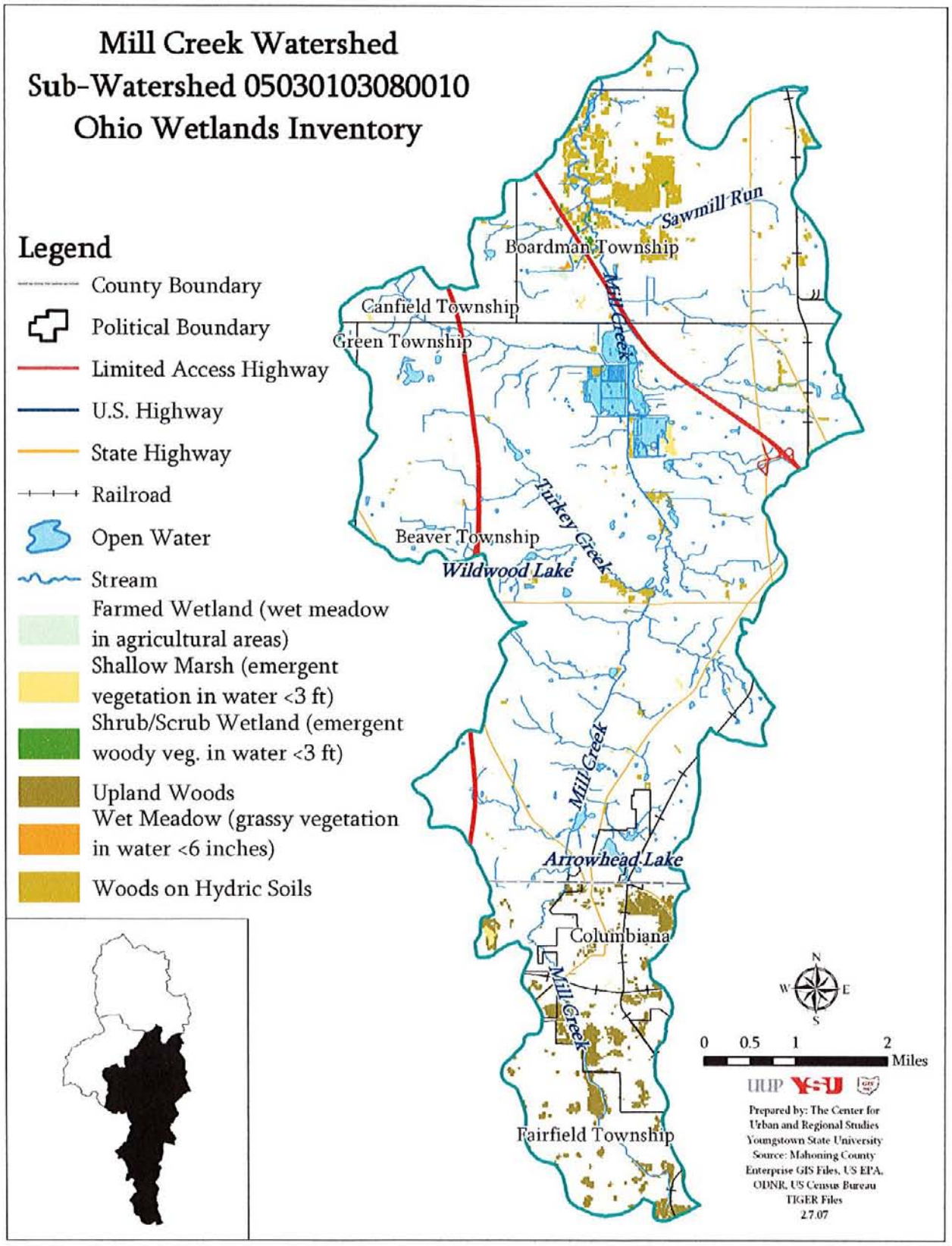

Mill Creek Watershed
Sub-Watershed 05030103080020
Ohio Wetlands Inventory
Canfield
Boardman Township
Canfield Township
Green Township
Beaver Township
Indian Run
Indian Run
Indian Run
Legend
Farmed Wetland (wet meadow in agricultural areas)
Shallow Marsh (emergent vegetation in water <3 ft)
Shrub/Scrub Wetland (emergent woody veg. in water <3 ft)
Wet Meadow (grassy vegetation in water <6 inches)
Woods on Hydric Soils
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Open Water
Stream
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.8.07

Figure 29


Mill Creek Watershed
Sub-Watershed 05030103080010
Ohio Wetlands Inventory
Legend
County Boundary
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad
Open Water
Stream
Farmed Wetland (wet meadow in agricultural areas)
Shallow Marsh (emergent vegetation in water <3 ft)
Shrub/Scrub Wetland (emergent woody veg. in water <3 ft)
Upland Woods
Wet Meadow (grassy vegetation in water <6 inches)
Woods on Hydric Soils
Sawmill Run
Boardman Township
Canfield Township
Green Township
Mill Creek
Turkey Creek
Beaver Township
Wildwood Lake
Arrowhead Lake
Columbiana
Fairfield Township
N
W
E
S
0 0.5 1 2
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

7.4 Groundwater Quality

Please see Aquifers above

7.5 Causes and Sources of Impairment

Both point and non-point pollution sources have and continue to contribute to the impairments of the Mill Creek Watershed. Recent development has contributed to water quality problems in all three creeks. Three man-made lakes (Newport, Cohasset, and Glacier) along Mill Creek in Mill Creek Park are all highly eutrophic as a result of high nutrient loading from both point and non-point sources in the watershed. In addition, heavy sediment loading from farms and construction sites has caused the deposition of over 400,000 cubic yards of sediment in Lake Newport.

A trend associated with development that has contributed to water quality impairment is the destruction of riparian areas and wetlands in the watersheds. The watershed group AWARE (Alliance for Watershed Action and Riparian Easements) has focused much of their attention on the protection of riparian areas in the Mill Creek watershed. The Mahoning Soil and Water Conservation District (MSWCD) and Mill Creek MetroParks have worked cooperatively with AWARE to obtain two grants (ODNR Stream Banking and Section 319 grants) that support the purchase of permanent riparian easements in critical areas of the watersheds and other related activities (e.g., riparian restoration through tree planting; watershed education).

7.5.1 Point Sources

Point source pollution, although more problematic in the past, continues to impair the water quality of Mill Creek. Any direct discharge into a river, stream, lake or wetland from sources such as sanitary sewage treatment plants or industry are required to secure a permit through the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program. This permit program helps regulate the pollution of the waters of the state through monitoring and controlling amounts being discharged from industry or sanitary sewage treatment plants.

Two sewage treatment plants (Columbiana and Boardman) discharge treated effluent into Mill Creek.

a. Permitted Discharges

According to the US EPA Envirofacts Data Warehouse Permit Compliance System Water Discharge Permits Query, there are twelve (12) NPDES permits within the Mill Creek Watershed, and they are listed in Table 22 below.

Table 22. Facilities Holding National Pollutant Discharge Elimination System (NPDES) Permits.

Mill Creek Watershed Sub-Watershed 05030103080010 NPDES Permits					
FACILITY NAME:	**NPDES:**	**COUNTY NAME:**	**ISSUED DATE:**	**EXPIRED DATE:**	**SIC CODE:**
BUCKEYE TRANSFER INC	OH0011452	COLUMBIANA	NOV-22-2004	DEC-31-2009	3297 NONCLAY REFRACTORIES
COLUMBIANA WWTP	OH0021776	COLUMBIANA	JUN-30-2006	JUL-31-2010	4952 SEWERAGE SYSTEMS
BOARDMAN WWTP	OH0037249	MAHONING	JUN-21-2001	OCT-31-2005	4952 SEWERAGE SYSTEMS
YOUNGSTOWN HARD CHROME PLATING & GRINDING INC	OH0064238	MAHONING	NOV-01-2005	NOV-30-2010	N/A
SNO TOP LLC	OH0101486	MAHONING	NOV-16-2004	DEC-31-2009	2033 CANNED FRUITS, VEGETABLES, PRESERVES, JAMS, AND JELLIES
PILOT TRAVEL CENTERS LLC #011	OH0101567	MAHONING	NOV-16-2004	DEC-31-2009	5541 GASOLINE SERVICE STATIONS
ST MARYS ALZHEIMERS CTR	OH0101575	COLUMBIANA	MAY-15-2001	MAY-31-2006	8051 SKILLED NURSING CARE FACILITIES
RUSTIC MEADOWS MOBILE HOME COMM	OH0128295	MAHONING	DEC-17-2002	JAN-31-2008	6515 OPERATORS OF RESIDENTIAL MOBILE HOME SITES
Mill Creek Watershed Sub-Watershed 05030103080020 NPDES Permits					
FACILITY NAME:	**NPDES:**	**COUNTY NAME:**	**ISSUED DATE:**	**EXPIRED DATE:**	**SIC CODE:**
CAMP STAMBAUGH	OH0134422	MAHONING	APR-15-2004	APR-30-2009	7033 RECREATIONAL VEHICLE PARKS AND CAMPSITES
Mill Creek Watershed Sub-Watershed 05030103080030 - NPDES Permits					
FACILITY NAME:	**NPDES:**	**COUNTY NAME:**	**ISSUED DATE:**	**EXPIRED DATE:**	**SIC CODE:**
SUNOCO PARTNERS MARKETING & TERMINALS LP	OH0012025	MAHONING	NOV-19-2001	DEC-31-2006	4491 MARINE CARGO HANDLING
NEW MIDDLETOWN SPRINGFIELD TWP WWTP	OH0037273	MAHONING	SEP-06-2005	SEP-30-2010	4952 SEWERAGE SYSTEMS
MARATHON ASHLAND PETROLEUM LLC *	OH0088129	MAHONING	MAR-02-2006	MAR-31-2011	1221 BITUMINOUS COAL AND LIGNITE SURFACE MINING

Because permits may be applied for or are regulated by local health departments and House Bill 110, some facilities may not be listed above. Additional information can be found at the Eastgate Regional Council of Governments website for the 208 Plans and updates http://Eastgatecog.org/env-regional.asp, Mahoning County District Board of Health at http://www.mahoning-health.org and the NPDES Permits by District list located on the OEPA Division of Surface Water Webpage http://www.epa.state.oh.us/dsw/permits/districts/NEDO.html. Maps of the NPDES permitted discharges are provided in Appendix A.

Table 23 Provides information on the superfund facilities located within the watershed.

Table 23. Superfund Facilities

SITE NAME	CERCLIS EPA ID	ADDRESS	COUNTY	SITE SMSA	FEDERAL FACILITY	NPL STATUS	CORPORATE LINK	RECORD OF DECISION (ROD) INFO	LATITUDE	LONGITUDE	EPA REGIONAL LINK
AMEDIA INCORPORATED	OHD093931038	1350 ALBERT STREET YOUNGSTOWN, OH 44505	MAHONING	9320	No	Not on the NPL	No	No	41.117926	-80.63156	No
CENTURY 21 PAINT	OHD051413078	166 S MERIDIAN RD AUSTINTOWN, OH 44515	MAHONING	9320	No	Not on the NPL	No	No	41.09857	-80.711288	No
LIBERTY AUTO WRECKING	OHSFN0507827	2630 HUBBARD ROAD YOUNGSTOWN, OH 44505	MAHONING	N/A	No	Not on the NPL	No	No	41.132866	-80.624536	No
PIERCE WELDING	OHD004470795	229 E.DENNICK AVENUE YOUNGSTOWN, OH 44501	MAHONING	9320	No	Not on the NPL	No	No	41.129961	-80.637629	No
YOUNGSTOWN HARD CHROME PLATING & GRINDING INC	OHN000508127	8451 SOUTHERN BLVD. YOUNGSTOWN, OH 44512	MAHONING	N/A	No	Not on the NPL	No	No	40.9944	-80.6534	No

The information in Table 24 below reflects the Toxics Release Inventory (TRI) for the watershed. More information on each of these specific facilities can be found at the Federal EPA website http://www.epa.gov/enviro/html/tris/column/tri_facility_id.html.

Table 24. Toxic Release Inventory List of Federal EPA-Regulated Facilities.

TRI FACILITY ID	FACILITY INFORMATION	FACILITY NAME	ADDRESS
44509CMMRC2701I	View Facility Information	PARKER HANNIFIN MOBILE CYLINDER DIV	2701 INTERTECH DRIVE YOUNGSTOWN, OH 44509
44502PPSCL500PE	View Facility Information	PEPSI-COLA CO	500 PEPSI PL. YOUNGSTOWN, OH 44502
44501GFFRN229ED	View Facility Information	PIERCE WELDING	229 E.DENNICK AVENUE YOUNGSTOWN, OH 44501
44509SFTYK11711	View Facility Information	SAFETY-KLEEN CORP *	1171 1/2 N.MERIDIAN RD. YOUNGSTOWN, OH 44509
44451SVRGN12080	View Facility Information	SOVEREIGN CIRCUITS INC	12080 DEBARTOLO DRIVE NORTH JACKSON, OH 444510000
44512SPCTR535BE	View Facility Information	SPECTRUM METAL FINISHING INC	535 BEV ROAD YOUNGSTOWN, OH 445126490
44501STLCT190NM	View Facility Information	STEEL CITY CORP	190 NORTH MERIDIAN ROAD YOUNGSTOWN, OH 44509
44501STLFR1775L	View Facility Information	STEEL FORMING INC (DBA COMMERCIAL	1775 LOGAN AVE. YOUNGSTOWN, OH 445018578
44507TNTRL215EI	View Facility Information	TEE NEE TRAILER CO	215 E. INDIANOLA AVE. YOUNGSTOWN, OH 44507
44509WLKRW912SA	View Facility Information	TSO OF OHIO INC	912 SALT SPRINGS ROAD YOUNGSTOWN, OH 44509
44502NTDFN1045C	View Facility Information	UNITED FOUNDRIES INC	1045 CRESCENT ST. YOUNGSTOWN, OH 445021302
44510NRTHS2669W	View Facility Information	V & M STAR	2669 MARTIN LUTHER KING JR. BL YOUNGSTOWN, OH 44510
44512WSTRN500MC	View Facility Information	WESTERN RESERVE PLASTICS	500 MCCLURG RD. YOUNGSTOWN, OH 44512
44502LTVST1290P	View Facility Information	YOUNGSTOWN ERW PIPE MILL	1290 POLAND AVE. YOUNGSTOWN, OH 44502
44512YNGST8451S	View Facility Information	YOUNGSTOWN HARD CHROME PLATING &	8451 SOUTHERN BLVD. YOUNGSTOWN, OH 44512
44510YNGST51DIV	View Facility Information	YOUNGSTOWN SINTER CO	251 DIVISION ST. YOUNGSTOWN, OH 44510
44509YNGST3700O	View Facility Information	YOUNGSTOWN WELDING &	3700 OAKWOOD AVENUE YOUNGSTOWN, OH 445090461
44515YSDND3710H	View Facility Information	YSD INDUSTRIES INC	3710 HENRICKS ROAD AUSTINTOWN, OH 44515

Table 24 Continued. Toxic Release Inventory List of Federal EPA-Regulated Facilities.

TRI FACILITY ID	FACILITY INFORMATION	FACILITY NAME	ADDRESS
44505GRMTC1410A	View Facility Information	AEROQUIP-REPUBLIC RUBBER DIV	1410 ALBERT ST. YOUNGSTOWN, OH 44505
44509GGSSN1055N	View Facility Information	AGA GAS INC	1055 NORTH MERIDIAN ROAD YOUNGSTOWN, OH 44509
44512LSNPC4449L	View Facility Information	AMERICAN WEATHER-SEAL CO *	4449 LAKE PARK RD. YOUNGSTOWN, OH 445121810
44471STRCT65MAI	View Facility Information	ASTRO COATINGS INC	65 MAIN STREET STRUTHERS, OH 44471
44471STRCT27MAI	View Facility Information	ASTRO COATINGS INC	27 MAIN ST. STRUTHERS, OH 44471
44505KPPRS1359L	View Facility Information	BEAZER EAST INC *	1359 LOGAN AVE YOUNGSTOWN, OH 44505
44515BLSSM207NO	View Facility Information	BLISS TECHNOLOGIES INC *	207 NORTH FOUR MILE RUN ROAD YOUNGSTOWN, OH 44515
44512BRDND6330M	View Facility Information	BORDEN DAIRY	6330 MARKET ST. YOUNGSTOWN, OH 445120000
44405CLXCR2415W	View Facility Information	CALEX CORP	2415 WILSON AVE CAMPBELL, OH 44405
44406CNFLD460WE	View Facility Information	CANFIELD METAL COATING CORP	460 W. MAIN ST. CANFIELD, OH 44406
44471LLGHN15UNI	View Facility Information	CMC IMPACT METALS	15 UNION ST BLDG 3 STRUTHERS, OH 44471
44501CLDMT45SOU	View Facility Information	COLD METAL PRODUCTS CO INC *	45 S. MONTGOMERY AVE. YOUNGSTOWN, OH 44501
44515CBBSN380VI	View Facility Information	CUBBISON CO	380 VICTORIA ROAD YOUNGSTOWN, OH 445152026
44515SCLMN3786O	View Facility Information	EASCO ALUMINUM	3786 OAKWOOD AVE. YOUNGSTOWN, OH 44515
44672PNNST1100N	View Facility Information	ECD INC.	1100 N. 21ST ST. SEBRING, OH 446720191
44502LCTRC751EL	View Facility Information	ELECTROCHEMICALS INC *	751 ELM STREET YOUNGSTOWN, OH 445020000
44512PC MCCLU	View Facility Information	EPCO	413 MCCLURG RD. BOARDMAN, OH 44512
44502XLCRPONEPE	View Facility Information	EXAL CORP *	1 PERFORMANCE PL. YOUNGSTOWN, OH 445022082
44672FRRCR16THS	View Facility Information	FMP INC	16TH STREET & WEST GEORGIA AVENUE SEBRING, OH 44672
44509GNRLL280NM	View Facility Information	GENERAL ELECTRIC CO AUSTINTOWN	280 NORTH MERIDIAN ROAD YOUNGSTOWN, OH 44509
44507GNRLX4040L	View Facility Information	GENERAL EXTRUSIONS INC	4040 LAKE PARK RD. YOUNGSTOWN, OH 44512
44502GRFBRWILLI	View Facility Information	GREIF BROS CORP INTERNATIONAL DIV	WILLIAMSON AVENUE EXTENSION YOUNGSTOWN, OH 44502
44512KSSLR302MC	View Facility Information	KESSLER PRODUCTS LTD	302 MCCLURG RD YOUNGSTOWN, OH 44512
44502MHNNG653JO	View Facility Information	MAHONING PAINT CORP	653 JONES ST. YOUNGSTOWN, OH 44502
44511YNGST1140B	View Facility Information	MARATHON ASHLAND PETROLEUM LLC *	1140 BEARS DEN ROAD YOUNGSTOWN, OH 44511
44512MTLCR6001S	View Facility Information	METAL CARBIDES INC	6001 SOUTHERN BOULEVARD YOUNGSTOWN, OH 44512
44510HCKTT2669M	View Facility Information	OLYMPIC MILL SERVICES	2669 MARTIN LUTHER KING JR BLVD YOUNGSTOWN, OH 44510
44505CMMRC1775L	View Facility Information	PARKER HANNIFIN CORP GEAR PUMP DIV	1775 LOGAN AVENUE YOUNGSTOWN, OH 44501

b. Spills and Illicit Discharges

The Mahoning County Engineers office is currently working with the Phase II Storm Water Communities to locate and identify illicit discharges within these areas. It is estimated that illicit discharges within the Phase II communities will be located and mapped by the fall of 2007.

Spill information for the Mill Creek watershed was gathered through the Ohio EPA RRS Short Report Information and is listed in Table 25 below.

Table 25. Spills Reported to Ohio EPA in the Mill Creek Watershed From 1978-2007.

Spill Number	TWP/City	Stream	Date Reported	Material Spilled	Areas Affected
8004-50-0534	Canfield	Sawmill Creek	4/7/1980	Oil, Brine	Sanitary Sewer
8305-50-1108	Youngstown	Sawmill Run Creek	5/13/1983	Greasy String and Blobs	Sanitary Sewer
9209-50-4075	Boardman	Sawmill Run Creek	9/16/1992	Latex Paint	Surface Water and Storm Sewers
9203-50-1145	Canfield	Sawmill Run Creek	3/30/1992	Material Unknown	Surface Water and Storm Sewers
7906-50-1232	Youngstown	Bears Den Run	6/28/1979	Cutting Oil	Sanitary Sewer
8003-50-0360	Austintown	Bears Den Run	3/12/1980	Acid, Oil	Sanitary Sewer
8604-50-1018	Youngstown	Bears Den Run	4/3/1986	Waste Oil	Sanitary Sewer
8904-50-1226	Youngstown	Bears Den Run	4/18/1989	Oil	Surface Water and Storm Sewers
9412-50-5325	Austintown	Bears Den Run Trib	12/19/1994	Sewage	Surface Water and Storm Sewers
9808-50-3337	Austintown	Bears Den Run Trib	8/9/1998	Black Smoke, Runoff	Surface Water and Storm Sewers
7904-50-0690	Youngstown	Axe Factory Run	4/17/1979	Sewage	Sanitary Sewer
8609-50-3288	Canfield	Anderson Run	9/18/1986	Fishkill- Unknown	Sanitary Sewer
8707-50-2661	Boardman	Anderson Run	7/29/1987	Fishkill, Oil	Sanitary Sewer
7906-50-1112	Boardman	Cranberry Run Trib	6/11/1979	Oil	Sanitary Sewer
7809-50-1466	Ellsworth	Turkey Creek	9/22/1978	Crude Oil	Sanitary Sewer
9109-50-4052	Beaver Twp	Turkey Creek	9/21/1991	Material Blue	Surface Water and Storm Sewers
8204-50-0919	Canfield	Indian Creek	4/29/1982	Styrene Monomer	Sanitary Sewer
8507-50-2479	Canfield	Indian Run	7/17/1985	Vegetation Kill, Brine	Sanitary Sewer
9306-50-2336	Canfield	Indian Run	6/12/1993	Pesticides	Surface Water and Storm Sewers
9407-50-3061	Boardman	Indian Run	7/11/1994	Material White	Surface Water and Storm Sewers
9012-50-5697	N.Lima	Mill Creek	12/15/1990	Gasoline	Surface Water and Storm Sewers
9103-50-0847	Youngstown	Mill Creek Trib.	3/19/1991	Antifreeze, Motor Oil	Surface Water and Storm Sewers
9210-50-4472	Canfield	Mill Creek	10/17/1992	Fuel Oil	Land or Surface Impact, Surface Water and Storm Sewers

ıble 25 Continued. Spills Reported to Ohio EPA in the Mill Creek Watershed From 1978-2007.

9209-50-4055	Boardman	Mill Creek	9/15/1992	Substance 4170	Surface Water and Storm Sewers
9209-50-3997	Boardman	Mill Creek	9/10/1992	Diesel Fuel	Surface Water and Storm Sewers/Groundwater, Subsurface
9207-50-2826	Boardman	Mill Creek	7/3/1992	Color	Surface Water and Storm Sewers
9206-50-2711	Boardman	Mill Creek	6/25/1992	Material Unknown	Surface Water and Storm Sewers
9206-50-2422	Canfield	Mill Creek	6/10/1992	Oil	Surface Water and Storm Sewers
9311-50-4844	Youngstown	Mill Creek	11/26/1993	Suspended Soilds	Surface Water and Storm Sewers
9304-50-1403	Boardman	Mill Creek	4/15/1993	Gasoline	Surface Water and Storm Sewers
9406-50-2774	Youngstown	Mill Creek	6/23/1994	Odor, Material Green	Surface Water and Storm Sewers
9709-50-3972	Boardman	Mill Creek	9/29/1997	Detergent/Soap	Surface Water and Storm Sewers
9809-50-3889	Boardman	Mill Creek	9/16/1998	Hydraulic Oil	Surface Water and Storm Sewers
9904-50-1404	Boardman	Mill Creek Trib.	4/20/1999	Gasoline	Surface Water and Storm Sewers
0007-50-2663	Youngstown	Mill Creek Trib.	7/13/2000	Sewage	Surface Water and Storm Sewers
0007-50-2503	Boardman	Mill Creek Trib.	7/3/2000	Chromic Acid	Surface Water and Storm Sewers
0006-50-2222	Boardman	Mill Creek Trib.	6/14/2000	Foam	Surface Water and Storm Sewers
0005-50-1871	Boardman	Mill Creek Trib.	5/23/2000	Diesel Fuel	Surface Water and Storm Sewers/Groundwater, Subsurface
0004-50-1179	Beaver Twp	Mill Creek Trib.	4/5/2000	Fuel Oil	Surface Water and Storm Sewers
0003-50-0865	Youngstown	Mill Creek	3/14/2000	Sheen	Surface Water and Storm Sewers/Air
0112-50-4642	Beaver Twp	Mill Creek Trib.	12/7/2001	Sewage	Surface Water and Storm Sewers
0111-50-4204	Youngstown	Mill Creek Trib.	11/4/2001	Muddy Water	Surface Water and Storm Sewers
0106-50-2305	Boardman	Mill Creek Trib.	6/27/2001	Coolant, Caustic Material	Land or Surface Impact
0103-50-0757	Youngstown	Mill Creek	3/8/2001	Run Off	Land or Surface Impact, Surface Water and Storm Sewers
0102-50-0421	Boardman	Mill Creek Trib.	2/8/2001	Spray Dye Indicator	Surface Water and Storm Sewers
0203-50-0883	Canfield	Mill Creek Trib.	3/14/2002	Slag Leachate	Surface Water and Storm Sewers
0201-50-0110	Boardman	Mill Creek Trib.	1/11/2002	Material Green	Surface Water and Storm Sewers
0007-50-2663	Youngstown	Mill Creek Trib.	7/13/2000	Sewage	Surface Water and Storm Sewers

7.5.2 Non-point Sources

Non-point sources of pollution appear numerous and sporadic throughout the watershed. Agricultural practices along southern segments of Mill Creek appear to contribute organic enrichment, nitrate-nitrite, nutrients, and phosphorus to the impairment of the watershed's water quality. Riparian zones along the southern portions of Mill Creek, have been destroyed by unrestricted livestock access and by farming in riparian zones and urban development. Residential and commercial developments have sprawled out of the central cities and into the rural areas. The outward migration of development leads to deterioration of water quality by habitat and flow alterations, the importing of sediment and nutrients into the tributaries, and by decreasing the amount of dissolved oxygen within the waters. Failing commercial and home septic systems have also become a nuisance in the watershed.

a. Home Sewage Systems/Projected Failing Systems

"Unfortunately, our affluent society has also been an effluent society."-Vice President Hubert H. Humphrey, October 11, 1966

The below information was provided by the Mahoning County District Board of Health.

Sub-Watershed 05030103080010 (Mill Creek, Turkey Creek)

This area is largely serviced by septic systems and not sanitary sewer and consists of approximately 400 systems. The area served by sanitary sewer includes the properties North of Calla Road and East of Sharrott/Hitchcock Roads, most subdivisions on Sharrott Road, the homes and businesses along Route 7 and those in the City of Columbiana sewer district. The homes along Sharrott Road currently serviced by septic systems can connect to the force main sewer line, but are not mandated at this time.

The area is serviced mostly by on-lot, non-discharging septic systems. Some off-lot* systems have been installed in this area, but at a minimum number. The ability to stay on-lot with septic system design is due largely to suitable soil types and adequate lot sizes.

Generally, this area is of only limited concern for impact to health and environment from the remaining septic systems. Isolated areas that may be the focus of this limited concern should include; Sharrott Creek Drive, Sharrott Creek Court, Sharrott Run, and other individual failing septic systems present throughout the sub-watershed. When failing systems are identified, they are ordered to make repairs or complete replacements.

** Off-lot septic systems installed since 1997 (repairs for existing homes only) are inspected and sampled annually by the Mahoning County Board of Health as part of a continuing Operations & Maintenance Program.*

Sub-Watershed 05030103080020 (Indian Run)

This area is largely serviced by septic systems and not sanitary sewer and consists of approximately 350 systems. The limited area served by sanitary sewer includes the properties northeast of Route 11, along Route 224 and those in the City of Canfield sewer district. Generally, this area would include the watershed north of Leffingwell Road.

The area is serviced mostly by on-lot, non-discharging septic systems. Some off-lot* systems have been installed in this area, but at a minimum number. The ability to stay on-lot with septic system design is due largely to suitable soil types and adequate lot sizes.

This area is of only limited concern for impact to health and environment from septic systems. When individual failing septic systems are identified, they are ordered to make repairs or complete replacements.

** Off-lot septic systems installed since 1997 (repairs for existing homes only) are inspected and sampled annually by the Mahoning County Board of Health as part of a continuing Operations & Maintenance Program.*

Sub-Watershed 05030103080030 (Anderson Run, Bears Den Run, Axe Factory Run, Lake Newport)

This area is largely serviced by sanitary sewer and not septic systems and consist of approximately 600 systems. But, due to the age of the community that makes up this watershed, some small isolated areas of homes with septic systems have been discovered in areas believed to be connected to sewer. These isolated homes are required to connect when they are identified and if sanitary sewer is available. The large areas that are serviced by a mix of on-lot and off-lot* septic systems would include:

- Route 62 from Tippecanoe South West to Shields Road.
- Raccoon Road from Mellinger South to Shields Road.
- Shield Road from Messerly Road to a point ~8oo ft. West of Tippecanoe Road
- Most of Messerly, Alladin, Alvacardo, Clearview, Fox Haven, McCartney, Joyce Ann, Fawn, Burgett, Orlando, Adeer and parts of Pleasant Valley

The septic areas listed above have received several complaints over the past few years and some septic systems have been replaced or upgraded. An area wide Public Health Nuisance investigation was conducted by the Mahoning County Board of Health in 2004 and 2005. The investigation did **not** identify a Public Health Nuisance as described in OAC 3745. Several failing septic systems were identified and ordered to be repaired as a result of the investigation and the associated complaints. This area remains a focus for the eventual extension of sanitary sewer when resources become available.

Recently, the West Glen area that had been historically partially serviced by septic systems that were discharging into Newport Lake was made accessible to a new sanitary sewer line and connections to the sanitary sewer were mandated.

** Off-lot septic systems installed since 1997 (repairs for existing homes only) are inspected and sampled annually by the Mahoning County Board of Health as part of a continuing Operations & Maintenance Program.*

One of the most important aspects of a Home Sewage Treatment System (HSTS) is ensuring that the system functions properly. In order for HSTS to function correctly, proper soil types have to be present.

Among the soils identified as common within the watershed, all except the Wooster soil are rated with a severe limitation for septic tank absorption fields, according to the Soil Survey of Mahoning County, Ohio. The gravely layers in Bogart, Chili, and Jimtown soils are a poor filter for effluent. Rittman, Wadsworth, Frenchtown, Canfield, Ravenna, Sebring, and Fitchville soils have restricted permeability in the subsoil. A seasonal high water table is a limitation for all of the soils except Wooster, Chili, Loudonvillle, Muskingum, and Dekalb. Bedrock within 40 inches of the surface is a limitation for septic tank absorption fields in Loudonville, Muskingum, and Dekalb soils.

The Mahoning County District Board of Health does have addresses for all HSTS installed as well as for systems in homes that have been sold. There is currently an effort to convert the data to a GIS layer. Though the addresses of homes with HSTS's do not pinpoint the locations of systems themselves, however it does identify the homes to which the systems are attached.

b. Number of New Homes Being Built

New residential developments are being constructed at a record pace in Beaver Township. Almost 23 percent of the total housing units located in Beaver Township have been constructed during the last 10 years.

Table 26. New Homes and Development Permits Issued Through the Mahoning County Building Inspection Department.

Township	Year	Single Family Dwlg. Permits Sold	Garage Permits Sold	Alter. Permits Sold	Duplex, Triplex Apartment Permits Sold	Comm. Permits Sold
Austintown	2004	84	46	65	1 duplex, 2 triplex	82
Beaver		31	26	15	1 duplex, 1 triplex	26
Boardman		44	23	57	0	162
Canfield		102	18	18	4 duplex, 1 triplex	15
Canfield City		27	5	11	0	14
Green		28	10	9	0	8
Austintown	2005	84	40	54	2 duplex, 1 triplex	110
Beaver		33	15	18	2 duplex, 1 triplex	32
Boardman		48	26	44	1 duplex	167
Canfield		72	20	13	1 duplex	31
Canfield City		14	5	14	0	18
Green		24	8	8	0	7
Austintown	2006	51	40	47	0	85
Beaver		28	17	12	4 duplex, 18 triplex	24
Boardman		14	22	47	0	158
Canfield		58	21	19	10 duplex, 4 triplex	42
Canfield City		23	1	16	0	20
Green		9	4	5	0	4

Between 1990 and 2000 the number of housing units in Beaver Township increased by 33 percent while the population rose 19 percent during the same time period. The number of new houses being constructed in Beaver Township is approximately five new houses per month. This trend is expected to continue through 2010. Census 2000 also reveals that approximately 72 percent of the housing units in Beaver Township are designated as rural housing units. This number was closer to 100 percent in 1990.

c. Number and Size of Animal Feeding Operations

There are no permitted Concentrated Animal Feeding Operations (CAFO's) in the Mill Creek Watershed.

d. Acres of Highly Erodible Land and Potential Soil Loss

Maps generated by YSU Center for Urban and Regional Studies show the erosion potential for bare soils and the potential for cultivated crops. Tables 28 and 29 below provide acreages that correspond with the maps in Appendix F.

Table 27 is broken down into the sub-watershed areas covering the ranges of 3-600 tons per acre per year of potential soil loss. The overall bare soil erosion potential within the Mill Creek watershed consists of the following:

- 4,878.6 acres are within the range of 3-5 tons/acre/year of potential soil loss.
- 11,553.7 acres are within the range of 5-10 tons/acre/year of potential soil loss.
- 4,051.6 acres are within the range of 10-25 tons/acre/year of potential soil loss.
- 7,228.8 acres are within the range of 25-60 tons/acre/year of potential soil loss.
- 6,930.5 acres are within the range of 60-600 tons/acre/year of potential soil loss.

Overall 34,643.2 acres within the watershed have the potential to be susceptible to erosion if bare soils are exposed.

Table 28 provides information for the cultivated crops soil erosion potential and reflects the ranges of 0.5 to 25 tons/acre/year of soil loss for each sub-watershed area. The overall cultivated crops soil erosion potential within the Mill Creek watershed consists of the following:

- 189.0 acres are within the range of 0.5-1 tons/acre/year of potential soil loss.
- 308.6 acres are within the range of 2-3 tons/acre/year of potential soil loss.
- 998.9 acres are within the range of 5-10 tons/acre/year of potential soil loss.
- 188.6 acres are within the range of 10-25 tons/acre/year of potential soil loss.

Overall 1,685.1 acres within the watershed have the potential to be susceptible to erosion if cultivated crops soils are exposed. Maps are available in Appendix F to show the areas that have been identified as susceptible to erosion if cultivated crops soils are exposed.

Table 27. Bare Soil Erosion Potential for the Mill Creek Watershed.

SUB-WATERSHED 05030103080010		
Rating	**Acreage**	**Percent of Total**
3-5 Tons/acre/year estimated soil loss	2,723.7	11.6%
5-10 Tons/acre/year estimated soil loss	6,817.0	28.9%
10-25 Tons/acre/year estimated soil loss	2,414.4	10.3%
25-60 Tons/acre/year estimated soil loss	3,193.2	13.6%
60-600 Tons/acre/year estimated soil loss	3,762.2	16.0%
Not rated - water, gravel pits, quarry, urban soils, etc.	2,093.2	8.9%
N/A	2,551.1	10.8%
Total	**23,554.8**	
SUB-WATERSHED 05030103080020		
Rating	**Acreage**	**Percent of Total**
3-5 Tons/acre/year estimated soil loss	1,044.0	11.3%
5-10 Tons/acre/year estimated soil loss	2,870.9	31.1%
10-25 Tons/acre/year estimated soil loss	698.6	7.6%
25-60 Tons/acre/year estimated soil loss	2,091.8	22.6%
60-600 Tons/acre/year estimated soil loss	1,694.6	18.3%
Not rated - water, gravel pits, quarry, urban soils, etc.	837.1	9.1%
Total	**9,237.1**	
SUB-WATERSHED 05030103080030		
Rating	**Acreage**	**Percent of Total**
3-5 Tons/acre/year estimated soil loss	1,110.9	6.4%
5-10 Tons/acre/year estimated soil loss	1,865.8	10.8%
10-25 Tons/acre/year estimated soil loss	938.6	5.4%
25-60 Tons/acre/year estimated soil loss	1,943.8	11.2%
60-600 Tons/acre/year estimated soil loss	1,473.7	8.5%
Not rated - water, gravel pits, quarry, urban soils, etc.	9,989.9	57.7%
Total	**17,322.7**	

Table 28. Cultivated Crops Soil Erosion Potential for Mill Creek Watershed.

SUB-WATERSHED 05030103080010		
Rating	**Acreage**	**Percent of Total**
.5-1 Tons/Acre/Year Estimated Soil Loss	168.0	0.7%
2-3 Tons/Acre/Year Estimated Soil Loss	278.2	1.2%
5-10 Tons/Acre/Year Estimated Soil Loss	598.3	2.5%
10-25 Tons/Acre/Year Estimated Soil Loss	150.7	0.6%
Non Agricultural Land Use	19,763.5	83.9%
Not Rated water, gravel pits, quarry, urban soils, etc.	45.0	0.2%
N/A	2,551.1	10.8%
Total	**23,554.8**	
SUB-WATERSHED 05030103080020		
Rating	**Acreage**	**Percent of Total**
.5-1 Tons/Acre/Year Estimated Soil Loss	21.0	0.2%
2-3 Tons/Acre/Year Estimated Soil Loss	27.9	0.3%
5-10 Tons/Acre/Year Estimated Soil Loss	325.0	3.5%
10-25 Tons/Acre/Year Estimated Soil Loss	37.9	0.4%
Non Agricultural Land Use	8,825.3	95.5%
Total	**9,237.1**	
SUB-WATERSHED 05030103080030		
Rating	**Acreage**	**Percent of Total**
2-3 Tons/Acre/Year Estimated Soil Loss	2.5	0.0%
5-10 Tons/Acre/Year Estimated Soil Loss	84.6	0.5%
Non Agricultural Land Use	17,235.5	99.5%
Total	**17,322.7**	

Sources: ODNR Erosion Potential on Cultivated Crops coverage

Potential soil loss is a concern in all areas where soil is exposed. The Mahoning County Board of Commissioners has recently adopted Erosion and Sediment Control Rules in the spring of 2007, pursuant to Ohio Revised Code, Section 307.79, to establish technically-feasible and economically-reasonable standards to achieve a level of management and conservation practices in order to abate soil erosion and degradation of the waters of the State by soil sediment on land used or being developed for non-farm commercial, industrial, residential or other non-farm purposes. Please see the full document for more detailed information. For more information on these new regulations, contact the Mahoning County Engineers Office or the Mahoning Soil and Water Conservation District.

Figures 30-32 below show the erosion potential for each sub-watershed if bare soils are exposed. If projects occur in the areas that are most likely to suffer from elevated levels of soil erosion the proper erosion and sediment control measures should be in place and followed at all times. Some erosion and sediment control practices can include but are not limited to the following:

- Schedule projects so clearing and grading are done during time of minimum erosion potential
- Designate and reinforce construction entrances
- Phase construction activities(disturb small areas at a time to prevent erosion in areas where no activity is occurring)
- Site fingerprinting (involves clearing areas that are essential to the construction activity and leaving other areas undisturbed)
- Locate potential pollutant sources away from steep slopes, water bodies and critical areas
- Route construction traffic away from existing or newly planted areas
- Protect natural vegetation with fencing, tree armoring, and retaining walls or tree wells and protect other environmentally sensitive areas
- Stockpile topsoil and reapply as a soil amendment to reestablish vegetation
- Cover or stabilize soil stockpiles
- Intercept runoff above disturbed slopes and convey it to a permanent channel or storm drain
- On long or steep, disturbed, or man made slopes, construct benches, terraces or ditches at regular intervals to intercept runoff
- Use retaining walls to decrease the steepness of a slope
- Provide linings for urban runoff conveyance channels (such as grass or sod)
- Use check dams
- Seed disturbed areas, use mulch or sodding for permanent stabilization where appropriate
- Install erosion control blankets
- Install sediment basins, traps and establish inlet protection
- Use silt fence

- Install vegetative filter strips and buffers

Figure 30

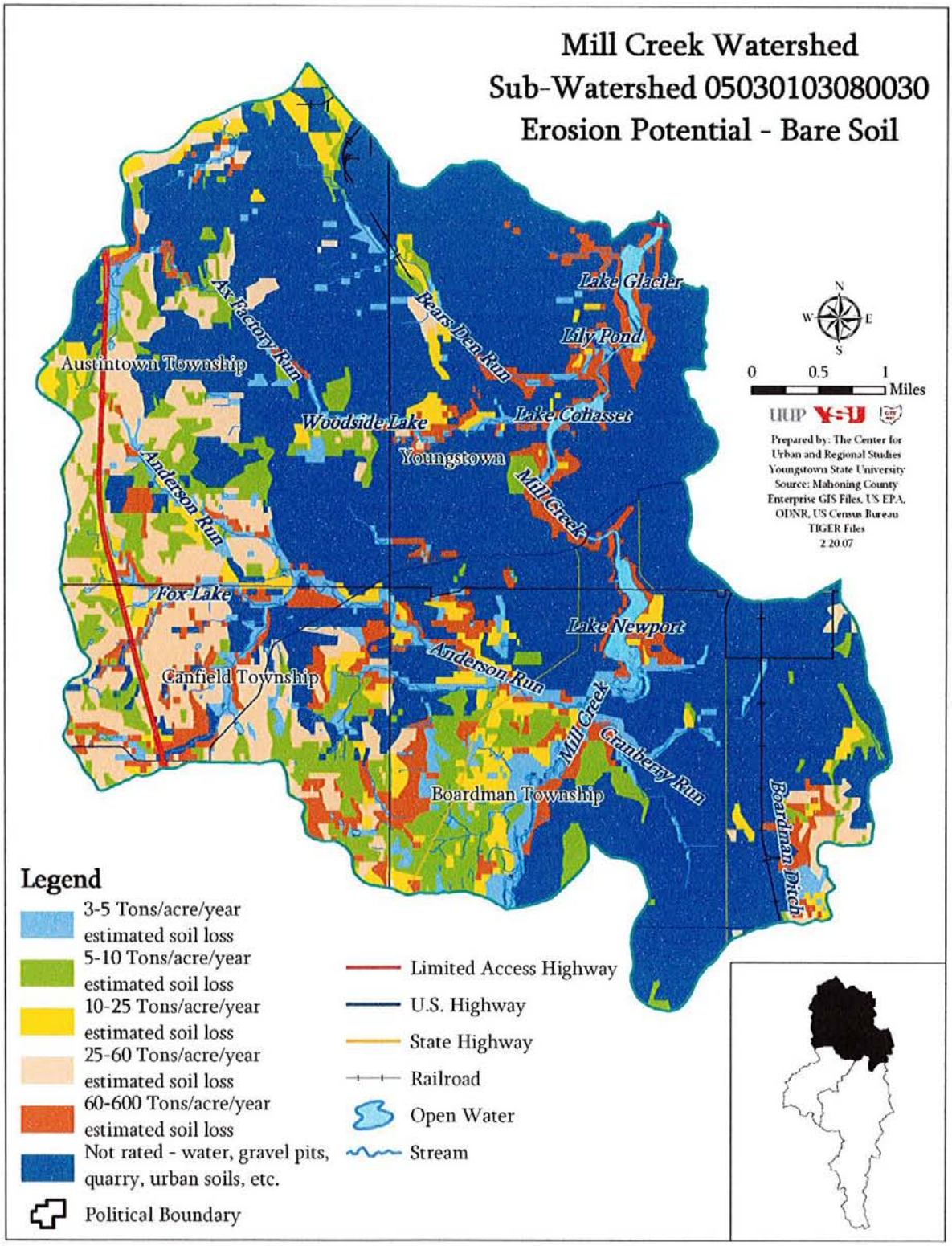


Figure 31

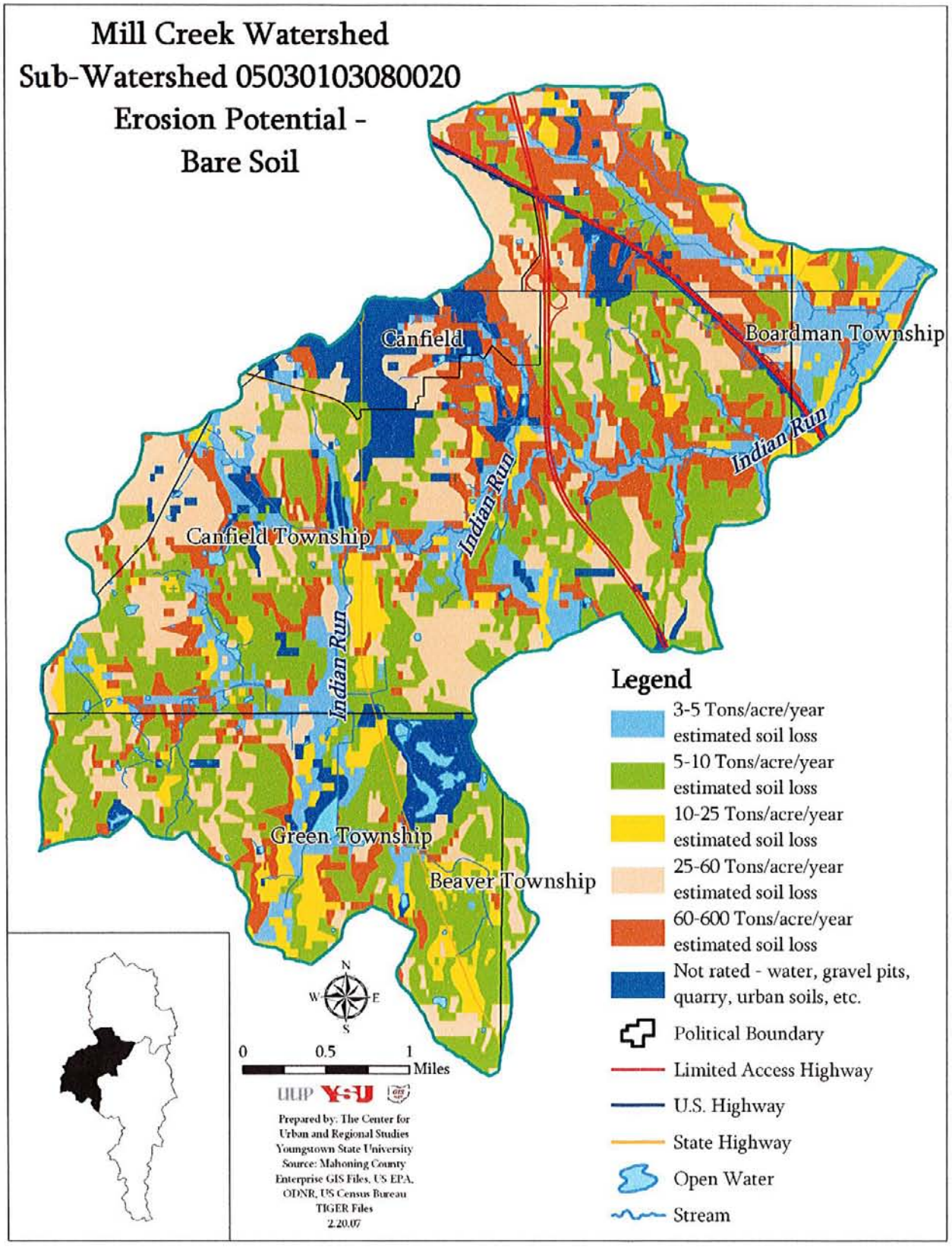
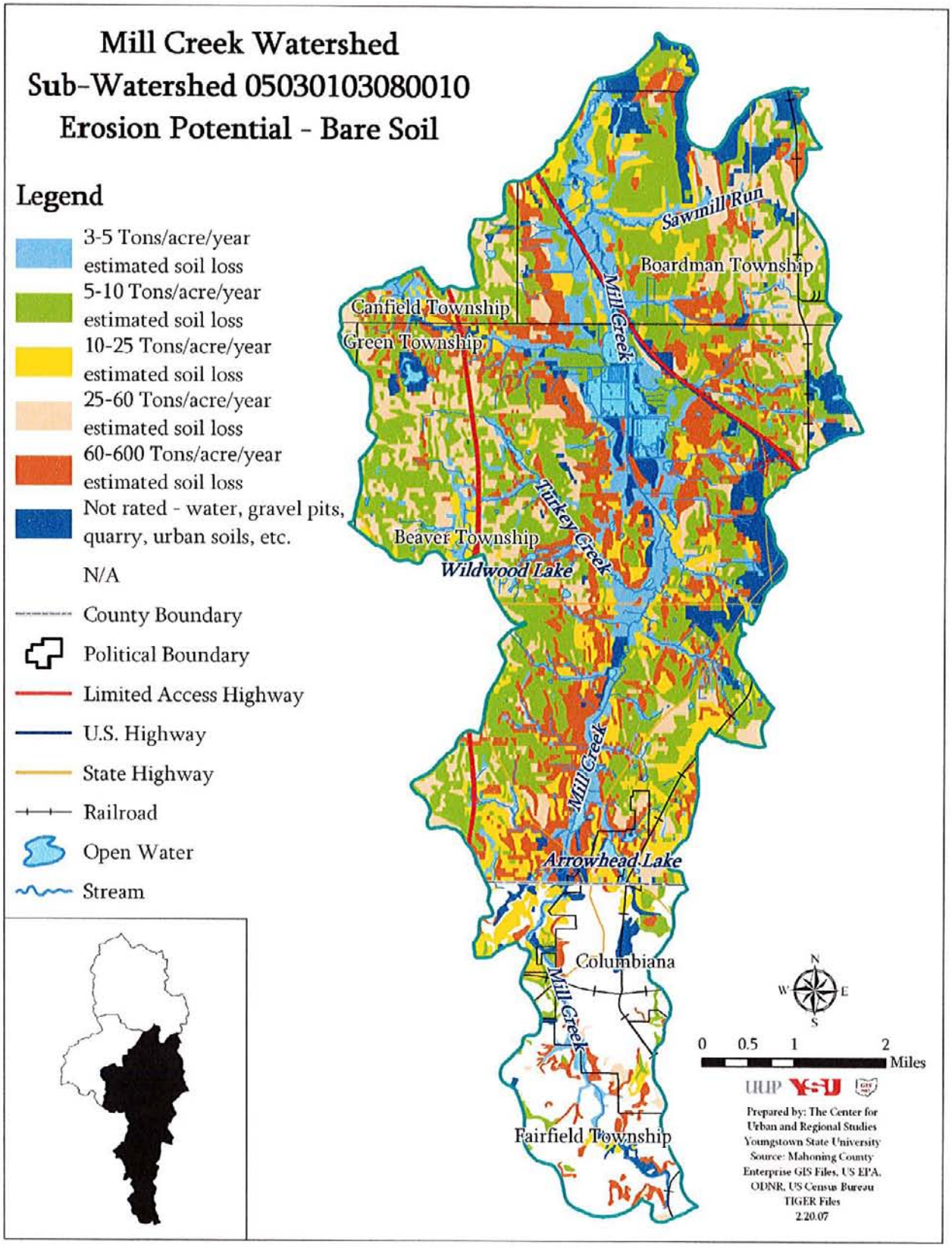

Mill Creek Watershed
Sub-Watershed 05030103080020
Erosion Potential -
Bare Soil
Canfield
Boardman Township
Indian Run
Indian Run
Canfield Township
Indian Run
Green Township
Beaver Township
Legend
3-5 Tons/acre/year estimated soil loss
5-10 Tons/acre/year estimated soil loss
10-25 Tons/acre/year estimated soil loss
25-60 Tons/acre/year estimated soil loss
60-600 Tons/acre/year estimated soil loss
Not rated - water, gravel pits, quarry, urban soils, etc.
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Open Water
Stream
N
W
E
S
0
0.5
1
Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.20.07

Figure 32


Mill Creek Watershed
Sub-Watershed 05030103080010
Erosion Potential - Bare Soil
Legend
3-5 Tons/acre/year estimated soil loss
5-10 Tons/acre/year estimated soil loss
10-25 Tons/acre/year estimated soil loss
25-60 Tons/acre/year estimated soil loss
60-600 Tons/acre/year estimated soil loss
Not rated - water, gravel pits, quarry, urban soils, etc.
N/A
County Boundary
Political Boundary
Limited Access Highway
U.S. Highway
State Highway
Railroad
Open Water
Stream
Sawmill Run
Boardman Township
Mill Creek
Canfield Township
Green Township
Turkey Creek
Beaver Township
Wildwood Lake
Mill Creek
Arrowhead Lake
Columbiana
Mill Creek
Fairfield Township
N
W
E
S
0 0.5 1 2 Miles
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.20.07

e. Culverted and Channelized Stream

There is approximately 39,654 feet of culverted stream and approximately 166,370 feet of channelized stream within the Mill Creek watershed. The information in Table 29 was provided by the Mahoning County Engineers office.

Table 29. Culverted and Channelized Streams Within Subwatershed 05030103080010

Stream Name	Culverted (feet)	Channelized (feet)
Sawmill Run	511	940
UNT21055	140	720
UNT21059	422	2772
UNT22058	650	5755
UNT21064	607	2715
UNT22066	775	2380
UNT21067	253	1645
UNT21071	558	1115
Sharrott Run	149	2338
UNT22063	450	1518
UNT21076	412	2837
UNT21079	132	1820
UNT22080	56	3670
UNT22083	101	3170
UNT21082	535	2818
UNT21078	56	1625
UNT21077	63	1695
Turkey Creek	312	3788
UNT21074	425	4000
UNT21073	571	5150
UNT21072	66	2170
Moff Run	167	5810
Mill Creek	0	9425
Total:	**7411**	**69876**
Culverted and Channelized Streams within subwatershed 05030103080020		
Stream Name	**Culverted (feet)**	**Channelized (feet)**
Indian Run and small UNT's	1948	34857
Little Indian Creek	4540	11605
UNT21059	667	2225
UNT21047	0	0
UNT21050	326	1765
UNT21048	163	0
UNT21046	36	0
Total:	**7680**	**50452**
Culverted and Channelized Streams within subwatershed 05030103080030		
Stream Name	**Culverted (feet)**	**Channelized (feet)**
Bears Den Run	4465	7100
Ax Factory Run	2137	7595
Anderson Run	3291	11703
UNT21028	540	7425
UNT21029	1710	830
UNT21012	480	0
Cranberry Run	4051	2310
UNT21030	1900	0
UNT22033	2505	4140
UNT21032	1600	3125
UNT21036	1884	1705
Mill Creek	0	109
Total:	**24563**	**46042**

f. Levied

There are no traditional levied sections of streams within the Mill Creek watershed however, there are areas that have significant channelization.

g. Exhibiting Little Human Impact

Unfortunately, most of the watershed has been impacted through various types of land uses such as industrial and commercial development, residential development, resource extraction such as timber harvesting and coal mining, building within the floodplain, destruction of wetlands and agricultural practices etc. There are no large tracts of land that are exhibiting little to no human impact.

Although the watershed has been impacted, lands are being preserved through the efforts of Mill Creek MetroParks, who is working towards acquiring properties with value to wildlife.

h. Effluent

Effluent volumes for the permitted NPDES entities that were listed above were provided by John Kowlek, Ohio EPA.

Table 30. Effluent Volumes for NPDES Permits Within the Mill Creek Watershed

Permitted Entity	Design Average Daily Flow (mgd)
City of Columbiana POTW	2.35 mgd
Mahoning Co. Boardman POTW	5.0 mgd
Buckeye Transfer	0.0005 mgd[1,3]
Youngstown Hard Chrome	Permitted Flow Not Applicable[2]
Sno Top	0.020 mgd
Pilot #011	Permitted Flow Not Applicable[2]
St. Mary's Alzheimer Center	0.020 mgd
Rustic Meadows MHP	0.0175 mgd
Camp Stambaugh	0.0048 mgd
Sunoco Partners	Permitted Flow Not Applicable[2]
Marathon LLC	Permitted Flow Not Applicable[2]
Sunoco Pipeline	Permitted Flow Not Applicable[2]
Mahoning Co. New Middletown POTW	0.55 mgd[1]

1-Entity does not discharge to the Mill Creek Basin. Entity discharges to the Middle Fork Little Beaver Creek Basin. 2-2 Entity discharges only storm water from the site. The NPDES Permit does not regulate the flow volume of storm water. However, concentration limits may be included in the permit to regulate the discharge of pollutants from the site. 3-Entity discharges 500 gpd of sanitary wastewater in addition to storm water from the site.

mgd=million gallons per day

The Design Average Daily Flow is based on the expected long-term average daily flow through the treatment system. Flow values such as the peak hourly flow can exceed the

Design Average Daily Flow for short periods of time. In addition, the wastewater flow through the treatment system can fall well below the Design Average Daily Flow depending on factors such as rain events and time of day. The Design Average Daily Flow for a sanitary wastewater treatment system is based on the number of customers, tributary to the treatment plant, and an expected per capita flow of wastewater. The Design Average Daily Flow of wastewater for an industrial facility may be based on many factors such as the capacity of the manufacturing facilities.

Rustic Meadows MHP and St. Mary's Alzheimer Center have proposed eliminating their treatment systems by connecting to sanitary sewers. Rustic Meadows has proposed connecting to the Mahoning County Boardman sanitary sewer system, and the St. Mary's Alzheimer Center has proposed connecting to the City of Columbiana sanitary sewer system.

i. Impounded Stream Miles

Dams have been installed across the nation's waters for uses such as recreation, flood control, flow regulation, irrigation, creation of hydroelectric power, and to provide navigable depths for commercial traffic downstream. Although created reservoir/lakes are useful to man's needs, looking closer at dams in an environmental manner, they are viewed as detrimental to natural systems because they can lead to depleted fisheries and degraded river ecosystems.

Because of the increased understanding of the importance of riverine ecosystem functions and values, when negative impacts of dams outweigh the value of the dam, removal of the dam occurs. Each case of dam removal is specific to the community and environmental needs. Dam removal usually occurs when the dam is no longer owned or properly maintained, is classified as a hazard or liability, or is causing large environmental impacts that are mandated to be restored.

The dams on Mill Creek are located within the historic district of Mill Creek Park and are owned and maintained by the Mill Creek MetroParks. The dams were originally constructed to create reservoirs for recreational use and continue to be used for recreational use today. In addition to the lakes possessing recreational values to the communities surrounding Mill Creek Park, Lake Newport, the first of the three impoundments, acts as a large settling basin for eroded sediments within the Mill Creek watershed. There are no plans currently to remove the dams on Mill Creek, they are viewed as historically significant to this region and are included in the Historic Park District.

The three dams that are located on the Mill Creek mainstem have created approximately 15,100 linear feet or 2.86 miles of impounded stream. (Lake Glacier Dam: approximately 4,700 linear feet (0.89mi), Lake Cohasset Dam 3,700 linear feet (0.70mi), Lake Newport Dam: 6,700 linear feet (1.27mi). Although lentic systems have been

created, water movement is somewhat permitted by water passing over the three individual spillways and along Mill Creek and then flow into the Mahoning River.

j. Officially Classified and/or Unofficially Maintained as Petition Ditches

No petition ditches are located within the Mill Creek Watershed. There are a few headwater streams that which are privately maintained, these sections of streams are referenced in the channelized streams inventory.

7.5.3 Status and Trends

a. Section 208 Water Quality Plan

Section 208 of the Clean Water Act requires that each state identify areas that are in need of water quality management plans. These plans address both municipal wastewater treatment issues and non-point source pollution management and control.

Information from the localized 208 plans are then included in the state Water Quality Management (WQM) Plan. As a component of the state WQM plan, water quality management functions are part of the continuing planning process.

Six urban areas of Ohio were identified by the Governor for regional water pollution control planning and planning areas cover 25 counties. The Eastgate Regional Council of Governments is responsible for updating the 208 Plan for this region (Trumbull and Mahoning Counties), which the Mill Creek watershed is located.

The original 208 plan was completed in 1977 and demonstrated to the state/federal government that local wastewater authorities had logical spending intentions for government-funded WWTP upgrades. Revisions to the plan began in 1999 and are an on-going process. The plan has evolved to focus on protecting water quality through the protection of our region's critical resources (i.e. drinking water sources, wetlands, conserved open space). Updates to the plan are necessary to reflect changes in current developmental and environmental protection goals of local officials, changes in economic trends and new environmental issues that arise within each watershed community.

While past efforts were effective in the reduction of pollution from point source discharges (i.e. a direct discharge from a wastewater treatment plant to a receiving stream), recent awareness has been directed toward the control of non-point source pollution (i.e. storm water runoff from construction sites or parking lots).

More specifically, impacts from land use, development on water sources, updates in the 201 Facility Planning Areas ((FPAs) are sub-areas within the 208 planning region that represent planning areas for wastewater treatment facilities).and their wastewater treatment planning prescription/option language and the identification of, and protective recommendations for protecting the region's critical resources and reducing non-point

source pollution will be included in the 208 Plan.

The 208 Plan update provides information about improving and protecting our region's water quality by developing measures for: curbing wasteful urban sprawl, urban sediment and storm water runoff control, better management of home sewage disposal systems, etc.

For more detailed information on the 208 Plan and its updates please contact:

Stephanie Dyer
Eastgate Regional Council of Governments
City Centre One Building
100 E. Federal St., Suite 1000
Youngstown, OH 44503
Phone: (330) 779-3800
Email: Sdyer@Eastgatecog.org

8.0 Watershed Impairments

"Can we afford clean water? Can we afford rivers and lakes and streams and oceans which continue to make possible life on this planet? Can we afford life itself? Those questions were never asked as we destroyed the waters of our nation, and they deserve no answers as we finally move to restore and renew them. These questions answer themselves." Senator Ed Muskie, Debate on the Clean Water Act, 1972

Within the past decade impairments caused by point source pollution are decreasing, while those caused by non-point sources are increasing. Based on results from state wide surveys, the Ohio EPA states, "Impacts from non-point sources of pollution, such as combined sewer overflows (CSOs), urban storm water, siltation of substrates, and habitat degradation are becoming increasingly evident as historically more pronounced impacts from point sources (i.e. municipal WWTPs, some industrial effluents) are reduced. Since 1988, there has been a 48% decline in point sources as a major source of impairment in reassessed stream and river segments. Non-point sources have emerged as a major source of impairment in streams and rivers during this period, with increases including 70% for agricultural sources to 123% for hydromodification related non point source impairments.

While successes resulting from the abatement of point sources have been documented, there are other indications that impacts from non-point source runoff, habitat degradation, and watershed disturbances may be worsening. Siltation of substrates and habitat degradation are now the second and third leading causes of aquatic life impairment in Ohio streams and rivers, surpassing ammonia and heavy metals. These impairments are principally the result of agricultural land use, intensive urbanization, and suburban development, the latter of which is emerging as one of the most significant threats to watersheds...Increasingly, water pollution problems are associated with non-point sources such as construction sites, farm land, abandoned mines, landfills, pits and lagoons, oil and gas wells, domestic sewage systems, manure and treatment processing residuals"

On a local level, based on Appendix E.2 of the 2006 Integrated Report, the leading "High Magnitude Causes" of impairment in Mahoning County and Trumbull County surface water systems include:

- Direct Habitat Alterations;
- Organic Enrichment/Dissolved Oxygen;
- Nutrients;
- Flow Alteration, Siltation, Wetland Alteration, and Unionized Ammonia; and
- Unknown sources.

The sources complimenting the causes are "High Magnitude Sources", and those include:

- Channelization Due to Development and Natural Causes;
- Major Municipal Point Sources, Dam Construction, Urban Runoff/Storm Sewers, Combined Sewer Overflows (CSO);
- Unknown sources;
- Contaminated Sediments; and
- Riparian/Stream Bank Vegetation Removal

A complete listing of High Magnitude Causes and Sources can be found within Appendix E.2 of the 2006 Integrated Report located on the Ohio EPA's website.

Specific information based on the Ohio EPA year 2000 305(b) lists the impairments of Mill Creek mainstem as nutrients, unionized ammonia, organic enrichment, siltation, flow alteration, other habitat alterations, metals and nutrients. The Ohio EPA year 2000 305(b) lists the causes of impairment for Bears Den Run and Axe Factory Run as meals and nutrients. Also included in the same report, Anderson Run Indian Run were also impaired by organic enrichment and metals. Work completed locally determined that Mill Creek is also impaired by sediment and had relatively high levels of fecal coliform bacteria throughout.

8.1 Pollutant Loading

The Total Maximum Daily Load (TMDL) program, established under Section 303(d) of the Clean Water Act requires identifying and restoring polluted rivers, streams, lakes and other surface waterbodies. A TMDL consists of a quantitative assessment of water quality problems, the identification of the contributing sources of pollution, the required reduction amounts to meet water quality standards and basic suggestions for restoration actions.

Table 31. Fecal Coliform TMDL Summary for Mahoning River Watershed .

Assessment Unit	Tributary	WLA (cfu/rec.season)	LA (cfu/rec.season)	MOS	TMDL (cfu/rec.season)
05030103-080	Mill Creek	4.21E+13	1.95E+14	10%	2.13E+14

Table 32. Load Allocations Summary Table for Mill Creek (Assessment Unit 0503103-080

Souces	Total Seasonal Loading for Exisiting Conditions (cfu/summer)	Total Seasonal Loading Allocations Conditions (cfu/summer)	Percent Reduction
Direct			
Straight Pipes	0.00E+00	0.00E+00	NA
Other *	3.28E+15	1.64E+14	95%
Indirect			
Pasture**	4.50E+14	2.25E+13	95%
Built Up ***	1.52E+14	7.62E+12	95%
Other ****	2.54E+13	1.27E+12	95%
Total	**3.91E+15**	**1.95E+14**	**95%**

** Includes pets, livestock, wildlife/**Includes hayland/***Urban pervious and urban impervious/****Includes wetland, forest, failing septic systems and all other/NA-Not Applicable*

Source: Final Mahoning River Total Maximum Daily Load (TMDL) for Fecal Coliform Bacteria, U.S. Environmental Protection Agency Region 5 Watersheds and Wetlands Branch 77 West Jackson Blvd. (WW-16J) Chicago, Illinois 60604 Modeled by:Tetra Tech, Inc.1468 West 9th Street, Suite 620Cleveland, Ohio 44113 September 2004

A (TMDL) has been scheduled to be completed for the year of 2013 or later for Mill Creek. There are no preexisting TMDL's in place at this time for Mill Creek alone, however, Mill Creek is included in the Mahoning River TMDL for bacteria-for more information please refer to the Final Mahoning River Total Maximum Daily Load (TMDL) for Fecal Coliform Bacteria, U.S. Environmental Protection Agency Region 5 Watersheds and Wetlands Branch 77 West Jackson Blvd. (WW-16J) Chicago, Illinois 60604 Modeled by: Tetra Tech, Inc.1468 West 9th Street, Suite 620 Cleveland, Ohio 44113 September 2004 .

In addition to the TMDL process other models are available for pollution reduction and they consist of the Sediment Delivery Model and the Agricultural Non-point Source Pollution Model. Currently there is no information specific to the Mill Creek watershed for existing application of the Sediment Delivery Model and the Agricultural Non-point Source Pollution Models.

8.2 Habitat Conditions/Monitoring

"A science of land health needs, first of all, a base datum of normality, a picture of how healthy land maintains itself as an organism."- Aldo Leopold

In the past, the 303(d) lists of impaired waters and 305 (b) water quality reports were available from Ohio EPA. Recently the Ohio EPA combined these reports into the Integrated Water Quality Monitoring and Assessment Report(s). The Integrated Water Quality Monitoring and Assessment Report provides information on the general quality of Ohio's waters and identifies waters that not meeting water quality standards.

According to information gathered by Heather Moser, Mahoning Soil and Water Conservation District, (original submittal of the plan) the Ohio EPA does not list any data

on wetlands or lakes with the exception of Lake Newport, Lake Cohasset and Lake Glacier, all of which do occur on the Mill Creek mainstem. All data that was submitted with the original plan is complied in Appendix I, J and L and consists of information gathered by AWARE, the Mahoning Soils and Water Conservation District and Ohio EPA.

Appendix J was compiled by the Monitoring and Research committee of AWARE. The data gathered was supplemented with local watershed knowledge determinations regarding causes and sources of impairment by the members of AWARE.

There is a large gap in available data for the watershed. The most recent conditions of the habitat and water quality within the watershed were documented over ten years ago (1994). Although this information is important to provide a baseline and document past conditions, new studies need to be completed to incorporate changes to the water quality within the watershed, be they positive or negative so that proper restoration or protection efforts can be completed.

Although detailed surveys of the habitat within the watershed are outdated, as any component of a watershed plan, monitoring is essential to document changes. Currently a volunteer monitoring plan has not been developed for the watershed, and there are no volunteers that are Qualified Data Collectors. Future updates of the plan will incorporate the following requirements have been identified as the collection methods for volunteer use and need to be incorporated into data collection efforts.

Future Monitoring Efforts

(Please note: All information in this section below has been modified from the Ohio EPA's website that can be found at http://www.epa.state.oh.us/dsw/volunteermonitoring/index.html)

The Ohio General Assembly passed Amended House Bill 43 in 2003 which allows watershed groups, community associations, educators, local governmental organizations, and private sector businesses to collect water quality data in Ohio.

The legislation and the rules are explicit in the desire to not only encourage the collection of monitoring data by volunteers, but also to ensure that the data is valid and useful for its intended purpose. In other words, the data should be "credible." The rule package bears the name "Credible Data" because of this important feature, and because the enabling legislation was referred to as the credible data bill.

Ohio EPA, using the framework established by this legislation, has adopted rules for the surface water monitoring program designed to encourage and oversee the collection, analysis and use of data collected by "volunteer" individuals and organizations. To promote scientific validity, Ohio EPA has established specific requirements to participate in the program and to collect data using approved study plans. Chapter 3745-4 of the Ohio Administrative Code provides rules which are required for all water quality monitoring projects that are considered as Credible Data.

Education, experience, and skills required for Qualified Data Collector (QDC) status vary depending on the credible data level; least rigorous for Level 1 to most rigorous for Level 3. In Level 2 and Level 3 the applicant must indicate what water quality sampling discipline or specialty area he or she is pursuing. The specialty areas are listed below.

- **Level 1 QDC Requirement** - Successfully completed training offered through an acceptable educational monitoring program or an acceptable volunteer monitoring program.
- **Level 2 QDC Requirements** - Note: No Level 2 for fish community biology., Stream habitat assessment (QHEI and/or HHEI), Benthic macroinvertebrate biology, Chemical water quality assessment.
- **Level 3 QDC Requirements**, Stream habitat assessment (QHEI and/or HHEI), Benthic macroinvertebrate biology, Chemical water quality assessment, Fish community biology

U. S. EPA has conducted national surveys to determine the most frequently tested parameters used in citizen based voluntary monitoring programs. To ensure that data on these commonly sampled parameters is credible for its intended use, the administrative rules identify some of the sampling and analytical methods suitable for Level 1 and Level 2 projects.

Commonly sampled parameters that are outlined on OEPA's website consist of acidity, conductivity, phosphorus, turbidity, alkalinity, DO (dissolved oxygen), pH, nitrate, temperature, bacteria*, total suspended residue, ammonia (as N)*, water transparency, stream flow and benthic insects (*this parameter is only available using Level 2 methods).

All laboratories that perform analysis under a Level 2 or Level 3 study plan shall implement a quality assurance program. There must be written documentation for all elements of the quality assurance program in the form of a quality assurance manual (QAM), a quality assurance plan (QAP), or a quality assurance project plan (QAPP). Guidelines for the content of this written documentation have been provided in the administrative rules for the Credible Data Program.

All laboratories that perform analysis under a Level 3 study plan must be accredited, and participate in annual proficiency testing. Accreditation by one or more of these organizations is acceptable:

- United States Environmental Protection Agency
- Ohio EPA Voluntary Action Program
- National Environmental Laboratory Accreditation Program
- American Industrial Hygiene Association
- International Organization for Standardization
- Any other governmental or private accrediting authorities that apply accreditation standards consistent with and equivalent to the organizations above

Note: A collection permit may be required from the Ohio Department of Natural Resources for biological sampling. This includes any collection of fish, macroinvertebrates, mollusks, shells, etc. but does not include, for example, identifying, counting, and releasing macroinvertebrates. Contact Ron Ollis (at (614) 265-6315) with the Division of Wildlife before collecting samples.

There is a list of current Qualified Data Collectors (QDCs) along with the organization(s) with which they are affiliated, their approved level and specialty, their approved QDC number, and the expiration date of their status is provided on OEPA's website.

Project Study Plans

Study plans are required for all water quality monitoring projects undertaken pursuant to the credible data rules. The person submitting the project study plan must be a Qualified Data Collector (QDC). Ohio EPA will review project study plans (depending upon available personnel) within 60 days of receipt. Ohio EPA will notify the person submitting the project study plan when deficiencies are found, and provide an opportunity to re-submit the plan. If not disapproved within 60 days, the project study plan is considered approved. The administrative rules for the program provide guidelines for the study plan content. Under the regulations the QDC is obligated to adhere to the study plan throughout the sampling effort.

All project study plans should be submitted to Ohio EPA. Ohio EPA has 60 days to act on the plan or it is automatically approved. Once a project study plan is approved, the QDC has one year to initiate the project and begin submitting the data to Ohio EPA.

Level 1 – A study plan for a project designed for public awareness and/or educational purposes should be based upon guidance materials available from the sources listed below or other similar resources.

- Healthy Water Healthy People: http://www.epa.state.oh.us/oeef/html/hwhpohconnect.html
- U.S. EPA Volunteer Monitoring: http://www.epa.gov/owow/monitoring/volunteer/

Level 2 – A study plan for a project designed for initial screening of water quality or for evaluating the effectiveness of pollution control efforts must be compiled using the guidelines found in Appendix A of rule 3745-4-05 (PDF 10K)).

Level 3 – A study plan for a project designed for any of the regulatory purposes stipulated in the law must be compiled using the guidelines found in Appendix A of rule 3745-4-06 (PDF 11K). (Ohio EPA will complete a survey every five (5) years for the major watersheds.)

Generic Study Plans

The Division of Surface Water also expects to generate one or more Generic Study Plans for common water quality projects. Once these are available, they may be implemented

without prior approval. However, the Division of Surface Water recommends that the QDC notify Ohio EPA of his or her intent to sample under a generic study plan 90 days in advance of the project to allow time for consultation.

Study Plan or QAPP?

U.S. EPA requires a Quality Assurance Project Plan (QAPP) for all U.S. EPA-funded monitoring of surface waters. All Section 319 funded projects have the QAPP requirements. Guidelines under the credible data rules for Level 2 and Level 3 study plans cover many of the same elements that U.S. EPA requires in QAPPs.

Submission of Data

Ohio EPA is responsible under the law for developing and maintaining a central database repository for all data collected through this program. Such a database is not available at this time. Several options are under consideration and additional information will be shared when available.

Submission of data is voluntary. Qualified Data Collectors (QDCs) are expected to carry out the monitoring program as described in their project study plan. There is no obligation to submit the data upon completion of all or part of the project. However, if the QDC chooses to submit data, he or she must submit all of the data collected. If part of the project study plan could not be completed, then an explanation of the circumstances should be provided to explain missing data.

Additional acceptable methodologies for monitoring streams, wetlands, lakes, and other natural resources are available by contacting the Ohio Environmental Protection Agency (OEPA), U.S. Army Corps of Engineers (USACE) and the Ohio Department of Natural Resources (ODNR). Some sampling methodologies require additional training/education and experience. The above mentioned agencies can assist with questions about the proper methodologies needed to ensure that the information that is gathered will be useful and specific to your project(s).

8.3 Problem Statements

a. Original Problem Statements

Problem statements were not generated for the first draft of the plan. Issues, causes and sources were identified and are listed below in a table format. This table was formed using that data that was gathered through the AWARE Monitoring and Research Committee, as well as local knowledge, determinations regarding causes and sources of impairments were made by an Ad Hoc committee. The committee were selected members of AWARE and was comprised of representatives of various agencies, including the Mahoning County District Board of Health, the Mahoning County Engineer, Mill Creek MetroParks, Mahoning Soil and Water Conservation District, Mahoning County Commissioners, Office for Special Projects, Consumers Ohio Water

Company (now known as Aqua Ohio), Youngstown State University, Ohio EPA, Eastgate Regional Council of Governments, and ODNR Division of Mineral Resource Management. Township trustees and representatives were also invited to attend, however, few did.

The Ad Hoc committee laid out aerial photos of sections of the watershed and examining all available data as well as utilizing personal knowledge of local issues, create lists of concerns, issues and preliminary recommendations. After the lists were comprised a public meeting was held in the Mill Creek watershed. During this meeting a presentation was made to the stakeholders and then those who were in attendance were asked to submit issues of concern through a basic survey. The comments were then complied and transferred to large sheets of paper and were voted on using the "dot vote" method. The issues, causes and sources that were originally identified for the watershed are listed in Table 33 below.

Table 33. Identified Issues, Causes and Sources. Produced October-December 2003, AWARE Ad Hoc Committee

Stream	Segment	Location Details	Cause/Issue	Source(s)	General Recommendations	Reference Number
Mill Creek	Middle Mainstem	North of OH 165	**Sediment**	Stream Bank ersosion	Acquisition of buffers to allow stream recovery in areas where stream has not been channelized	2MC-1 Project
Mill Creek		Bassinger Road - Western Reserve Road	**Sediment**	Stream Bank ersosion	Natural Channel Resoration	2MC-2 Project
Mill Creek		Bassinger Road Curve	**Sediment**	Storage of WWTP sludge in floodplain	improved handling of WWTP sludge	2MC-3 Project
Mill Creek	Middle to Lower Mainstem and tributaries	Western Reserve Road - US 224	**Sediment**	Stream Bank ersosion	Acquisition of buffers to allow stream recovery in areas where stream has not been channelized.	2MC-1 Project
Mill Creek	Middle to Lower Watershed	Western Reserve Road - US 224	**Sediment**	Stream Bank ersosion	Buffers for floodplain storage, Addition of Riaparian Setbacks in Zoning Ordinance to allow floodplain storage	2MC-4 Policy
Mill Creek	Middle to Lower Watershed	Western Reserve Road - US 224	**Sediment**	Stream Bank ersosion	Buffers for floodplain storage, Easements on tributaries and in headwater areas	2MC-4 Project
Mill Creek	Middle to Lower Mainstem	Western Reserve Road - US 224	**Sediment**	Stream Bank ersosion related to in channel debris	Selective removal of debris to avoid erosion points	2MC-5 Project
Indian Run	All	Calla Road - US 224	**Sediment**	Stream Bank ersosion	Buffers for floodplain storage, Easements on tributaries and in headwater areas	2MC-4 Project
Anderson Run	Near confluence with Mill Creek	Mill Creek MetroParks property	**Sediment**	Stream Bank ersosion	Channel Restoration	2MC-6 Project
Anderson Run	Headwaters - Middle Watershed	Canfield and Austintown Township west of US 62	**Sediment**	lack of flood plain storage leads to channel instability downstream	Buffers for floodplain storage, Addition of Riaparian Setbacks in Zoning Ordinance to allow floodplain storage	2MC-4 Policy
	Headwaters - Middle Watershed	Canfield and Austintown Township west of US 62	**Sediment**	lack of flood plain storage leads to channel instability downstream	Prioritize easements in headwaters area	2MC-4 Project
Anderson Run	Middle - Lower Watershed	East of US 62, West of Truesdale	**Sediment**	lack of flood plain storage leads to channel instability downstream	Buffers for floodplain storage, Addition of Riaparian Setbacks in Zoning Ordinance to allow floodplain storage	2MC-4 Policy
	Middle - Lower Watershed	East of US 62, West of Truesdale	**Sediment**	Channel instablity	Examination of retrofit stormwater retention for areas developed prior to Phase 1	2MC-7 Project
Ax Factory Run	Upper Watershed	West of Meridian	**Sediment**	Streambank erosion due to lack of access to floodplain and older development	Buffers for floodplain storage, Addition of Riaparian Setbacks in Zoning Ordinance to allow floodplain storage, Easements on existing corridors (Austintown Township trustees, Board of Ed, Maronite Center, Library)	2MC-4 Project

Table 33. Continued. Identified Issues, Causes, Sources. Produced October-December 2003, AWARE Ad Hoc Committee

Stream	Segment	Location Details	Cause/Issue	Source(s)	General Recommendations	Reference Number
Mill Creek	Headwaters	South of 165	**lack of data**	Biological	OEPA fish sampling demo	1MC-1 Research 1MC-1 Education
Mill Creek		South of Columbiana	**lack of data**	Biological	Volunteer monitor assignments	1MC-2 Research
Mill Creek	Headwaters	Near Columbiana	**lack of data**	Functional	Better identification of wetlands and easement potential in Columiana Co. portion of watershed. Include in Riparian Area Protection Plan update	1MC-3 Research
Mill Creek	All	Entire watershed	**lack of data**	Morphological	Determine miles of channelized stream using GIS	1MC-4 Research
Mill Creek	Headwaters and Mid-watershed	South of 224	**Fecal coliform contamination**	Manure application	Catalogue manure application practices, identify producers spreading manure, education campaign	3MC-1 Research 3MC-1 Education
Mill Creek	Headwaters of Mainstem	Columbiana County/Fairfield Township	**Fecal coliform contamination**	Failing HSTS	Work with Columbiana County Health Department to gather data as it becomes available.	3MC-2 Research
Mill Creek	Lower Mill Creek and tribs	North of 224	**Fecal coliform contamination**	Combined Sewer Overflows	City of Youngstown, SE and MS consultants are planning to address this	3MC-3 Project
Sawmill Run	All	Near Hitchcock	**Fecal coliform contamination**	Presumed to be illicit discharges and cross connections	Phase II will adress illicit discharges and cross connections	3MC-4
Indian Run	All	Boardman and Canfield Township	**Fecal coliform contamination**	Failing HSTS	Summit Drive in Canfield is believed to be a major source for this area. Sewer is currently being planned for this area.	3MC-5 Project
Indian Run	Mid section	Canfield Township	**Fecal coliform contamination**	Manure application	Catalogue manure application practices, work with large applyers of manure in this watershed to improve practices	3MC-1 Project
Anderson Run	Headwaters of Anderson Run	Canfield Township	**Fecal coliform contamination**	Manure application	Catalogue manure application practices, identify producers spreading manure, education campaign	3MC-1 Research
Anderson Run	Mid section	Aladdin, Fox Haven, Edenrock, Alvacardo, etc. near US 62	**Fecal coliform contamination**	Failing HSTS	Form subcommittee to investigate options (including living machine type packet plants) for eliminating HSTS discharges	3MC-6 Project
Ax Factory Run	Ax Factory Run	Near Orkney and New Rd. ???	**Fecal coliform contamination**	Failing HSTS	After Anderson Run is addressed, possibly same approach as is taken there.	3MC-7 Project
Indian Run	Indian Run	Boy Scout Camp Stambaugh	**Inappropriate Recreational Use Designation**	NA	Recommend that OEPA redesignate Indian Run as PUBLIC BATHING WATER (currently it is designated as PRIMARY CONTACT RECREATION WATER)	4MC-1 Project
Mill Creek	Entire watershed		**Lack of Riaparian Cover/Buffer enhancement**	NA	Recommendation that a priority list be put together of areas with known existing buffers and areas targeted for easement. Riparian area protection plan update.	5MC-1 Project
	Mid section	Beaver Township	**Lack of Riaparian Cover/Buffer enhancement**	Development/ construction encroachment on riparain areas	Work with Beaver Township to provide technical support to their efforts to encorporate a Riparian Setback into their zoning ordinance.	5MC-2 Policy
	Entire watershed		**Lack of Riaparian Cover/Buffer enhancement**	Development/ construction encroachment on riparain areas	Work with Fairfield, Boardman and Canfield Township to provide technical support and encouragement for the inclusion of a Riparian Setback into their zoning ordinance.	5MC-2 Policy

Table 33. Continued. Identified Issues, Causes, Sources. Produced October-December 2003, AWARE Ad Hoc Committee

Stream	Segment	Location Details	Cause/Issue	Source(s)	General Recommendations	Reference Number
	Entire watershed		Lack of Riaparian Cover/Buffer enhancement	Landowner management	Continue Riparian tree planting cost share. Prioritize areas listed in watershed priority document.	5MC-3 Project
Mill Creek	Western Reserve -US 224		Excessive In-stream Debris	Trees and large scale debris	Selective removal of large woody debris which is causing erosion and channel diversion.	6MC-1 Project
Ax Factory Run	Middle watershed	Trustees park to Meridian Lake	Trash	Urban NPS	Stream Cleanups	7MC-1 Project
Ax Factory Run	Lower Watershed	Meridian Lake- Mill Creek Park	Trash	Urban NPS	Stream Cleanups	7MC-2 Project
Mill Creek	Lake Newport		Trash	Urban NPS	Stream/Wetland Cleanups	7MC-3 Project
Mill Creek	Lake Glacier		Trash	Fishing refuse	Stream/Lake Cleanups	7MC-4 Project

Using the cause and source information generated by the Ad Hoc committee in combination with the concerns listed at the public meetings, AWARE members met on February 25, 2004 and listed specific projects to address the issues raised throughout the watershed planning process. The original recommendations for projects relating to the above issues, causes and sources from the first watershed plan submittal are attached in Appendix J.

Unfortunately, the watershed coordinator position has been terminated; therefore the tasks and projects that were identified to be the responsibility of that position no longer can be completed as outlined in the original submittal. Additionally, some of the tasks that were listed in Appendix J have been completed, the information is now outdated (the original submittal was in 2004) and/or objectives of the plan may slightly differ from the original plan. Because of the complications, the goals and tasks outlined within the plan have been updated and revised and official problem statements have been identified to reflect the current objectives of AWARE and its many partners.

b. Updated Problem Statements

The following problem statements identify concerns within the Mill Creek Watershed, however it is important to note that although these problems exist, the list is not comprehensive and upon further investigation/data collection there may be additional concerns identified in the future.

1. <u>Streams, floodplains and wetlands continue to be impacted through:</u>
    a. Lack of established riparian buffers/vegetation
    b. Draining and filling of wetlands
    c. Channel instability
    d. Existing channelization of streams
    e. Increased storm water flows due to lack of storm water retention areas/management
    f. Development/fill occurring within the floodplain
    g. Excess of in-stream debris and trash

2. Excessive sedimentation limits in-stream habitat for macroinvertebrates and fish through:
    a. Minimal or lack of enforcement of erosion and sedimentation control practices
    b. Excessive streambank erosion
    c. Lack of floodplain storage within the watershed
    d. Storm water runoff from roadways and other development

3. Elevated bacteria levels within Mill Creek limit recreational use due to:
    a. Storage of wastewater sludge within the floodplain
    b. Waste water treatment plant overflows during high water and/or storm events.
    c. Failing home septic systems and gray-water discharges.
    d. Direct accessibility of livestock to the stream

4. Undesignated and the failure to meet assigned aquatic life use designation(s).
    a. The tributaries of Bears Den Run, Axe Factory Run, Anderson Run, and Indian Run are not in attainment of the Warm Water Habitat (WWH) designation. Original
    b. Change Camp Stambaugh use designation through Ohio EPA
    c. All tributaries within the watershed are undesignated with the exception of Bears Den Run, Axe Factory Run, Anderson Run and Indian Run.

9.0 Watershed Restoration and Protection Goals

In order to address the problems within the watershed, the following goals are identified.

Goal 1 - Education: Promote an understanding of the importance of wetland and riparian areas for maintaining water quality and providing essential habitat for flora and fauna.

Goal 2 - Land Preservation/Protection: Obtain easements or full fee acquisition rights, or restrict activities that have a negative impact within Mill Creek watershed including but not limited to: riparian areas along the mainstem of Mill Creek, tributaries to Mill Creek, wetlands and other important habitat and/or environmentally sensitive areas in the watershed.

Goal 3 - Restoration of streams, floodplains and wetlands: Promote the restoration of preexisting functions in damaged or destroyed wetland and riparian systems.

Goal 4 – Reduction of bacteria levels: Identify and reduce the sources of bacteria input into the watershed.

Goal 5 – Reduction of sedimentation and storm water: Removal of sediment from runoff, streambank stabilization, education and enforcement of erosion and sediment control and storm water practices.

Goal 6 – Data Collection: Continue watershed data collection through inventories and proper volunteer monitors training.

Goal 7 – Model Ordinances: Creation of ordinances for the reduction of environmental impacts.

10.0 Implementation

10.1 Objectives

1. Reduce impacts to streams, floodplains and wetlands through:
    a) Property acquisition to preserve and/or promote the restoration of the preexisting functions of wetlands, floodplains, riparian areas and adjacent upland areas within the Mill Creek watershed.
    b) Establishing riparian buffers/vegetation.
    c) Establish conservation easements
    d) Establishment of Wetland Mitigation Bank(s)
    e) Complete restoration activities using "natural design approaches" such as bioengineering or natural stream channel design techniques).
    f) Conduct educational outreach programs through the establishment of a demonstration area showcasing ideal practices.

2. Reduce sedimentation to waterways within the Mill Creek Watershed.
    a) Property Acquisition
    b) Restoration of native plant and tree species through establishment of riparian buffers.
    c) Establish conservation easements
    d) Utilizing bioengineering and/or natural stream channel design techniques for restoration projects.

3. Reduce bacteria levels within the Mill Creek Watershed
    a) Educational outreach.
    b) Offer assistance towards the implementation of updating existing waste water treatment plant facilities.
    c) Educate homeowners about proper maintenance of home septic systems and gray-water discharges.

4. Improve quality of streams that currently fail to meet assigned aquatic life use designation (s).

5. Gather data to supplement OEPA and ODNR's efforts to establish aquatic life use designation(s).

a) Headwater stream data collection within the Mill Creek Watershed using methodology outlined by the Ohio EPA Primary Headwater Habitat Initiative.
b) Create supplemental methodology for the monitoring of existing wetland systems within the watershed.
c) Data collection for the development of entrenchment ratios.

10.2 Proposed Tasks

The proposed tasks listed in Tables 34 through 40 directly reflect the goals that were identified above and will help in reaching the objectives of this plan.

Table 34. Goal 1 - Education

Goal 1- Education: Promote an understanding of the importance of wetland and riparian areas for maintaining water quality and providing essential habitat for flora and fauna.

Proposed Tasks	Responsible Parties	Funding	Interim Indicators	Status	Final Indicator or Completed Task	Cost Estimate	Project Rating
Provide educational meeting for developers, local officials, landscapers for better sight design techniques, changes in laws and regulations, and creation of setback ordnances.	MSWCD-Lead Mahoning County Engineers-Support	General Funds	Educate at least one of these entities per year	On-going as requested or needed.	On-going	$350.00	High-Moderate
Education to K-12 about watersheds and wetlands	MSWCD	MSWCD	Complete at least 6 programs to schools per year.	On-going as requested or needed.	On-going and the completion of least 6 programs to schools per year.	$250.00	High-Moderate
Education of BMP's for water quality improvement (buffers, infiltration, prevention of polluted storm water runoff by not allowing pollutants and runoff to mix, etc.)	MSWCD	319	Education and outreach to at least 10 property owners per year	On-going as requested or needed.	Create informational handouts for BMP's for protecting water quality, restoring stream edges, promote infiltration and keeping "clean" water "clean"	$200.00	Moderate
Hold functions for local communities and residents about local watershed issues and finding possible solutions	MSWCD	319	Schedule at least 1 function before June of each year	On-going as requested or needed.	Hold at least 2 funtions for landowners and residents	$1,000.00	Moderate
Establish BMP demonstration areas at the Mill Creek MetroParks Experimental Farm	MCMP	319 Grants, donations and other funding	Completion of 1 survey identifying the priority areas for BMP installation	On-going	Installation of at least 2 BMPS by 2009	Dependant on BMP type	High
Education of public about recycling	Green Team	Green Team	Educate at least 10,000 people/students per year about recycling	On-going as requested or needed.	Reach at least 15,000 people each year	$80,000.00	Moderate
New Septic System Education Program	Mahoning County District Board of Health	General Funds	By July 1st of every year send out at least 50 educational packets	On-going	Annually send out at least 300 educational packets	$600.00	High
Septic System Contractors Training	Mahoning County District Board of Health	General Funds	Schedule 2 meetings per year	On-going	Hold at least 2 seminars for contractors with at least 100 in attendance at each seminar	$2,000.00	High
Natures Recycling Educational Programs	Green Team	General Funds	Schedule at least 5 programs per year	On-going	Hold at least 5 programs per year, with at least 30 people per session, and provide composting bins to each person in attendance	$5,000.00	High

Table 35. Goal 2 - Land Preservation/Protection

Goal 2- Land Preservation/Protection: Obtain easements or full acquisition rights or restrict activities that have a negative impact within Mill Creek watershed including, but not limited to: riparian areas along the main stem of Mill Creek, tributaries to Mill Creek, wetlands and other important habitat and/or environmentally sensitive areas within the watershed.

Tasks	Responsible Parties	Funding	Interim Indicators	Status	Final Indicator or Completed Task	Cost Estimate	Project Rating
Establish Riparian Easements within the Mill Creek Watershed	MSWCD- Lead MCMP-Support	319 Grant	Discuss with 15 landowners per year	In-progress	Acquire 111 acres of conservation easements between July 1, 2005 through June 30, 2008	$8,000.00 per easement	High
Establish Riparian Buffers within the Mill Creek Watershed	MSWCD- Lead MCMP-Support	319 Grant	Distribute 2,500 letters to landowners and landscapers about the program	In-progress	Establish 1300 linear feet of riparian buffers between July 1, 2005 through June 30, 2008	$12,390.00	High
Acquire property for storm water retention areas	Boardman Twp	FEMA	ID at least 1 property for acquisition	In-progress	Aquire at least 200 feet of property frontage	$123,000.0	Moderate-High
Property acquisition for the preservation of environmentally sensitive and important areas (headwaters, along Mill Creek, wetland areas etc).	MCMP	WRRSP, Clean Ohio	Acquire at least 150 acres of land for preservation	In-progress	Acquire at least 150 acres of land for preservation between 2006 and 2007	$1.6 Million	High

Table 36. Goal 3 - Restoration of streams, floodplains and wetlands

Goal 3- Restoration of streams, floodplains and wetlands: Promote the restoration of preexisting functions in damaged or destroyed wetland and riparian areas.

Tasks	Responsible Parties	Funding	Interim Indicators	Status	Final Indicator or Completed Task	Cost Estimate	Project Rating
Identify lands and areas of ecological importance for preservation	Mahoning County GIS- Lead Eastgate- support	Agency Funds	Development of maps	On-going	Prepare and maintain a priority list of property for preservation	$4,000.00	Moderate-Low
Identify streams, floodplains and wetland areas that need restoration or enhancement	Mahoning County GIS- Lead Eastgate- support	Agency Funds	Development of maps	On-going	Prepare and maintain a priority list of areas that need restoration or enhancement	$4,000.00	Moderate-Low
Restoration of wetlands	MCMP	WRRSP	Funding secured, will acquire property in 2007	In-progress	Complete 44 acres of wetland restoration by 2010	$403,000.00	High
Trash clean ups	MCMP	MCMP	Contact local Boy Scouts of America troops for trash clean up days	Yearly	Hold at least 1 Boy Scouts trash clean up day within the Mill Creek Park 2007-2010.	$120.00	Moderate-High
Remediation of AMD from surface and deep mines	MSWCD- Lead ODNR-Support	319 grants, other grants, donations	Procurement of funding for data collection, design and installation of treatment systems or plugging of wells	Deferred	Installation of 1 treatment system or plugging of 1 well by 2010.	Dependant on remediation practice	High
Watershed Action Plan for Meander Creek Watershed	Mahoning Valley Sanitary District- Lead MCMP -Support	In-house Funding	Acquire conditional endorsement of the watershed plan by Spring of 2008	In-progress	Acquire State and local endorsement of the plan by Spring of 2009	$20,000.00	High
Watershed Action Plan for Yellow Creek Watershed	Lead- Unknown at this time. MCMP- Support	Unknown	Acquire conditional endorsement of the watershed plan by 2009	Deferred	Acquire State and local endorsement of the plan 2010	$20,000.00	Moderate

*Tasks outlined in this table are going to be updated as funding and new projects are identified.

Table 37. Goal 4 - Reduction of bacterial levels

Goal 4- Reduction of bacterial levels: Identify and reduce the sources of bacteria input into the watershed.							
Tasks	Responsible Parties	Funding	Interim Indicators	Status	Final Indicator or Completed Task	Cost Estimate	Project Rating
Mailing of HSTS Informational packets to septic system owners within the watershed	Mahoning County District Board of Health	In-house match for 319	By December 31, 2006 completed 4800 informational packets mailed	In-Progress	Mailing of HSTS 9600 informational packets to septic system owns within the watershed by June 30, 2008	$7,600.00	High
Storm sewer outfall inventory	Mahoning County Engineers	Mahoning County Engineers	By the fall of 2007 GPS and map outfalls within the Phase II areas	In-Progress	Creation of 1 map that identifies the locations of outfalls by October 2007	$75,000.00	High
Illicit Discharge elimination	Mahoning County District Board of Health	Mahoning County District Board of Health	Notify at least 10 homeowners of needed upgrades or connection with sanitary lines	In-Progress	Installation of at least 30 septic system replacements, upgrades or connection to sanitary lines. 2007-2009	$5,00.00	High
Creation of GIS layer (shp file) of all septic systems within the Mill Creek Watershed	Mahoning County District Board of Health,YSU Center for Urban Studies	Mahoning County District Board of Health	Begin data collection of systems by July 1, 2007	On-Going	Collect data on all new systems installed yearly. Approximately 300 new systems per year.	$5,00.00- On-going	Moderate-High
Exclusion of cattle or horses from streams	MSWCD, NRCS	319 Grants, NRCS funded programs	Contact at least 5 landowners about alternative watering sources, stream cattle crossings, and streambank fencing	On-Going	Fence or install other BMPS to exclude cattle or horses from streams on at least 4 farms within the watershed by 2008.	Dependant on BMP type	Moderate-low
Elimination of CSO's	City of Youngstown Sanitary Engineer, Ohio EPA	City of Youngstown, Ohio EPA grant programs	Completion of survey of all CSO's	On-Going	85% of CSO loading eliminated by 2010.	$112,000,000.00	Moderate
Dry weather screening of illicit discharges	All Phase II stormwater permit holders	General Funds	Identification of 50% of discharges by fall of 2007	In-Progress	By April of 2008 have sceening completed	$25,000.00	High
Enforcement and monitoring of permitted illicit discharges	Mahoning County District Board of Health	General Funds	Monitor at least 205 permitted discharges annaully	In-Progress	Monitor all permitted discharge systems	$70,000.00	High

Table 38. Goal 5- Reduction of sedimentation and storm water

Goal 5- Reduction of sedimentation and storm water: Removal of sediment from runoff, stream bank stabilization, education, enforcement of erosion and sediment control and storm water practices.

Tasks	Responsible Parties	Funding	Interim Indicators	Status	Final Indicator or Completed Task	Cost Estimate	Project Rating
Complete stream channel restoration projects using natural stream channel design or other approved bioengineering techniques on streams within the watershed	MSWCD	Possible funding through 319, Clean Ohio, WRRSP, other state and federal grants or through private donations	Apply for grant funding by the end of 2008.	On-going and as needed. Project and funding dependant.	Completion of 1 project by the end of 2010	$140.00 per linear foot.	Moderate
Retro-fitting existing storm water detention and incorporation of subsurface storm water detention	Townships, Cities	Private Land/Business Owners, Townships, Cities	Identify 1 Location by 2009 as a Demonstration Area	Deferred- Identified as Future Items to Incorporate into Planning Efforts	Possible Completion of 1 Project by the end of 2011	$30.00 per square foot	Moderate-Low
Retrofit retention in storm water systems.	Townships, Cities	Private Land/Business Owners, Townships, Cities	Identify 1 Location by 2009 as a Demonstration Area	Deferred- Identified as Future Items to Incorporate into Planning Efforts	Possible Completion of 1 Project by the end of 2011	$30.00 per square foot	Moderate-Low
Provide infiltration for storm water	Townships, Cities	Private Land/Business Owners, Townships, Cities	Identify 1 Location by 2009 as a Demonstration Area	Deferred- Identified as Future Items to Incorporate into Planning Efforts	Possible Completion of 1 Project by the end of 2011	$30.00 per square foot	Moderate-Low
Removal of impervious surface and replace with permeable pavers, and bio-retention areas.	Townships, Cities	Private Land/Business Owners, Townships, Cities	Identify 1 Location by 2009 as a Demonstration Area	Deferred- Identified as Future Items to Incorporate into Planning Efforts	Possible Completion of 1 Project by the end of 2011	Grass pavers $4.00/sf Bio Retention areas $40.00/sf	Moderate-Low
Establish Mahoning County Erosion and Sediment Rules	Mahoning County Engineers- lead, MSWCD- support	In-House Funds	Draft completed by December of 2006	In-Progress	Adoption of E&S rules by spring of 2007	$2,500.00	High
Construction of a Rain Garden as a demonstration area at the MetroParks Farm	MCMP	MCMP General Funds	Design completed by July of 2007	In-Progress	Project completed by spring of 2008	$2,500.00	High
Creation of a Green Roof as a demonstration area at the MetroParks Farm	MCMP	MCMP General Funds	Design completed by July of 2007	In-Progress	Project completed by spring of 2008	$2,500.00	High
Storm Water Management and Drainage Review (SWPPP)	Engineers	Gas Tax/License Plate Fees	Number of plans reviewed by mid year	On-going	100% of plans reviewed for active projects	$60,000	High

Table 38 Continued. Goal 5- Reduction of sedimentation and storm water

Goal 5- Reduction of sedimentation and storm water: Removal of sediment from runoff, stream bank stabilization, education, enforcement of erosion and sediment control and storm water practices.

Tasks	Responsible Parties	Funding	Interim Indicators	Status	Final Indicator or Completed Task	Cost Estimate	Project Rating
Storm Water Pollution Prevention Plan Review (ESC Plans)	SWCD	County General Fund	Number of plans reviewed by mid year	On-going	100% of plans reviewed for active projects	$25,000/yr	High
Construction Site ESC Inspection/ Inspect Active Sites	SWCD	County General Fund	Number of sites inspected by mid-year	On-going	100% of active sites inspected annually	$25,000/yr	High
County ESC Rules	Engineers/ Commissioners	Gas Tax/License Plate Fees	Rules Drafted	Completed	Adoption of Rules	$2,500	High
Local Zoning ESC Regulations	Townships	TAXES (property?)	Rules Drafted	In-Progress	Adoption of Rules	$2,500/twp.	High
Storm Water Management and Drainage Review (SWPPP)	Engineers	Gas Tax/License Plate Fees	Number of plans reviewed by mid year	On-going	100% of plans reviewed for active projects	$60,000	High

Table 39. Goal 6 - Data Collection

Goal 6- Data Collection: Continue watershed data collection through inventories and proper volunteer monitors training.

Proposed Tasks	Responsible Parties	Funding	Interim Indicators	Status	Final Indicator or Completed Task	Cost Estimate	Project Rating
Train volunteers to properly gather water quality, stream habitat and macroinvertebrate data.	MCMP- Hosting Ohio EPA- Training	MCPM, grants or private donations	Host at least 1 Levels I and II Ohio EPA Credible Data Collection Training at the Mill Creek MetroParks Facilities	On-going and as needed	Certification of volunteer monitors for data collection through the Ohio EPA Credible Data Training	$150.00	Moderate-Low
Comprehensive data collected on the Cranberry Run wetlands.	MCMP-sponsor research YSU- Write methodologies	Grants, private donations, MCMP	Creation of 1 wetland monitoring methodology for existing wetlands for use in MCMP facilities	In-Progress	Completion of at least 1 year of wetland monitoring on the Cranberry Run Wetlands area.	$5,000.00	Moderate-High
Inventory and sample streams	Ohio EPA, Volunteer Monitors	Ohio EPA, volunteer time, grants	Using QHEI, HHEI or other approved biologic sampling methods, sample at least 5 streams per year.	Deferred, and on-going	Completion of data collection	$35.00 per hour	High
Change Camp Stambaugh use designation through Ohio EPA	Ohio EPA	Ohio EPA	Complete at least 2 surveys on Indian Run.	Deferred	Redesignation of Indian Run at Camp Stambaugh	Unknown	Moderate-Low
Complete TMDL for Mill Creek	Ohio EPA	Ohio EPA	Necessary data collection and field surveys completed	Deferred	TMDL completed for Mill Creek by 2013	Unknown	High
Develop Entrenchment ratios for Mill Creek watershed	MSWCD- Lead YSU- Support	General Funds, grants or other donations	Assess at least 50% of streams by the end of 2008	Deferred	Completion of stream assessments by 2009	$10,000.00	Moderate-Low
Stream Monitoring	MSWCD- Lead YSU- Support	General Funds	Identification of at least 2 groups or citizens for stream monitoring by Spring 2008	Deferred, and on-going	Completed a training course on how to use sampling equipment that is provided by MSWCD and set up sampling locations by Fall of 2008	$1,000.00	Moderate
Wildlife and habitat survey/inventory of the Mill Creek MetroParks Wildlife Sanchuary	MCMP- Sponsor research Cleveland Museum of Natural History- Complete research and reports	MCMP General funds	Complete cost proposal and contract agreement by spring of 2007	In-Progress	Completion of data collection, surveys, and report by fall of 2008	$15,000.00	High

Table 40. Goal 7 - Model Ordinances

Goal 7- Model Ordinances: Creation of ordinances for the reduction of environmental impacts.							
Proposed Tasks	Responsible Parties	Funding	Interim Indicators	Status	Final Indicator or Completed Task	Cost Estimate	Project Rating
Create a model riparian setback ordinance	Eastgate- Lead, MSWCD- support	Eastgate funding, 319 Grant	Complete 1 ordinance by 2006	In- Progress	Acceptance of the ordinance by at least 3 municipalities or townships by 2008	$17,500.00	High
Create a trash containment ordinance	Mahoning County Engineers- Lead, MSWCD- Support	319 Grant	Complete 1 ordinance by 2007	In- Progress	Acceptance of the ordinance by at least 3 municipalities or townships by 2008	$2,500.00	High
Create a increased permeability in parking areas ordinance	MSWCD	319 Grant	Complete 1 ordinance by 2008	In- Progress	Acceptance of the ordinance by at least 1 municipalities or townships by 2008	$2,500.00	High
Model Zoning for Erosion and Sediment Control	Mahoning County Engineers	General Fund	Complete 1 ordinance by April 2007	In- Progress	Acceptance of the ordinance by at least 3 municipalities or townships by 2008	$1,500.00	High

10.3 Education/Information/Marketing Strategy

The AWARE watershed group does not have a marketing strategy at this time because it is an Ad Hoc committee. Although there is no formal marketing strategy in place at this time, the AWARE group shows a strong presence within the watershed communities at events such as fairs, conferences and miscellaneous meetings.

AWARE has an educational table-top display, brochures, watershed maps, and other informational/educational handouts for the public. Education of watershed issues and generating public involvement has been and continues to be a priority to AWARE. Educational programs are available to schools through partnering agencies such as the Conservation District's Watershed and Wetland EnviroScape models, and other programs. In addition, the Mill Creek MetroParks hosts and presents a number of different educational programs that are based on watershed related issues for professional groups and the general public. Educational programs and materials are available at events or upon request.

10.4 Funding Strategy

Given the unique composition of the AWARE group, there is not a formal outlined funding strategy at this time. Projects are completed on an as needed basis through the partnering agencies that commit the needed professional personnel and resources in order to complete various watershed related projects. Grants are typically the main funding source for AWARE. The partners within AWARE that do possess non-profit status are the grant recipients and ensure completion of the projects in partnership with other agencies within the AWARE group.

10.5 Evaluation

Evaluation of the plan will enable the tracking of progress through documenting the activities that have been completed, reporting successes and lessons leaned through the implementation process. Meetings with the AWARE group will be held on a "needs basis" to review progress and success of the plan.

11.0 Plan Update/Revision

Revisions to the plan will be made on an "as needed" basis after substantial studies have been completed and needed data is collected for the watershed. Timeframes and goals will be reevaluated, revised, reviewed by the AWARE partners and forwarded to the Ohio EPA and ODNR.

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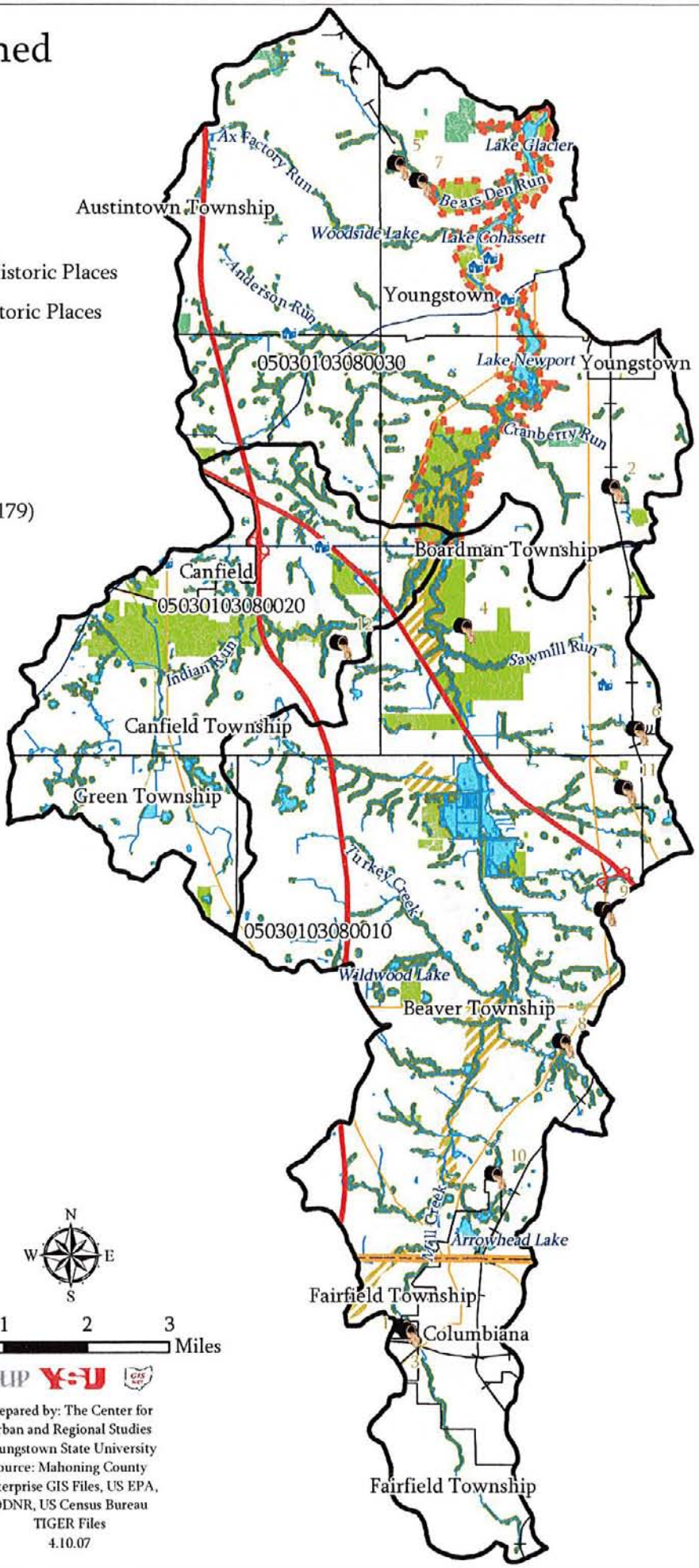
U.S. Environmental Protection Agency, Region 5 Watersheds and Wetlands Branch. September 2004. *Final Mahoning River Total Maximum Daily Load (TMDL) for Fecal Coliform Bacteria.*

Appendix A.

Basic Watershed Maps

Mill Creek Watershed



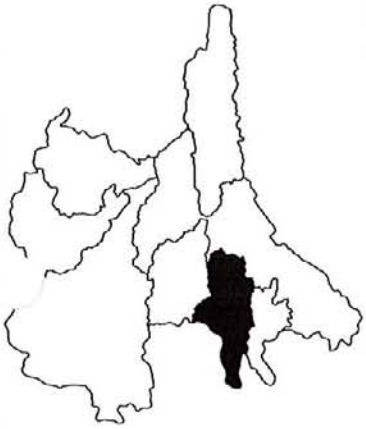
Legend

- Sub-Watershed Boundary
- Structure on the National Register of Historic Places
- District on the National Register of Historic Places
- Park or Other Conservation Area
- Cemetery
- Facility Holding NPDES Permit
- Riparian Forested Area
- Greatest GW Pollution Potential (160-179)
- County Boundary
- Political Boundary
- Limited Access Highway
- Highway Ramp
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream
- 10-Foot Contour Line

NPDES Permitted Discharges

Map ID	NPDES ID	Facility Name
1	OH0011452	BUCKEYE TRANSFER INC
2	OH0012025	SUNOCO PARTNERS MARKETING & TERMINALS LP
3	OH0021776	COLUMBIANA WWTP
4	OH0037249	BOARDMAN WWTP
5	OH0037273	NEW MIDDLETOWN SPRINGFIELD TWP WWTP
6	OH0064238	YOUNGSTOWN HARD CHROME PLATING & GRINDING INC
7	OH0088129	MARATHON ASHLAND PETROLEUM LLC *
8	OH0101486	SNO TOP LLC
9	OH0101567	PILOT TRAVEL CENTERS LLC #011
10	OH0101575	ST MARYS ALZHEIMERS CTR
11	OH0128295	RUSTIC MEADOWS MOBILE HOME COMM
12	OH0134422	CAMP STAMBAUGH

Mahoning River Watershed

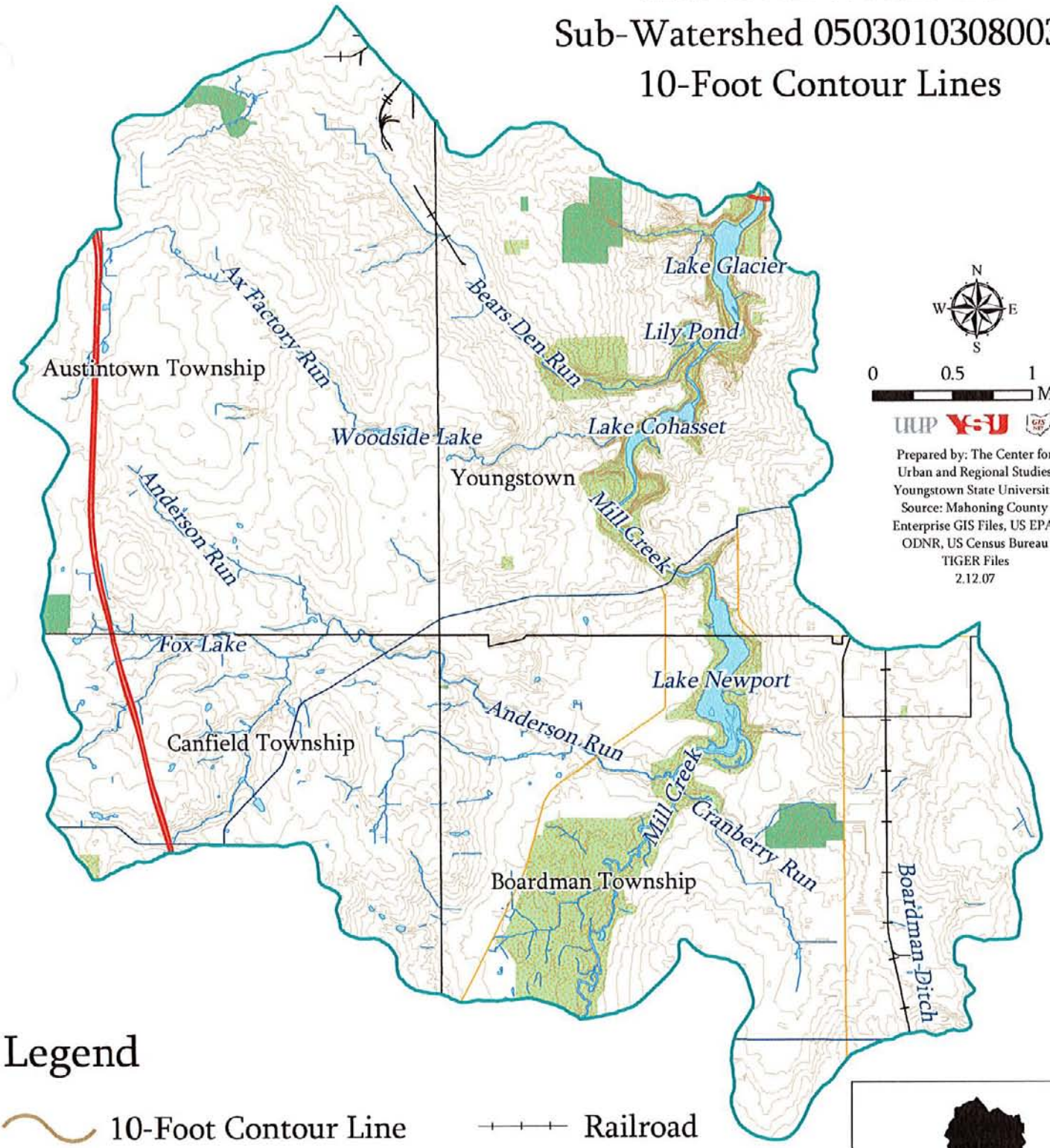


N W E S

0 0.5 1 2 3 Miles

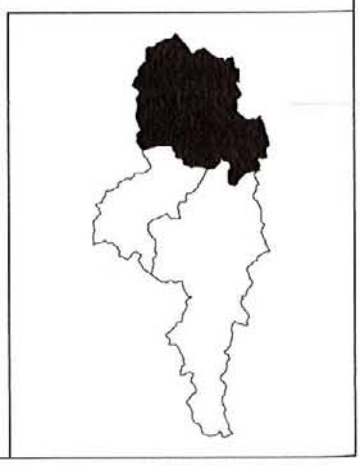
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
4.10.07

Mill Creek Watershed
Sub-Watershed 05030103080030
10-Foot Contour Lines

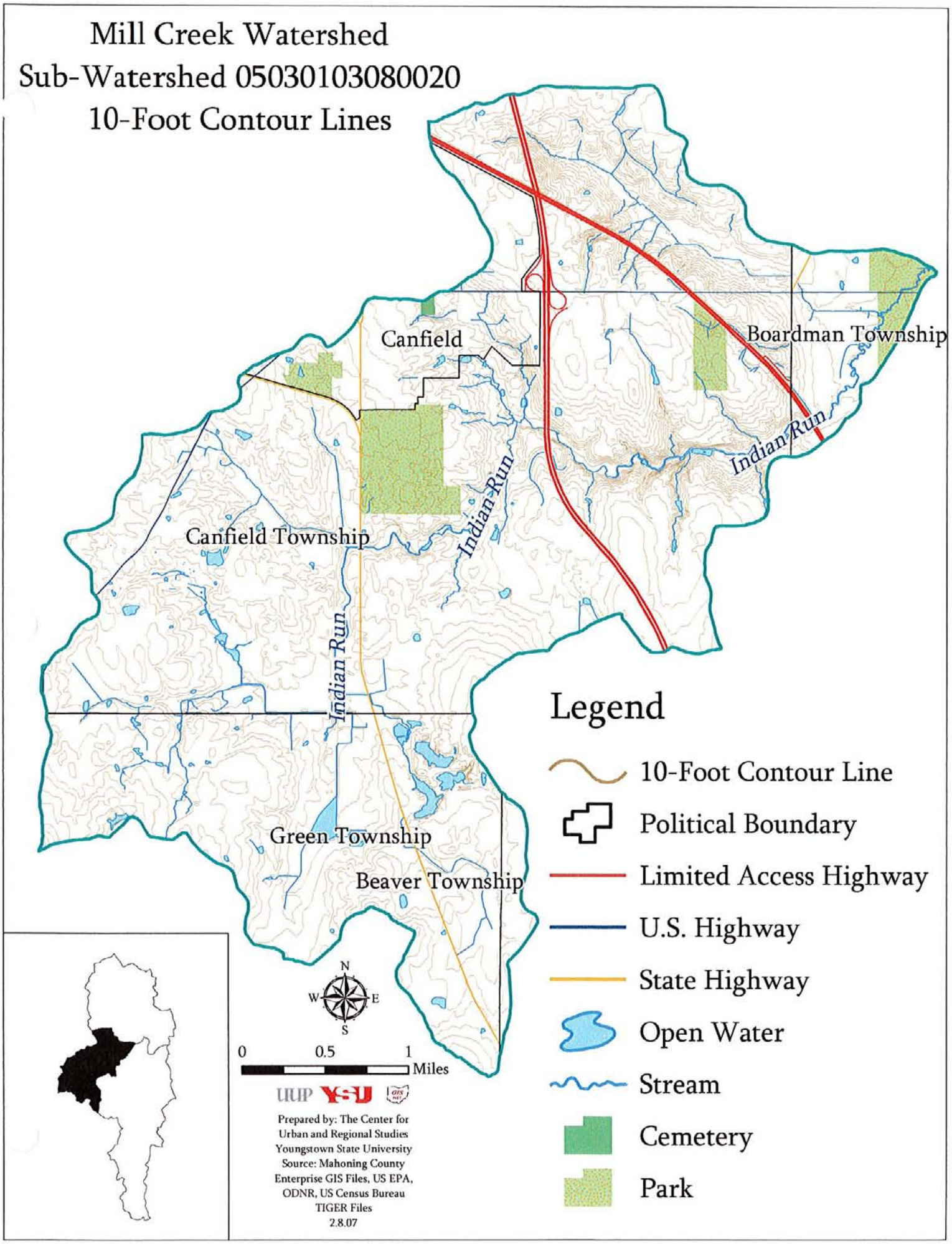


Legend

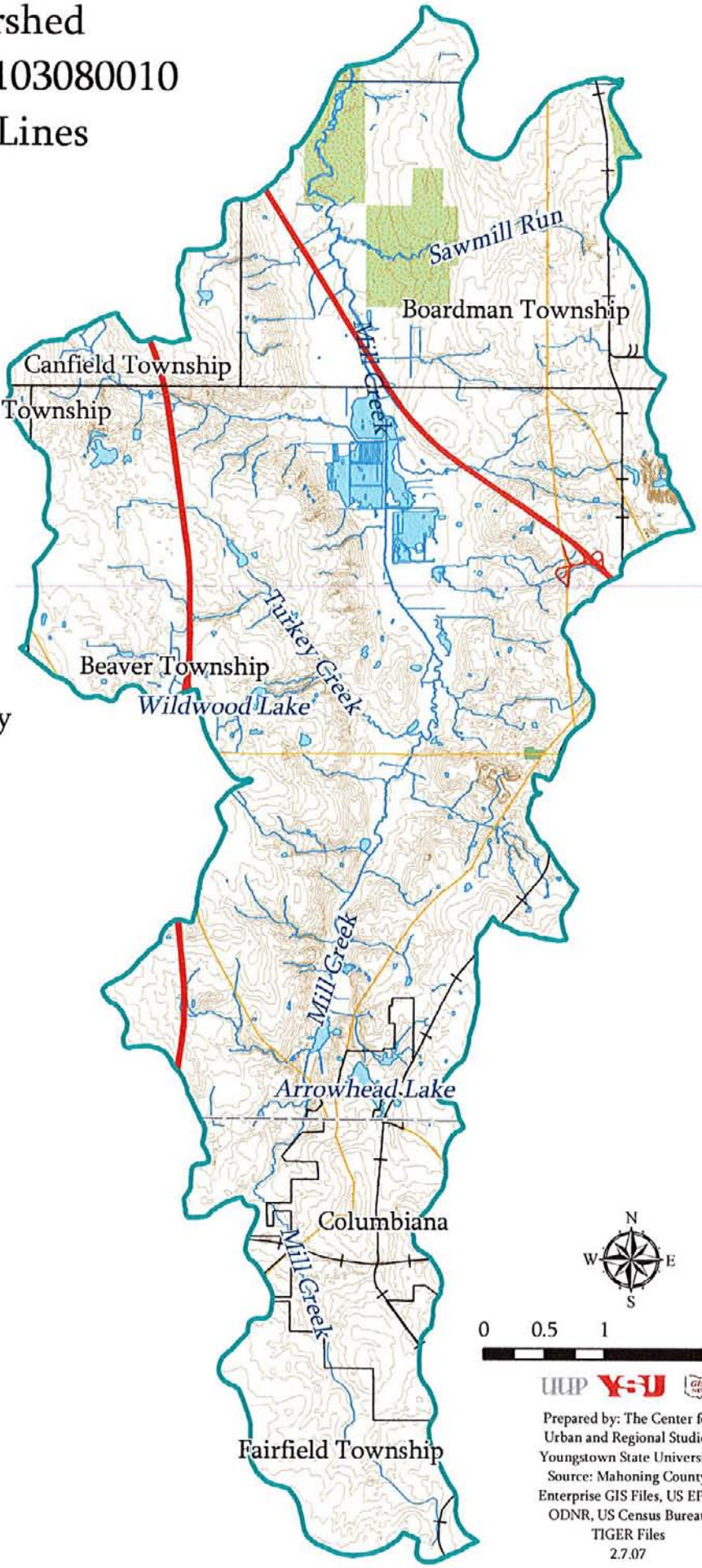
- 10-Foot Contour Line
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream
- Cemetery
- Park



Mill Creek Watershed
Sub-Watershed 05030103080020
10-Foot Contour Lines



Mill Creek Watershed
Sub-Watershed 05030103080010
10-Foot Contour Lines

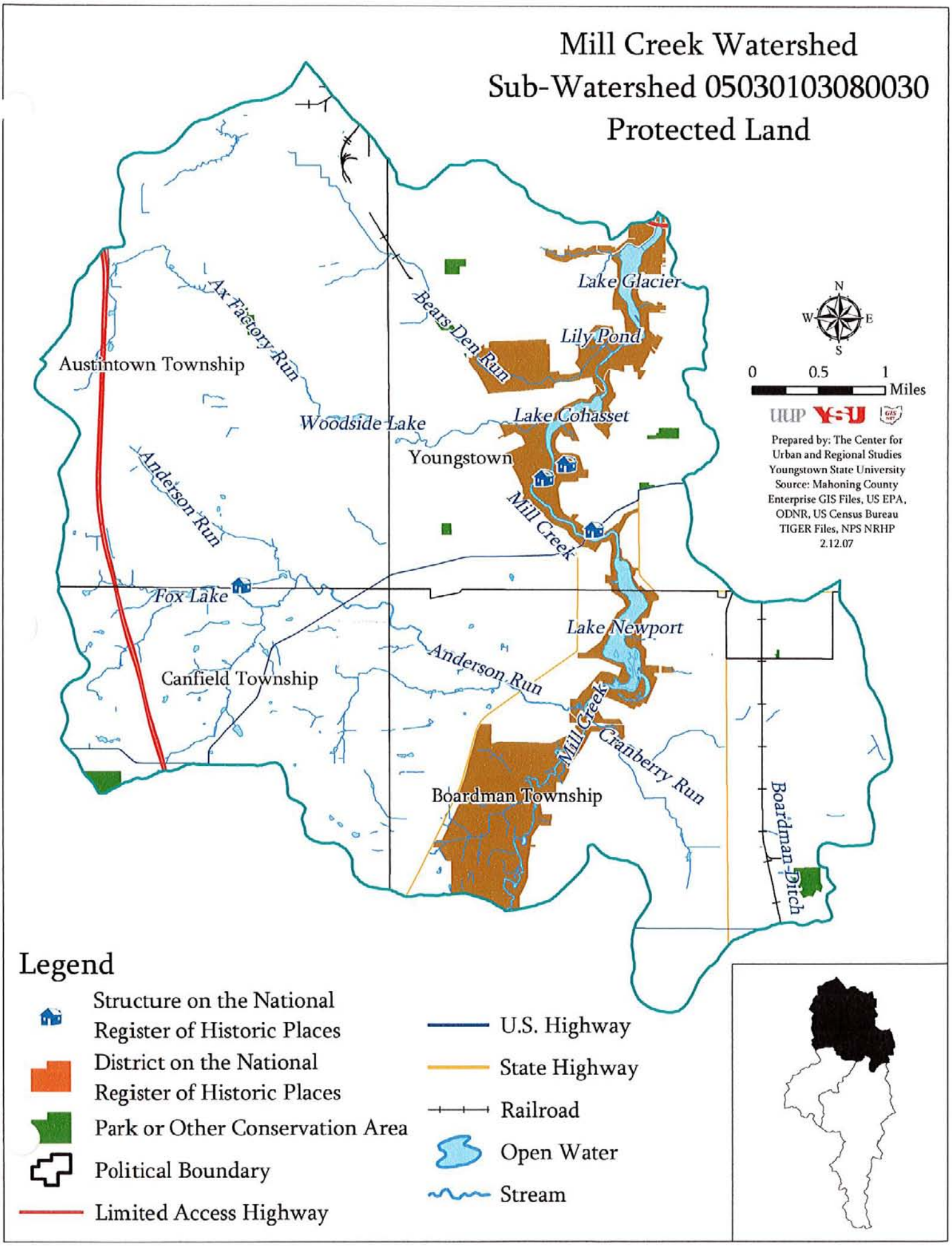


Legend

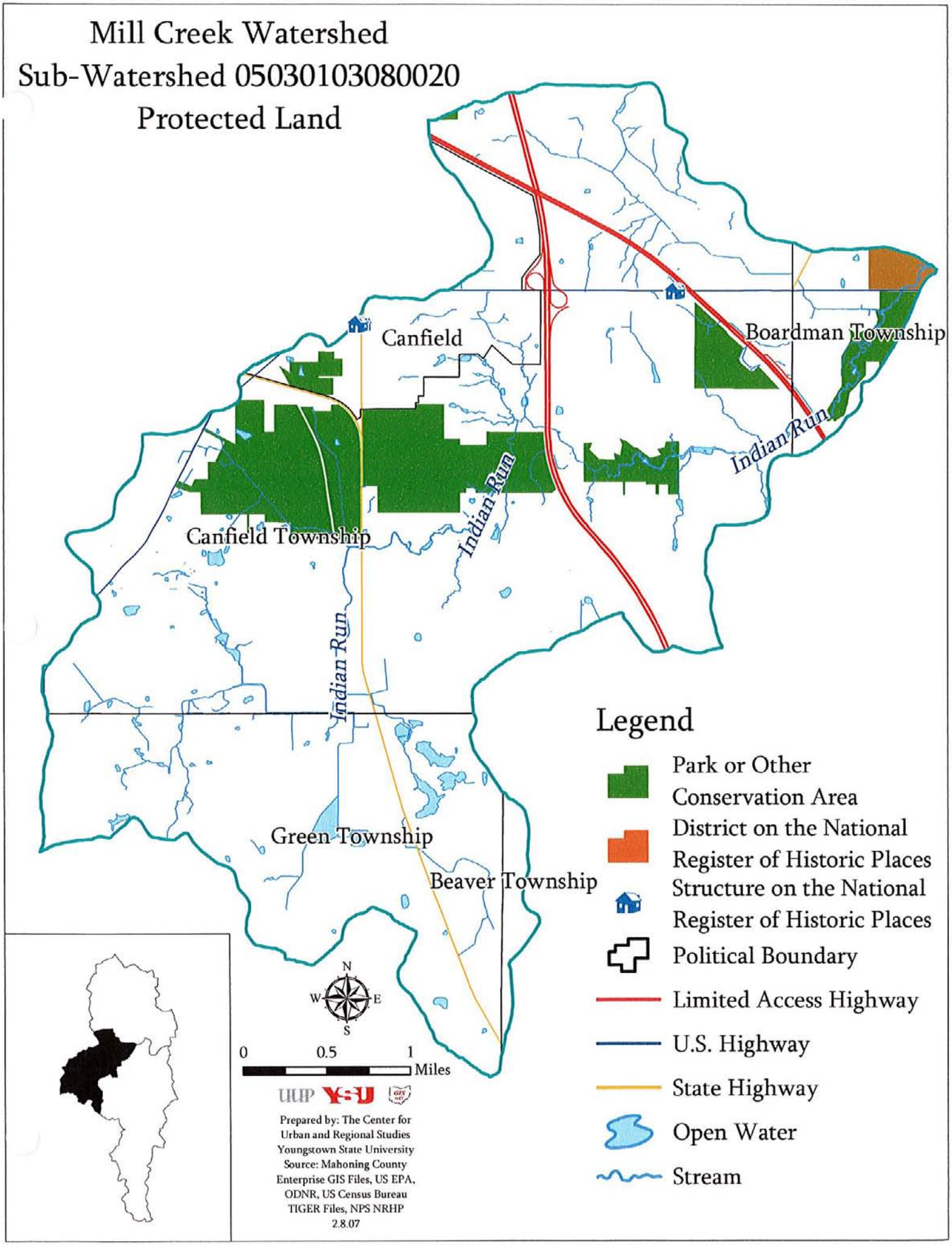
- 10-Foot Contour Line
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream
- Cemetery
- Park

Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

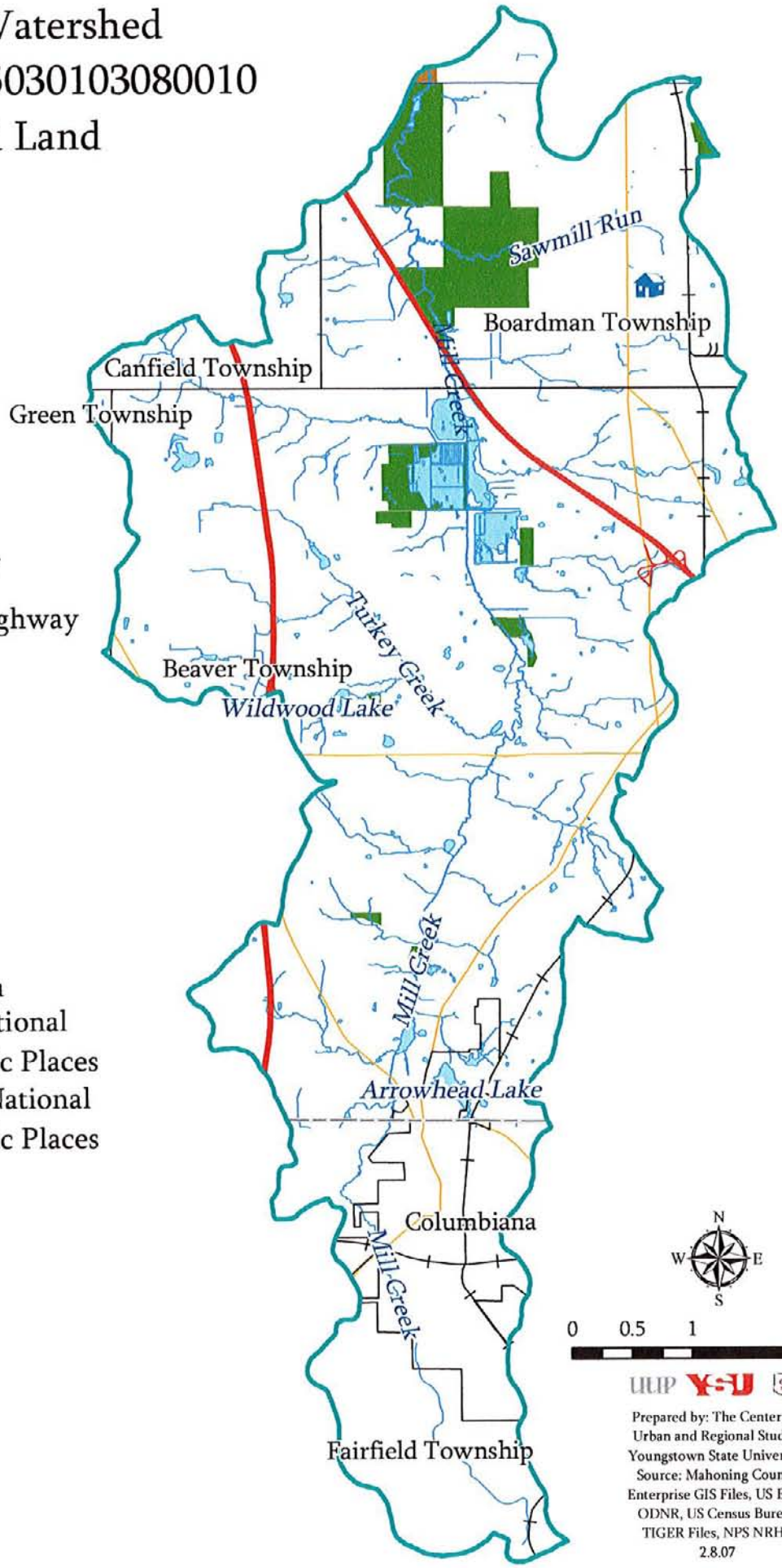
Mill Creek Watershed
Sub-Watershed 05030103080030
Protected Land



Mill Creek Watershed
Sub-Watershed 05030103080020
Protected Land

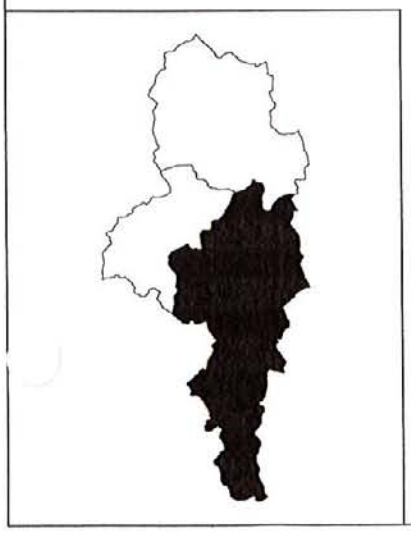


Mill Creek Watershed
Sub-Watershed 05030103080010
Protected Land



Legend

- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream
- Park or Other Conservation Area
- District on the National Register of Historic Places
- Structure on the National Register of Historic Places

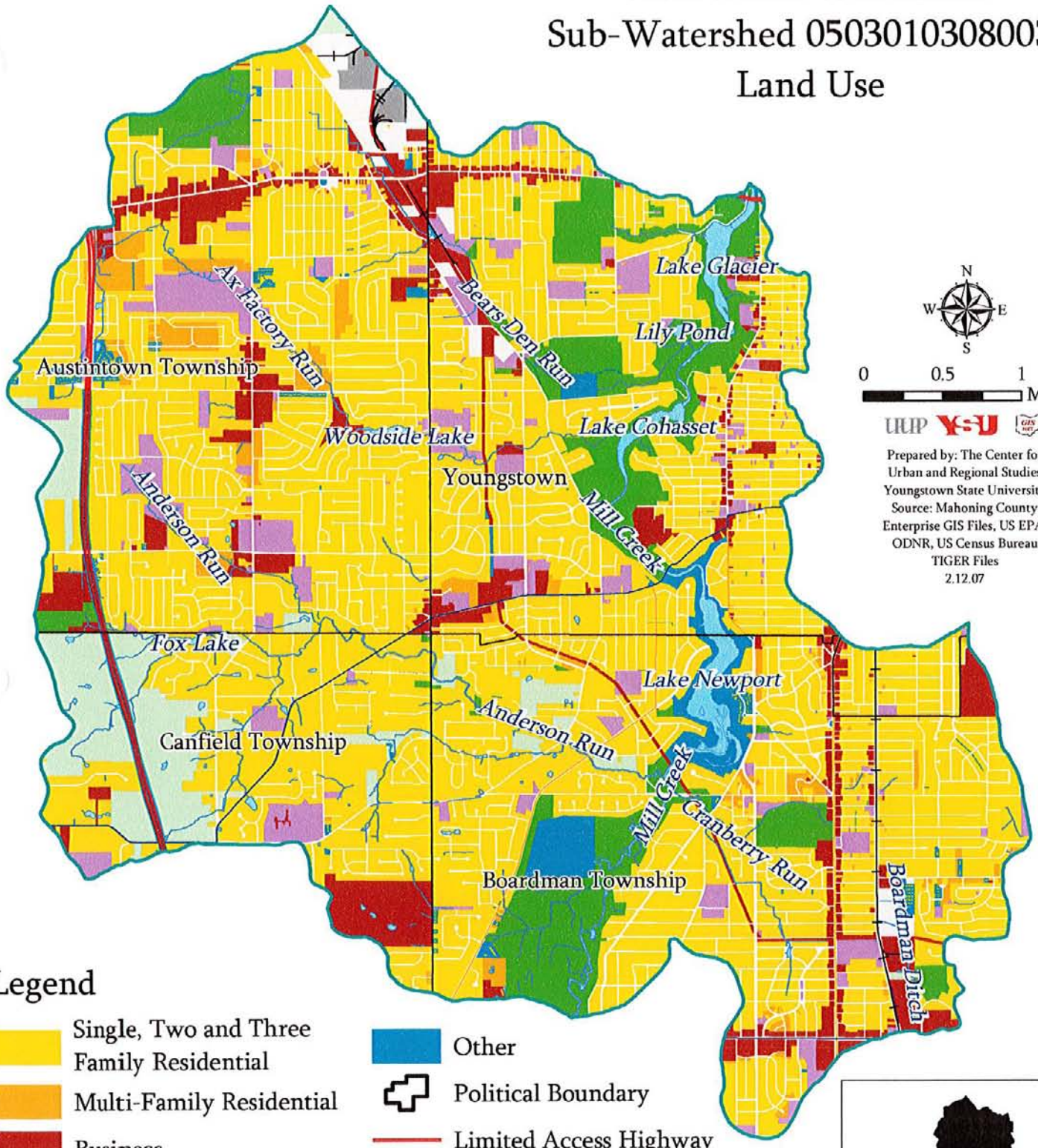


Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files, NPS NRHP
2.8.07

Appendix B.

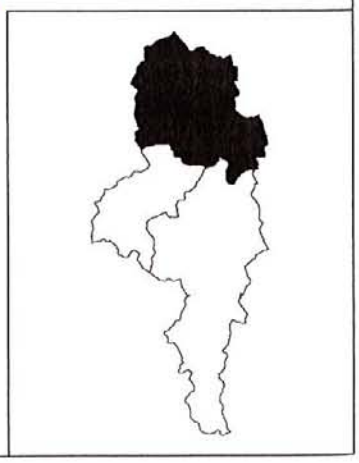
Land Use and Land Cover

Mill Creek Watershed
Sub-Watershed 05030103080030
Land Use

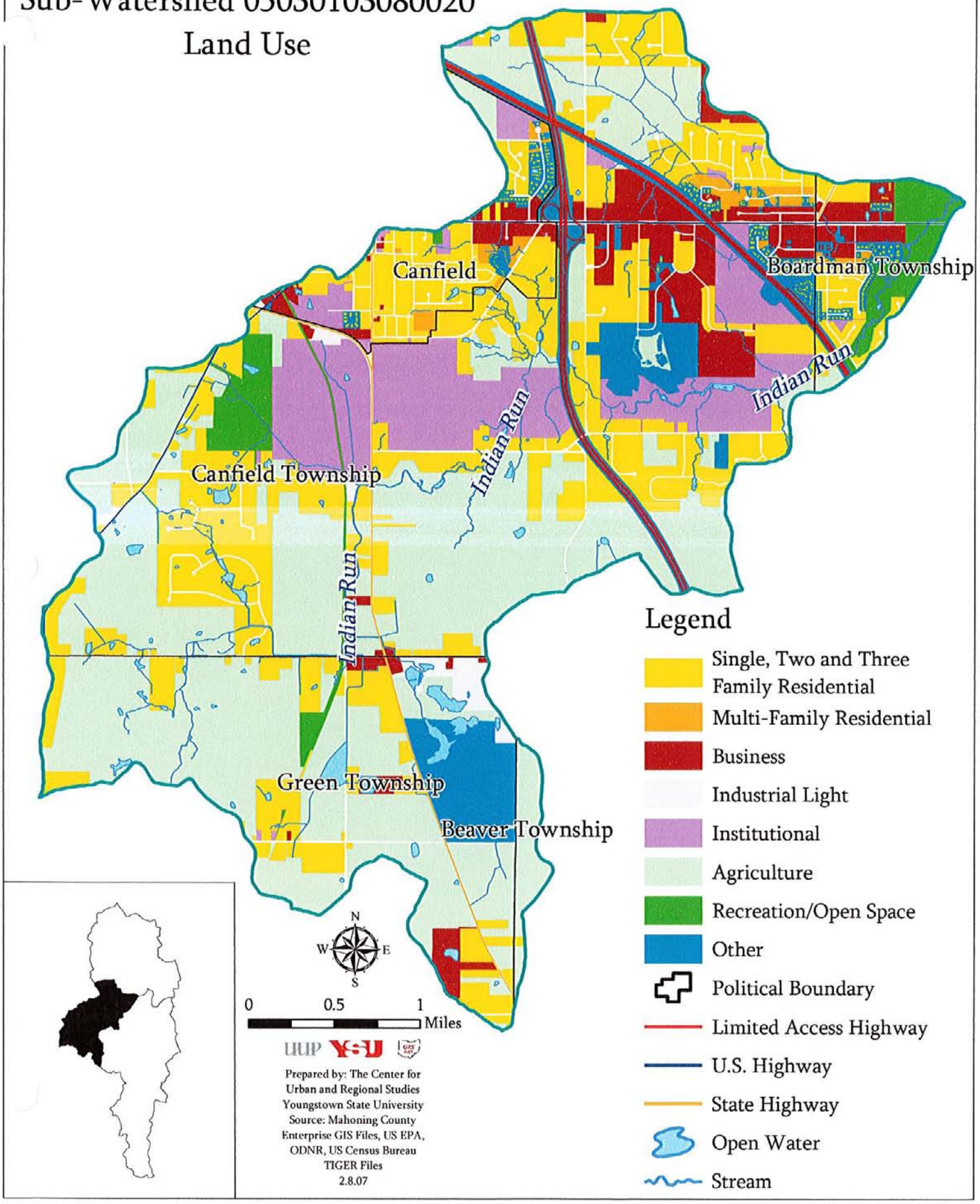


Legend

- Single, Two and Three Family Residential
- Multi-Family Residential
- Business
- Industrial Light
- Industrial Heavy
- Institutional
- Agriculture
- Recreation/Open Space
- Other
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



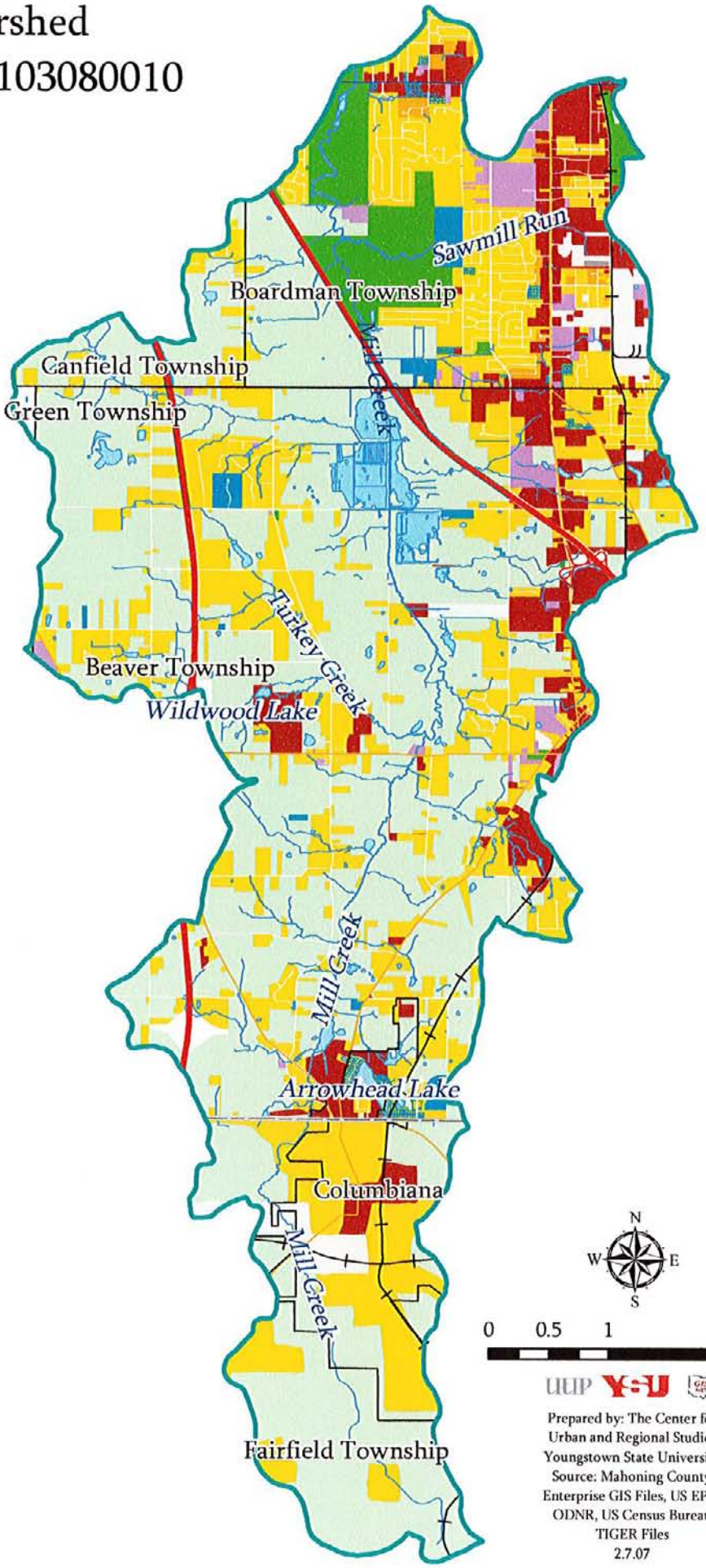
Mill Creek Watershed
Sub-Watershed 05030103080020
Land Use

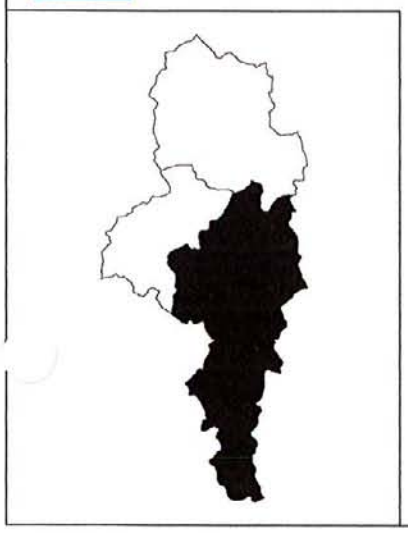


Mill Creek Watershed
Sub-Watershed 05030103080010
Land Use

Legend

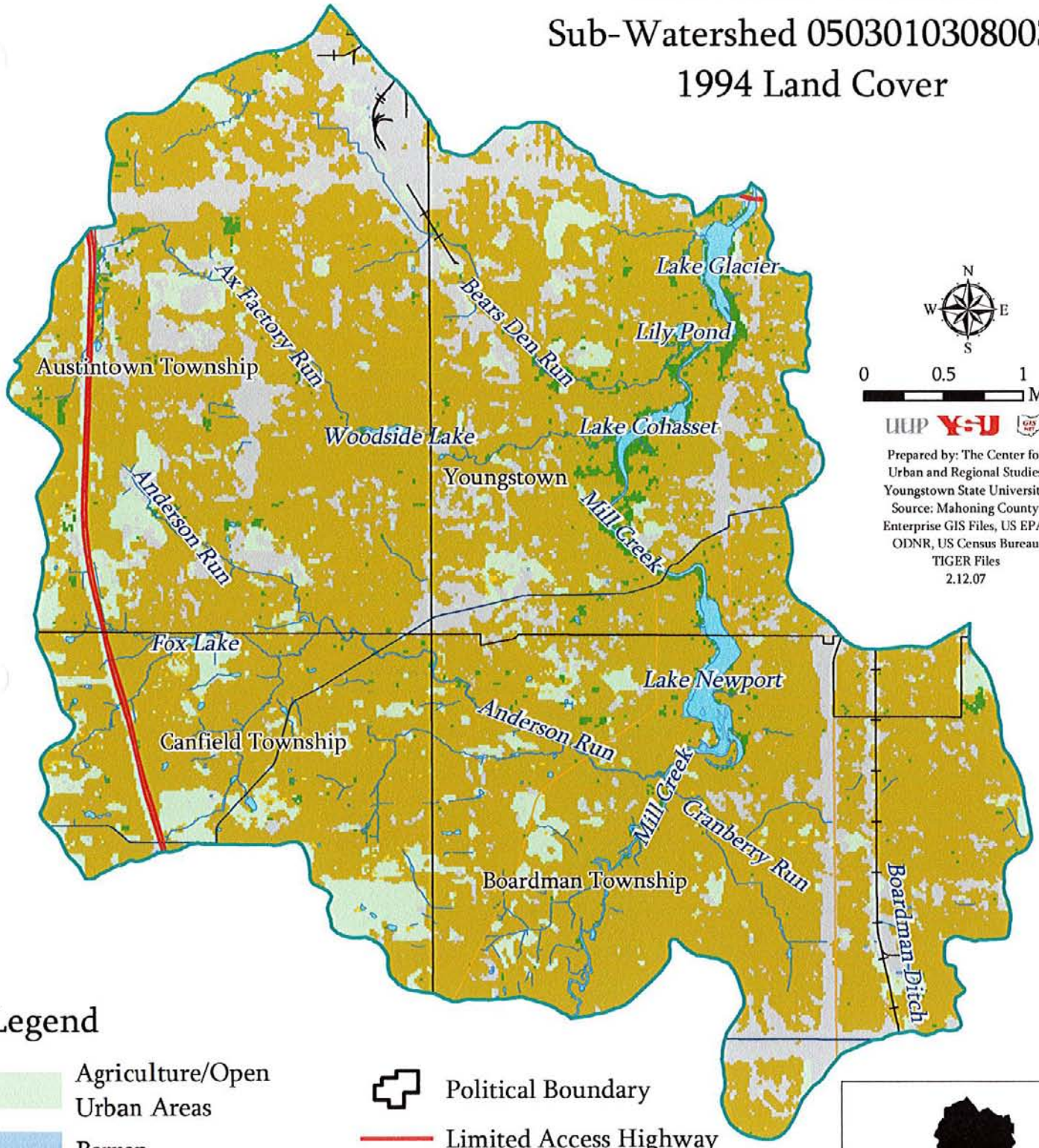
- County Boundary
- Political Boundary
- Limited Access Hwy.
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream
- Single, Two and Three Family Residential
- Multi-Family Residential
- Business
- Industrial Light
- Industrial Heavy
- Institutional
- Agriculture
- Recreation/Open Space
- Other





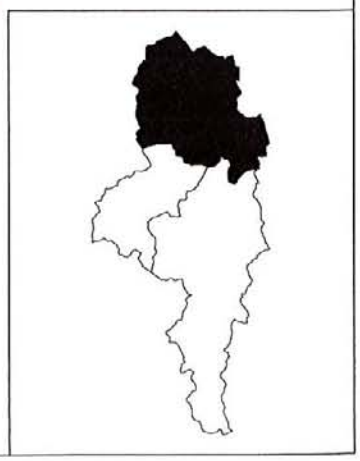
Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

Mill Creek Watershed
Sub-Watershed 05030103080030
1994 Land Cover

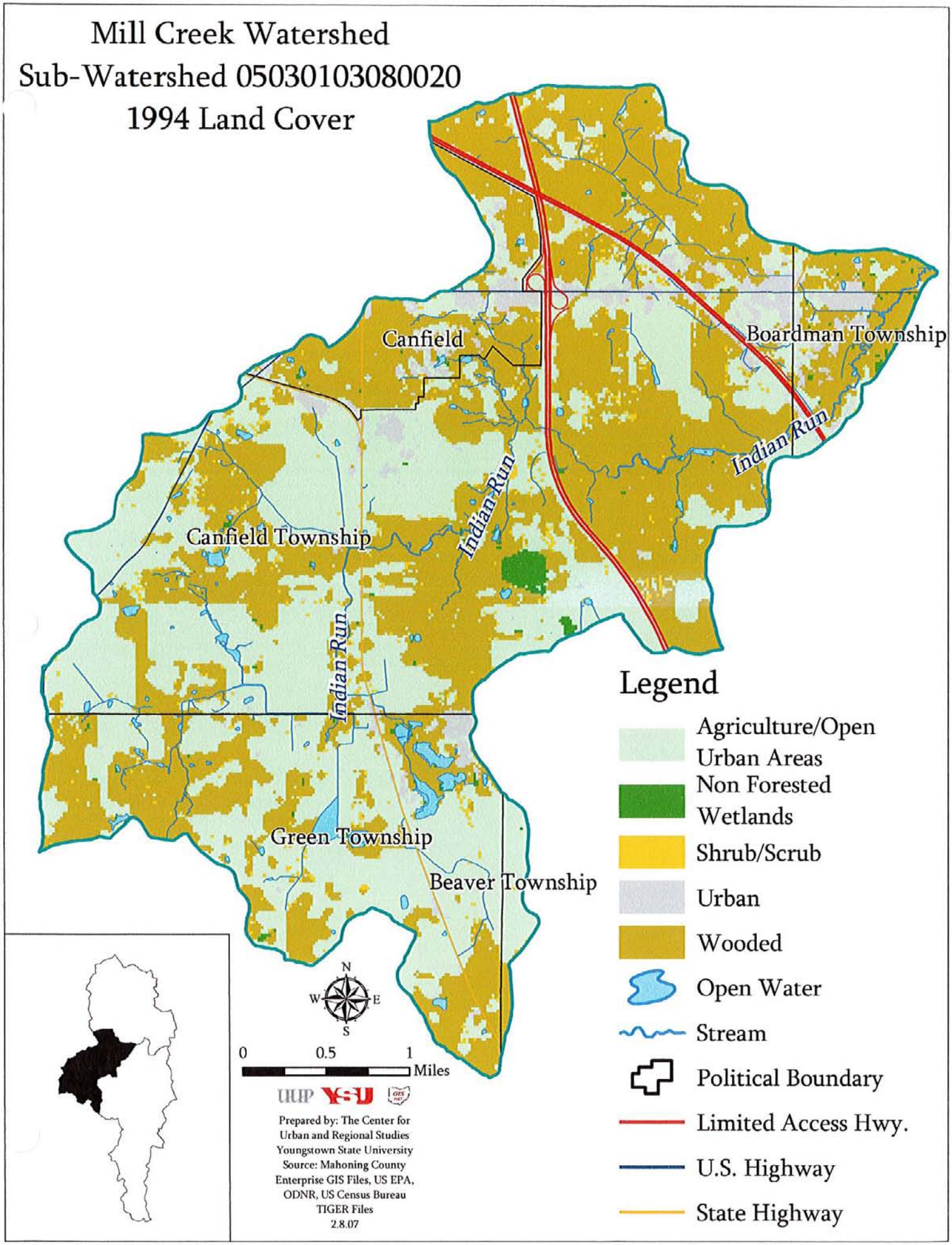


Legend

- Agriculture/Open Urban Areas
- Barren
- Non Forested Wetlands
- Shrub/Scrub
- Urban
- Wooded
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



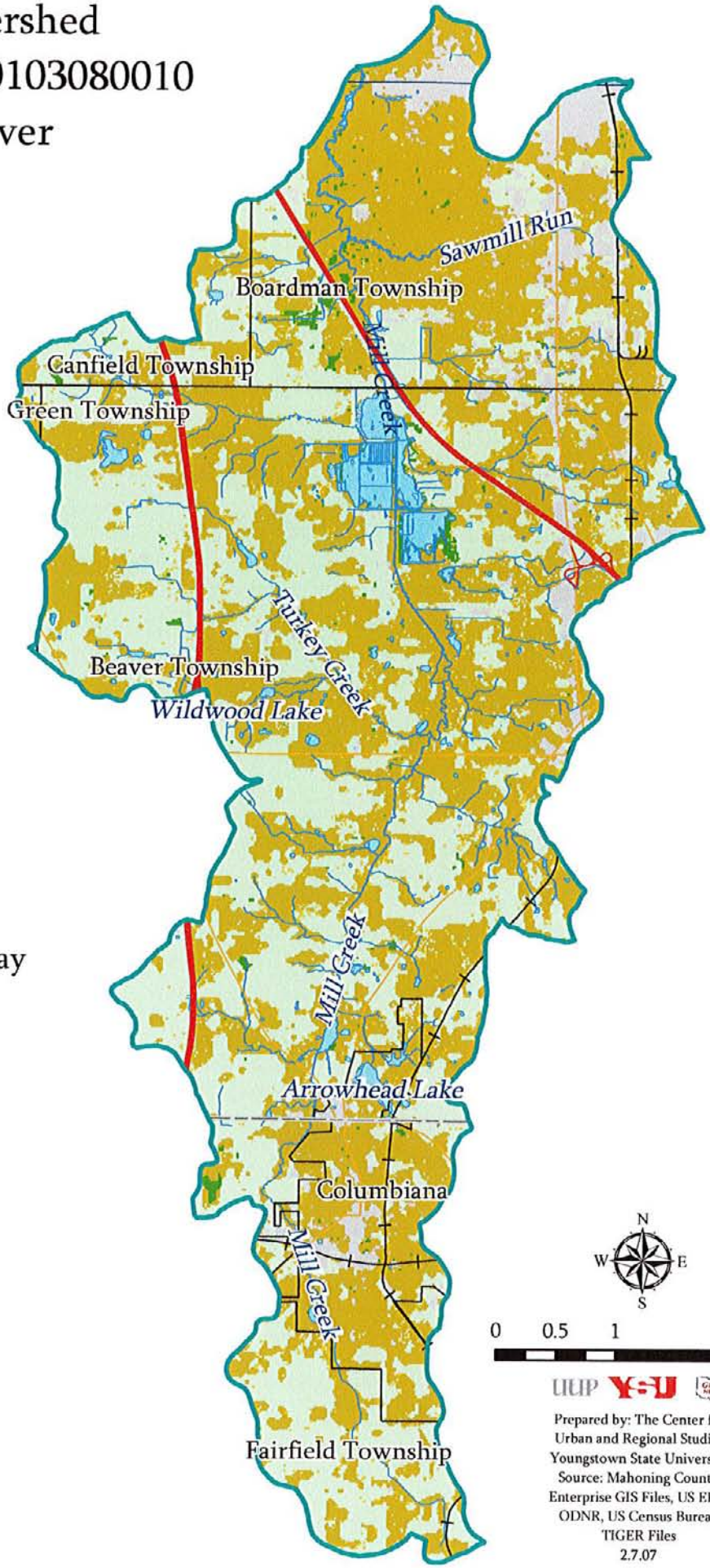
Mill Creek Watershed
Sub-Watershed 05030103080020
1994 Land Cover



Mill Creek Watershed
Sub-Watershed 05030103080010
1994 Land Cover

Legend

- Agriculture/Open
- Urban Areas
- Barren
- Non Forested Wetlands
- Shrub/Scrub
- Urban
- Wooded
- Open Water
- Stream
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad



Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

LAND USE - SUB-WATERSHED 05030103080030

Land Use Class	*Parcel Acreage*	*Percentage of Sub-total*	*Percentage of Total*
Agriculture			
CASH GRAIN/GEN FARM	346.7	43.7%	2.3%
NURSERY	11.4	1.4%	0.1%
OTHER AGRICULTURAL	147.2	18.6%	1.0%
VACANT LAND	288.3	36.3%	1.9%
Sub-total	**793.6**		**5.2%**
Business			
AUTO SALES AND SERVICE	38.5	3.1%	0.3%
AUTO SERVICE STATION	2.9	0.2%	0.0%
BANK	8.0	0.6%	0.1%
BOWLING ALLEY	2.1	0.2%	0.0%
CAR WASH	2.7	0.2%	0.0%
COMMERCIAL GARAGE	27.3	2.2%	0.2%
COMMERCIAL STRUCTURE	163.7	13.2%	1.1%
COMMERCIAL WAREHOUSE	33.8	2.7%	0.2%
COMMUNITY SHOPPING CENTER	49.3	4.0%	0.3%
DISCOUNT STORE	24.2	2.0%	0.2%
DRIVE-IN RESTAURANT	28.1	2.3%	0.2%
DRY CLEANING PLANT OR LAUNDRY	0.3	0.0%	0.0%
DWELLING USED AS OFFICE	9.1	0.7%	0.1%
DWELLING USED AS RETAIL	7.2	0.6%	0.0%
FUNERAL HOME	11.2	0.9%	0.1%
GOLF COURSE	157.0	12.7%	1.0%
LODGE HALL OR AMUSEMENT PARK	25.3	2.0%	0.2%
MEDICAL OFFICE	9.6	0.8%	0.1%
MOTEL/TOURIST CABINS	8.4	0.7%	0.1%
NEIGHBORHOOD SHOPPING CENTER	71.4	5.8%	0.5%
NURSING HOME OR HOSPITAL	24.8	2.0%	0.2%
OFFICE / APARTMENTS OVER	0.1	0.0%	0.0%
OFFICE BLDG ONE & TWO STORY	100.2	8.1%	0.7%
OTHER COMMERCIAL HOUSING	2.8	0.2%	0.0%
OTHER FOOD SERVICE STRUCTURE	1.2	0.1%	0.0%
PARKING LOT OR STRUCTURE	5.3	0.4%	0.0%
REGIONAL SHOPPING CENTER	4.2	0.3%	0.0%
RESTAURANT OR BAR	21.0	1.7%	0.1%
RETAIL / APARTMENTS OVER	2.0	0.2%	0.0%
RETAIL / OFFICE OVER	1.5	0.1%	0.0%
RETAIL / STORAGE OVER	0.4	0.0%	0.0%
RETAIL STRUCTURE	57.2	4.6%	0.4%
SAVINGS & LOANS	3.2	0.3%	0.0%
SMALL RETAIL STRUCTURE	47.0	3.8%	0.3%
SUPERMARKET	6.5	0.5%	0.0%
THEATER	0.2	0.0%	0.0%
VACANT COMMERCIAL LAND	179.7	14.5%	1.2%
Business (undefined)	98.5	8.0%	0.6%
Sub-total	**1,235.7**		**8.1%**

Industrial Heavy				
HEAVY MANUFACTURING		54.7	100.0%	0.4%
	Sub-total	**54.7**		**0.4%**
Industrial Light				
FOOD/DRINK PROCESSING		3.3	1.7%	0.0%
INDUSTRIAL STRUCTURE		35.0	17.6%	0.2%
INDUSTRIAL TRUCK TERMINAL		3.4	1.7%	0.0%
INDUSTRIAL WAREHOUSE		13.6	6.8%	0.1%
LIGHT MANUFACTURING		47.2	23.7%	0.3%
MEDIUM MANUFACTURING		26.9	13.5%	0.2%
SMALL SHOP		24.2	12.1%	0.2%
VACANT INDUSTRIAL LAND		30.1	15.1%	0.2%
Industrial Light (undefined)		15.7	7.9%	0.1%
	Sub-total	**199.4**		**1.3%**
Institutional				
CHARITABLE EXEMPTION		135.8	14.7%	0.9%
CHURCHES, PUBLIC WORSHIP		363.1	39.2%	2.4%
OWNED BY BOARD OF EDUCATION		248.6	26.9%	1.6%
OWNED BY COUNTY		51.0	5.5%	0.3%
OWNED BY MUNICIPALITY		29.5	3.2%	0.2%
OWNED BY STATE		21.8	2.4%	0.1%
OWNED BY TOWNSHIP		74.8	8.1%	0.5%
OWNED BY USA		0.7	0.1%	0.0%
	Sub-total	**925.2**		**6.1%**
Multi-Family Residential				
APARTMENTS 20 TO 39 FAMILY		15.7	4.0%	0.1%
APARTMENTS 4 TO 19 FAMILY		92.8	23.8%	0.6%
APARTMENTS 40+ FAMILY		278.8	71.4%	1.8%
OWNED BY METRO HOUSING AUTH		3.2	0.8%	0.0%
	Sub-total	**390.6**		**2.6%**
Other				
Other (undefined)		593.9	100.0%	3.9%
	Sub-total	**593.9**		**3.9%**
				0.0%

Recreation/Open Space			0.0%
CEMETARY/MONUMENTS	382.1	24.9%	2.5%
OWNED BY PARK DISTRICT	1,149.8	75.1%	7.5%
Sub-total	**1,531.9**		**10.0%**
Single, Two and Three Family Residential			
1-FAMILY DWL 0-9.99 AC	432.2	4.5%	2.8%
1-FAMILY DWL ON COM STRIP	34.2	0.4%	0.2%
1-FAMILY DWL PLATTED LOT	7,631.0	80.1%	50.0%
2-FAMILY DWL 0-9.99 AC	2.7	0.0%	0.0%
2-FAMILY DWL ON COM STRIP	1.9	0.0%	0.0%
2-FAMILY DWL PLATTED LOT	162.3	1.7%	1.1%
3-FAMILY DWL ON COM STRIP	0.5	0.0%	0.0%
3-FAMILY DWL PLATTED LOT	5.7	0.1%	0.0%
CONDOMINIUM UNIT	17.2	0.2%	0.1%
HSE TRL (REAL) PLATTED LOT	0.7	0.0%	0.0%
OTHER REDID STRUCTURE	51.0	0.5%	0.3%
OTHER RESID ON COM STRIP	0.2	0.0%	0.0%
VAC RES ON COM STRIP	11.9	0.1%	0.1%
VACANT LND 0-9.99 AC	100.2	1.1%	0.7%
VACANT LND 20-29.99 AC	26.6	0.3%	0.2%
VACANT LND PLATTED LOT	1,053.4	11.1%	6.9%
Sub-total	**9,531.9**		**62.5%**

Total Parcel Acreage 15,256.9

Sources: Mahoning County Enterprise GIS Files, Mahoning County Auditor Land Use Codes

LAND USE - SUB-WATERSHED 05030103080010

Land Use Class [Mahoning County]	*Parcel Acreage*	*Percentage of Sub-total*	*Percentage of Total*
Agriculture			
CASH GRAIN/GEN FARM	4,630.2	47.3%	24.6%
NURSERY	65.2	0.7%	0.3%
OTHER AGRICULTURAL	798.3	8.2%	4.2%
TIMBER OR FOREST LAND	73.7	0.8%	0.4%
VACANT LAND	4,221.9	43.1%	22.4%
Sub-total	**9,789.2**		**51.9%**
Business			
AUTO SALES AND SERVICE	65.2	3.7%	0.3%
AUTO SERVICE STATION	0.6	0.0%	0.0%
BANK	7.0	0.4%	0.0%
BOWLING ALLEY	9.5	0.5%	0.1%
CAR WASH	2.6	0.1%	0.0%
COML LND&IMP OWND PU OTRR	12.6	0.7%	0.1%
COMMERCIAL GARAGE	51.6	3.0%	0.3%
COMMERCIAL STRUCTURE	251.8	14.4%	1.3%
COMMERCIAL WAREHOUSE	75.0	4.3%	0.4%
COMMUNITY SHOPPING CENTER	9.8	0.6%	0.1%
CONDOMINIUM OFFICE UNITS	5.5	0.3%	0.0%
DISCOUNT STORE	16.8	1.0%	0.1%
DRIVE-IN RESTAURANT	7.7	0.4%	0.0%
DWELLING USED AS OFFICE	9.9	0.6%	0.1%
DWELLING USED AS RETAIL	3.4	0.2%	0.0%
ELEVATOR OFFICE BUILDING	10.9	0.6%	0.1%
FUNERAL HOME	0.7	0.0%	0.0%
GOLF COURSE	117.7	6.8%	0.6%
HOTEL	2.7	0.2%	0.0%
LODGE HALL OR AMUSEMENT PARK	14.5	0.8%	0.1%
MANUFACTURED HOME PARK	16.4	0.9%	0.1%
MEDICAL OFFICE	38.7	2.2%	0.2%
MOTEL/TOURIST CABINS	25.3	1.4%	0.1%
NEIGHBORHOOD SHOPPING CENTER	34.1	2.0%	0.2%
NURSING HOME OR HOSPITAL	50.4	2.9%	0.3%
OFFICE BLDG ONE & TWO STORY	70.4	4.0%	0.4%
OTHER COMMERCIAL HOUSING	0.4	0.0%	0.0%
PARKING LOT OR STRUCTURE	2.1	0.1%	0.0%
REGIONAL SHOPPING CENTER	80.8	4.6%	0.4%
RESTAURANT OR BAR	8.1	0.5%	0.0%
RETAIL / APARTMENTS OVER	0.4	0.0%	0.0%
RETAIL / OFFICE OVER	0.6	0.0%	0.0%
RETAIL STRUCTURE	55.4	3.2%	0.3%
SAVINGS & LOANS	2.9	0.2%	0.0%
SMALL RETAIL STRUCTURE	20.4	1.2%	0.1%
SUPERMARKET	12.1	0.7%	0.1%
THEATER	5.3	0.3%	0.0%
VACANT COMMERCIAL LAND	447.5	25.7%	2.4%
Business (undefined)	196.4	11.3%	1.0%
Sub-total	**1,742.9**		**9.2%**

Other			
Other (undefined)	797.9	100.0%	9.0%
Sub-total	**797.9**		**9.0%**
Recreation/Open Space			
CEMETARY/MONUMENTS	3.7	1.2%	0.0%
OWNED BY PARK DISTRICT	304.6	98.8%	3.4%
Sub-total	**308.3**		**3.5%**
Single, Two and Three Family Residential			
1-FAMILY DWL 0-9.99 AC	613.3	24.8%	6.9%
1-FAMILY DWL 20-29.99 AC	18.7	0.8%	0.2%
1-FAMILY DWL ON COM STRIP	2.8	0.1%	0.0%
1-FAMILY DWL PLATTED LOT	1,248.8	50.5%	14.1%
2-FAMILY DWL 0-9.99 AC	11.1	0.4%	0.1%
2-FAMILY DWL ON COM STRIP	2.3	0.1%	0.0%
2-FAMILY DWL PLATTED LOT	6.0	0.2%	0.1%
CONDOMINIUM UNIT	33.4	1.4%	0.4%
HSE TRL (REAL) PLATTED LOT	14.3	0.6%	0.2%
OTHER REDID STRUCTURE	76.1	3.1%	0.9%
VAC RES ON COM STRIP	0.1	0.0%	0.0%
VACANT LND 0-9.99 AC	129.7	5.2%	1.5%
VACANT LND PLATTED LOT	316.3	12.8%	3.6%
Sub-total	**2,472.8**		**27.9%**
Total Parcel Acreage	**8,857.9**		

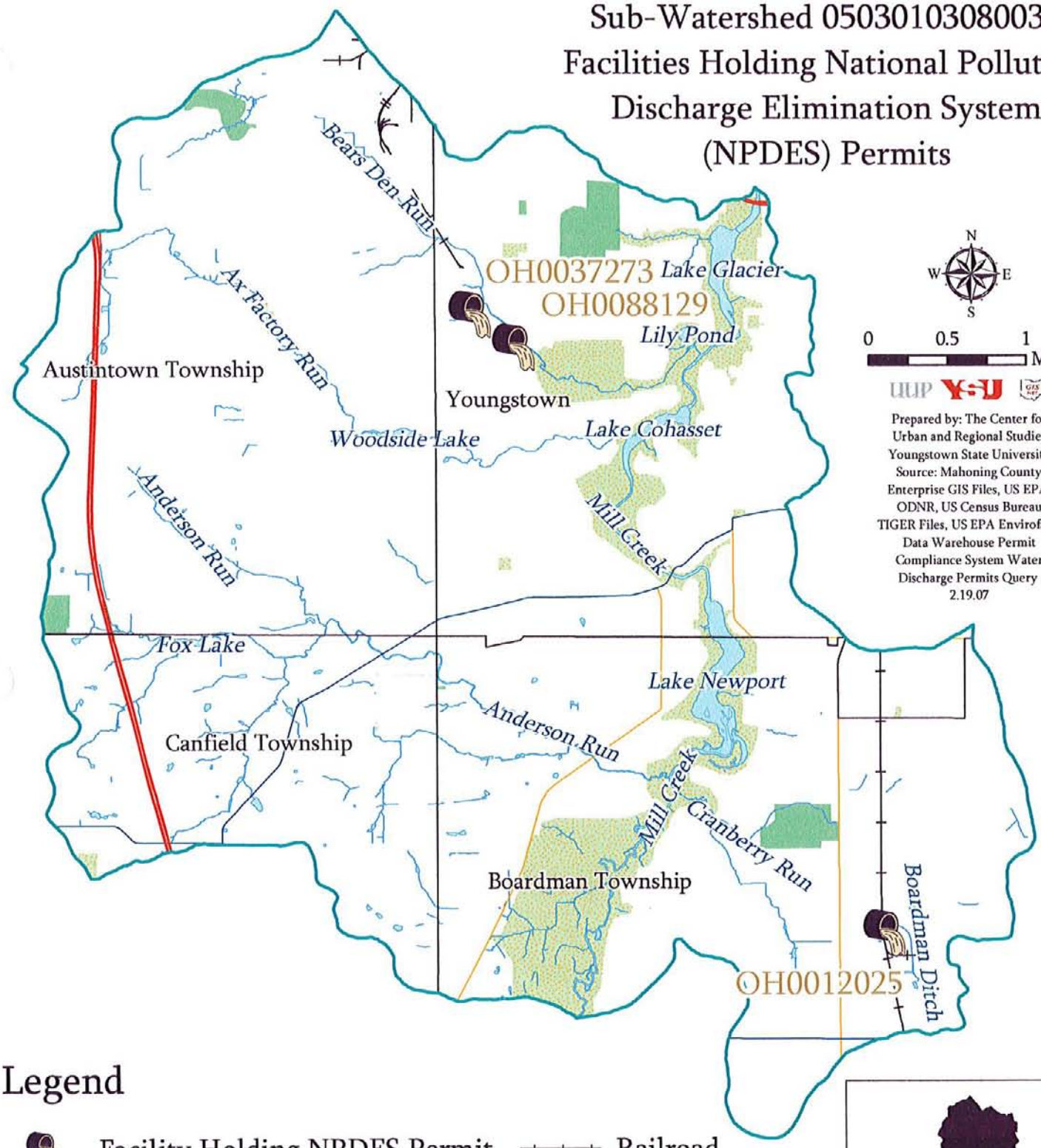
Sources: Mahoning County Enterprise GIS Files, Mahoning County Auditor Land Use Codes

LAND USE - SUB-WATERSHED 05030103080020

Land Use Class	*Parcel Acreage*	*Percentage of Sub-total*	*Percentage of Total*
Agriculture			
CASH GRAIN/GEN FARM	1,898.6	53.5%	21.4%
FRUIT AND NUT FARM	0.9	0.0%	0.0%
LIVESTOCK 0/T 03 & 04	38.3	1.1%	0.4%
OTHER AGRICULTURAL	34.2	1.0%	0.4%
TIMBER OR FOREST LAND	18.8	0.5%	0.2%
VACANT LAND	1,556.1	43.9%	17.6%
Sub-total	**3,546.9**		**40.0%**
Business			
AUTO SALES AND SERVICE	5.9	1.0%	0.1%
BANK	2.9	0.5%	0.0%
CAMP GROUNDS	16.1	2.8%	0.2%
CAR WASH	1.8	0.3%	0.0%
COMMERCIAL GARAGE	6.9	1.2%	0.1%
COMMERCIAL STRUCTURE	19.3	3.4%	0.2%
COMMERCIAL WAREHOUSE	4.1	0.7%	0.0%
COMMUNITY SHOPPING CENTER	8.5	1.5%	0.1%
CONDOMINIUM OFFICE UNITS	0.9	0.2%	0.0%
DRIVE-IN RESTAURANT	11.3	2.0%	0.1%
DWELLING USED AS OFFICE	1.2	0.2%	0.0%
DWELLING USED AS RETAIL	1.6	0.3%	0.0%
ELEVATOR OFFICE BUILDING	0.0	0.0%	0.0%
FUNERAL HOME	1.0	0.2%	0.0%
GOLF COURSE	18.7	3.3%	0.2%
HOTEL	1.8	0.3%	0.0%
LODGE HALL OR AMUSEMENT PARK	36.6	6.4%	0.4%
MEDICAL OFFICE	19.9	3.5%	0.2%
NEIGHBORHOOD SHOPPING CENTER	19.9	3.4%	0.2%
OFFICE BLDG ONE & TWO STORY	54.2	9.4%	0.6%
RESTAURANT OR BAR	6.7	1.2%	0.1%
RETAIL STRUCTURE	23.7	4.1%	0.3%
SAVINGS & LOANS	1.1	0.2%	0.0%
SMALL RETAIL STRUCTURE	10.3	1.8%	0.1%
SUPERMARKET	8.2	1.4%	0.1%
VACANT COMMERCIAL LAND	271.9	47.2%	3.1%
Business (undefined)	21.1	3.7%	0.2%
Sub-total	**575.5**		**6.5%**

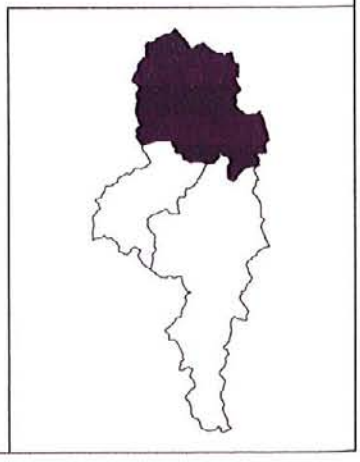
Industrial Heavy				
No parcels				0.0%
	Sub-total	**0.0**	**100.0%**	**0.0%**
Industrial Light				
GRAIN ELEVATOR		0.2	0.3%	0.0%
INDUSTRIAL STRUCTURE		39.9	44.7%	0.5%
INDUSTRIAL WAREHOUSE		7.1	8.0%	0.1%
LIGHT MANUFACTURING		1.7	1.9%	0.0%
SMALL SHOP		5.5	6.2%	0.1%
VACANT INDUSTRIAL LAND		34.7	38.9%	0.4%
	Sub-total	**89.3**		**1.0%**
Institutional				
CHARITABLE EXEMPTION		388.0	39.6%	4.4%
CHURCHES, PUBLIC WORSHIP		14.1	1.4%	0.2%
OWNED BY BOARD OF EDUCATION		24.7	2.5%	0.3%
OWNED BY COUNTY		424.8	43.4%	4.8%
OWNED BY MUNICIPALITY		44.0	4.5%	0.5%
OWNED BY STATE		83.1	8.5%	0.9%
OWNED BY TOWNSHIP		1.2	0.1%	0.0%
	Sub-total	**979.9**		**11.1%**
Multi-Family Residential				
APARTMENTS 20 TO 39 FAMILY		10.2	11.6%	0.1%
APARTMENTS 4 TO 19 FAMILY		61.0	69.9%	0.7%
APARTMENTS 40+ FAMILY		16.1	18.4%	0.2%
	Sub-total	**87.3**		**1.0%**

Mill Creek Watershed
Sub-Watershed 05030103080030
Facilities Holding National Pollutant Discharge Elimination System (NPDES) Permits

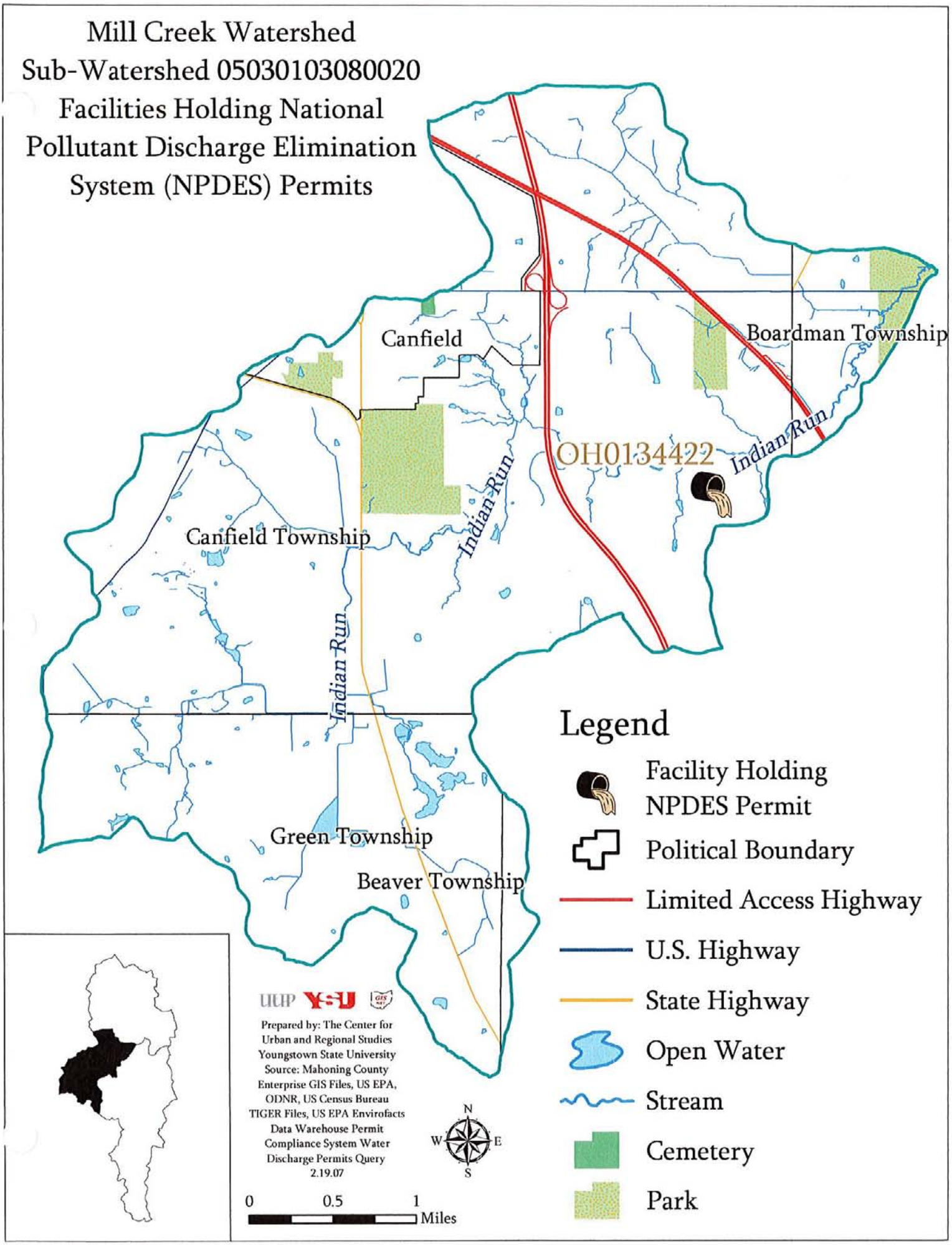


Legend

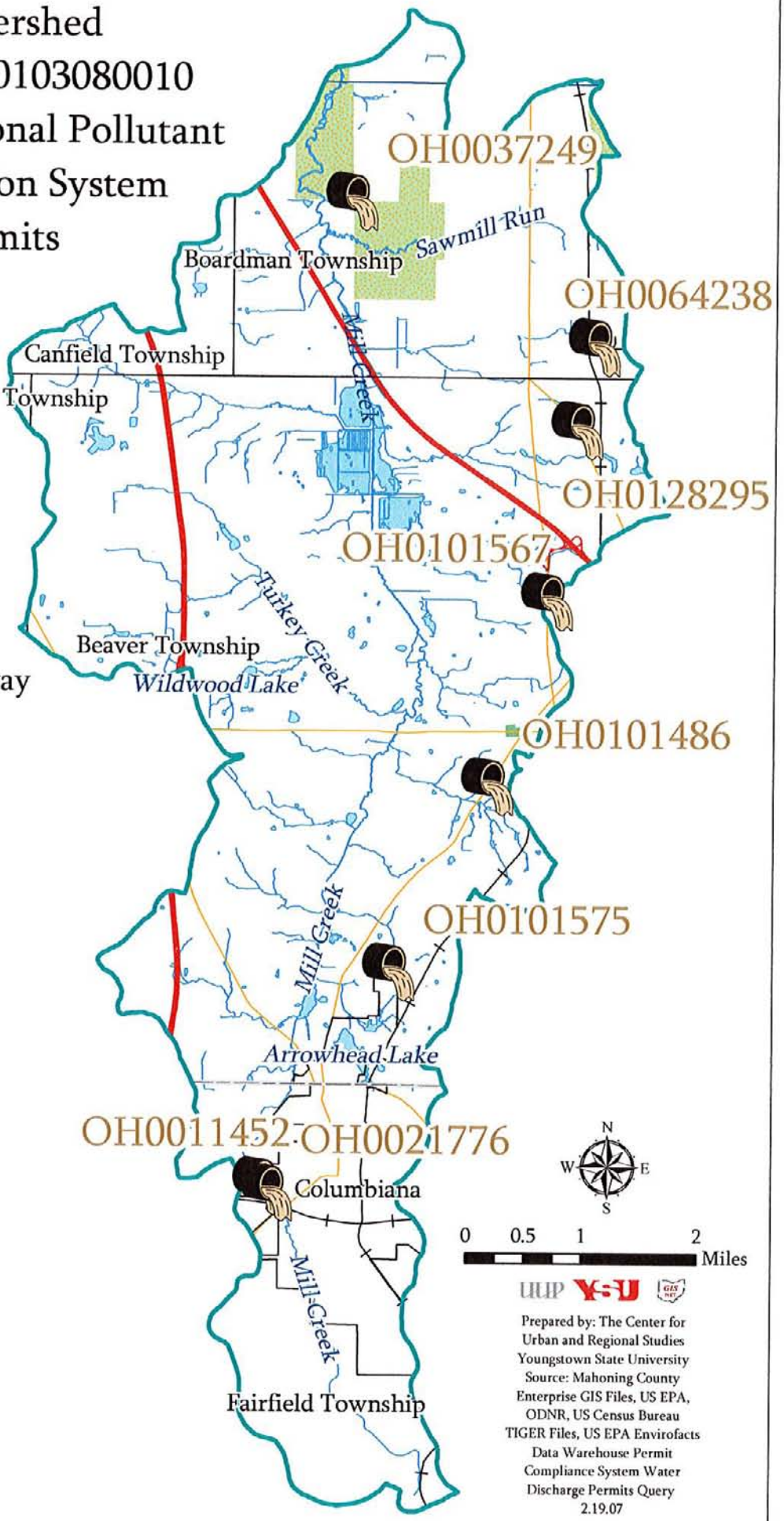
- Facility Holding NPDES Permit
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream
- Cemetery
- Park



Mill Creek Watershed
Sub-Watershed 05030103080020
Facilities Holding National Pollutant Discharge Elimination System (NPDES) Permits

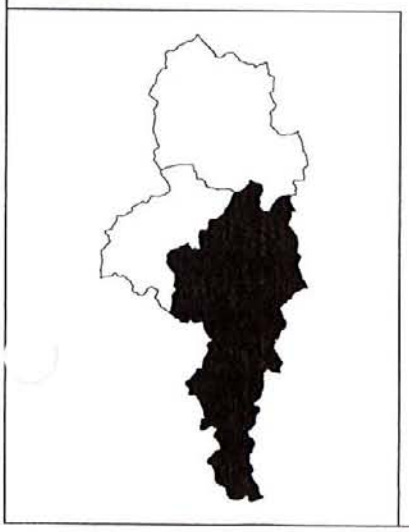


Mill Creek Watershed
Sub-Watershed 05030103080010
Facilities Holding National Pollutant Discharge Elimination System (NPDES) Permits



Legend

- Facility Holding NPDES Permit
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream
- Cemetery
- Park

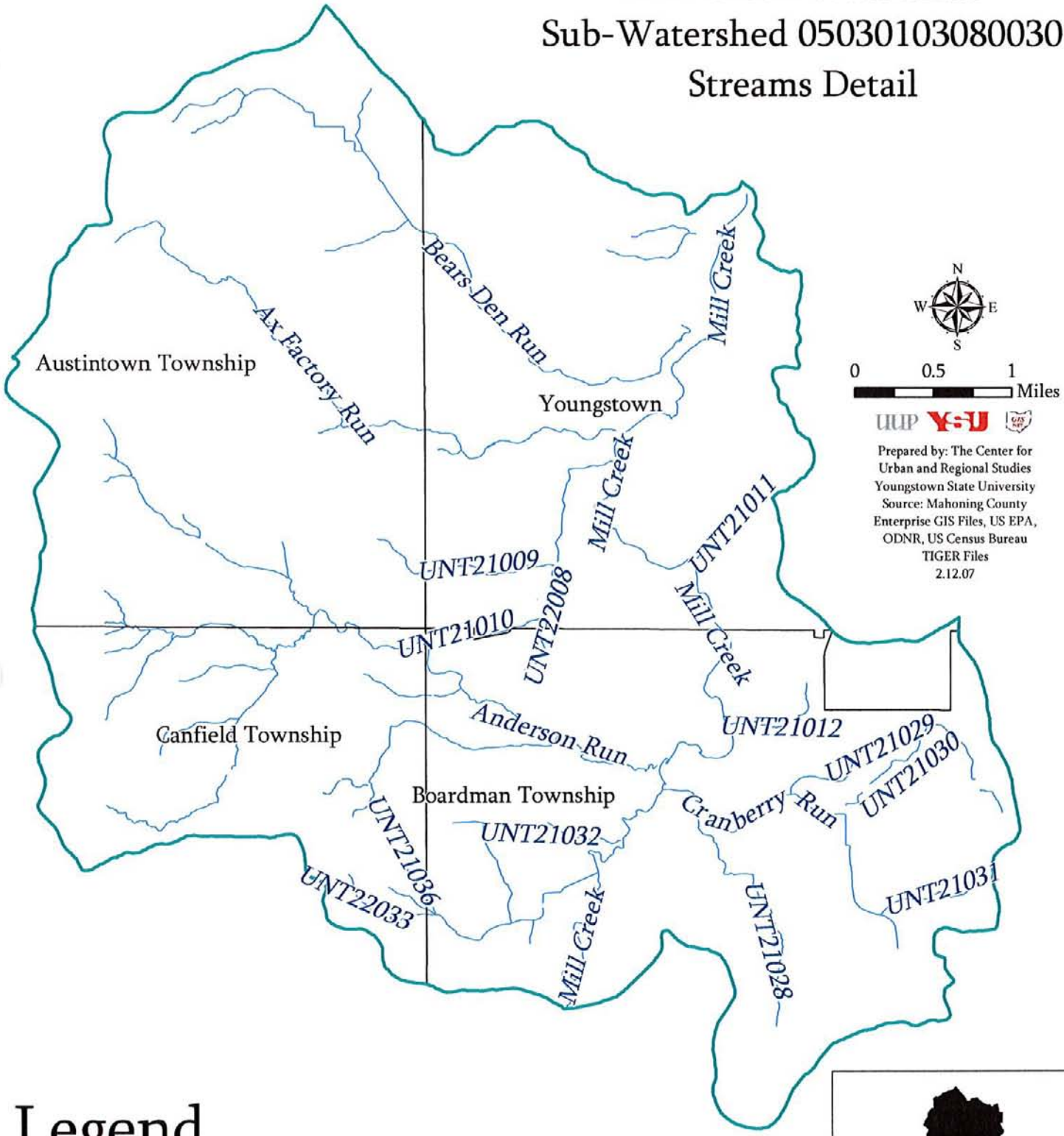


Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files, US EPA Envirofacts Data Warehouse Permit Compliance System Water Discharge Permits Query
2.19.07

Appendix C.

Streams

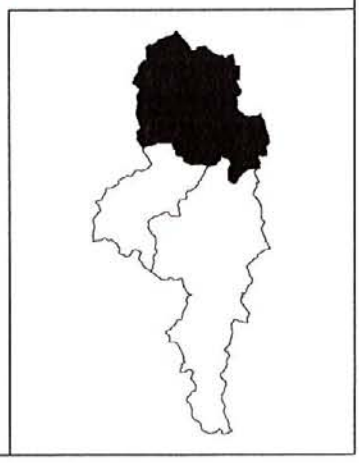
Mill Creek Watershed
Sub-Watershed 05030103080030
Streams Detail



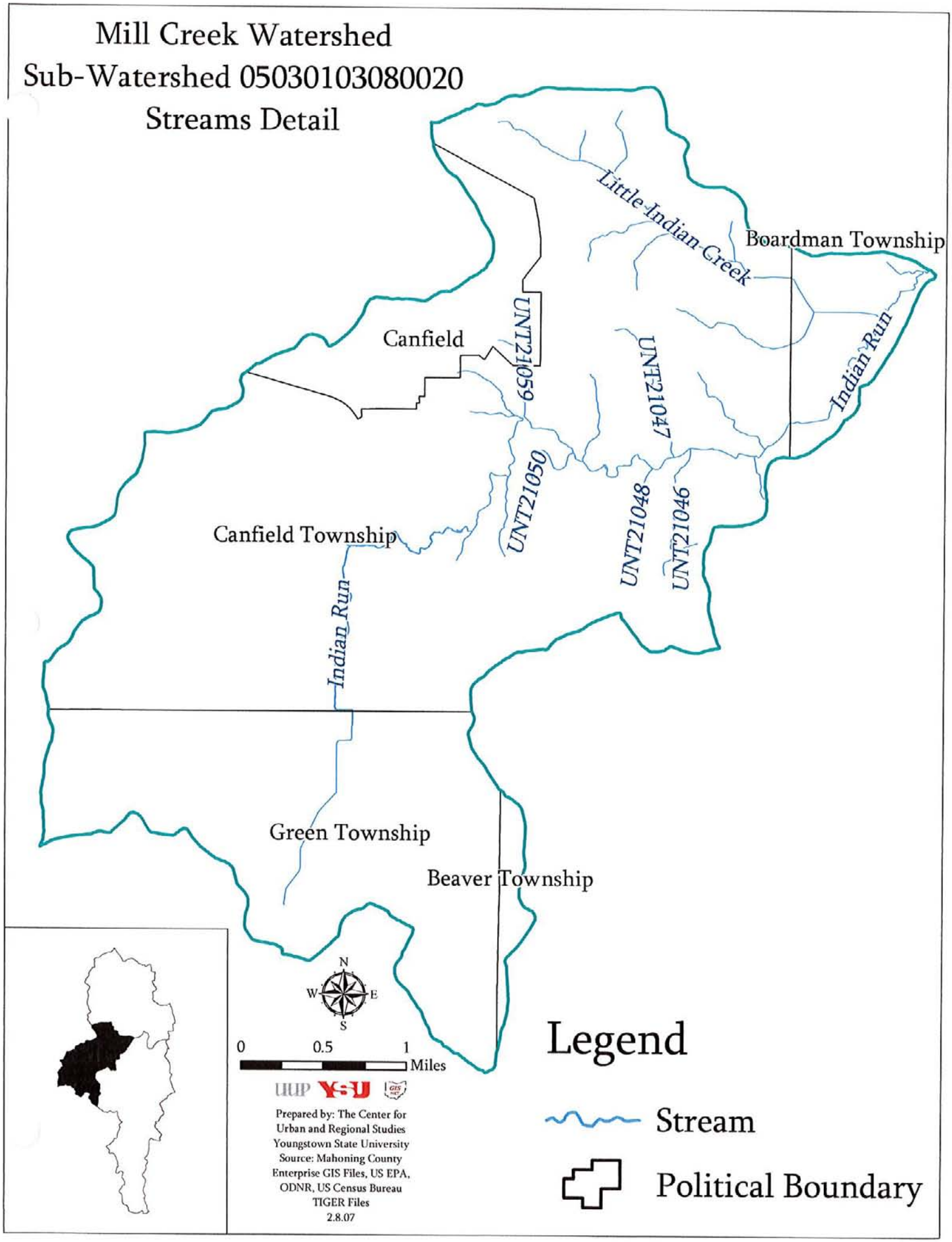
Legend

Stream

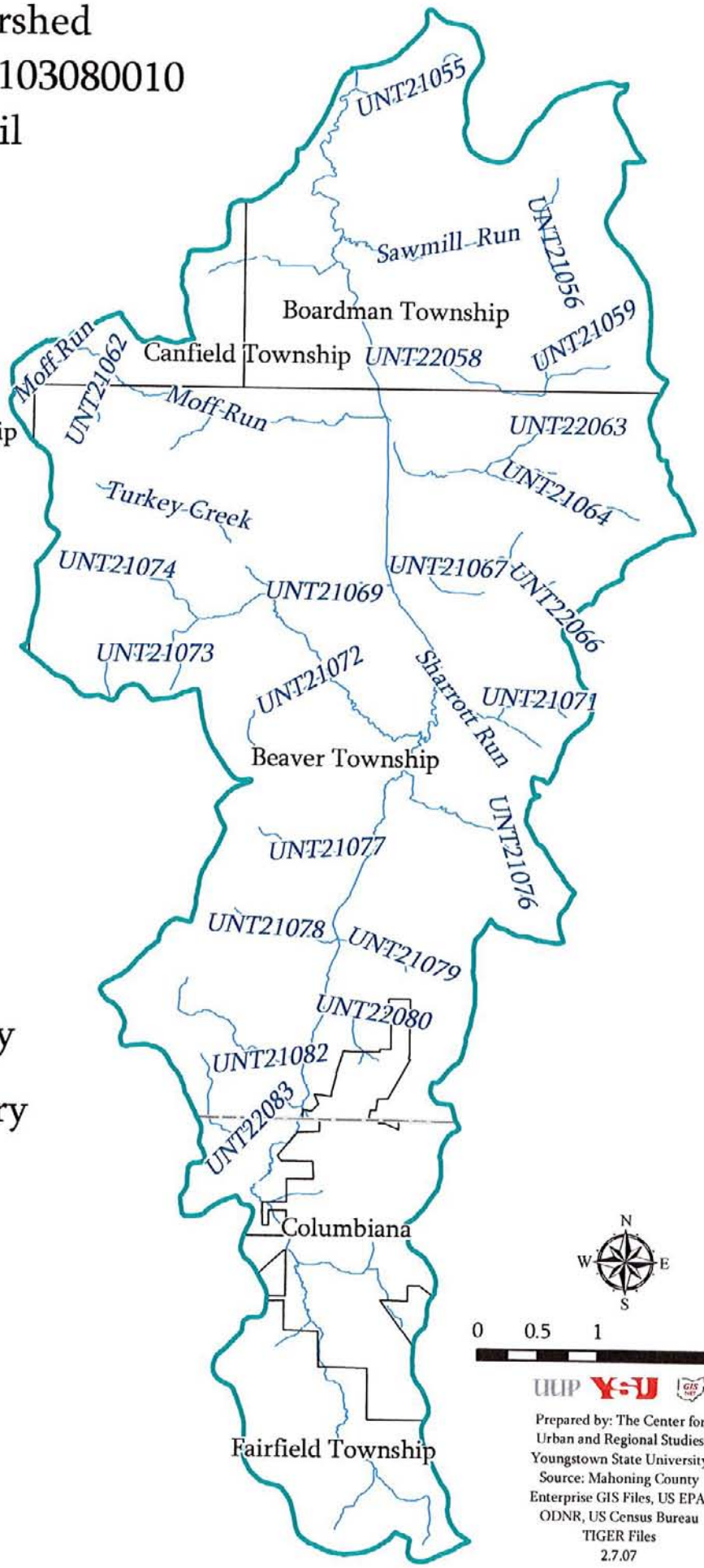
Political Boundary



Mill Creek Watershed
Sub-Watershed 05030103080020
Streams Detail

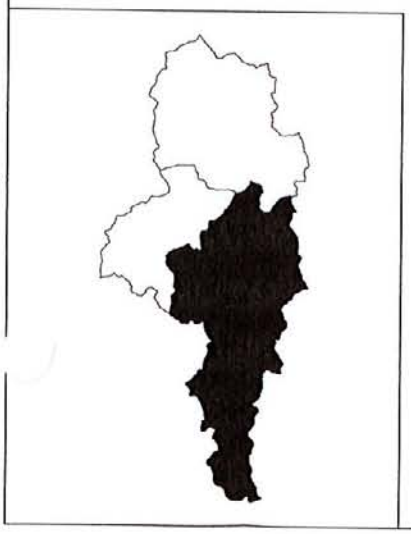


Mill Creek Watershed
Sub-Watershed 05030103080010
Streams Detail



Legend

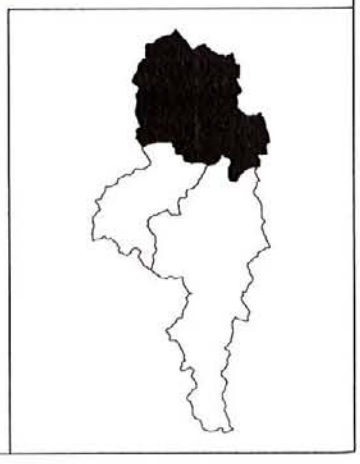
- Stream
- County Boundary
- Political Boundary



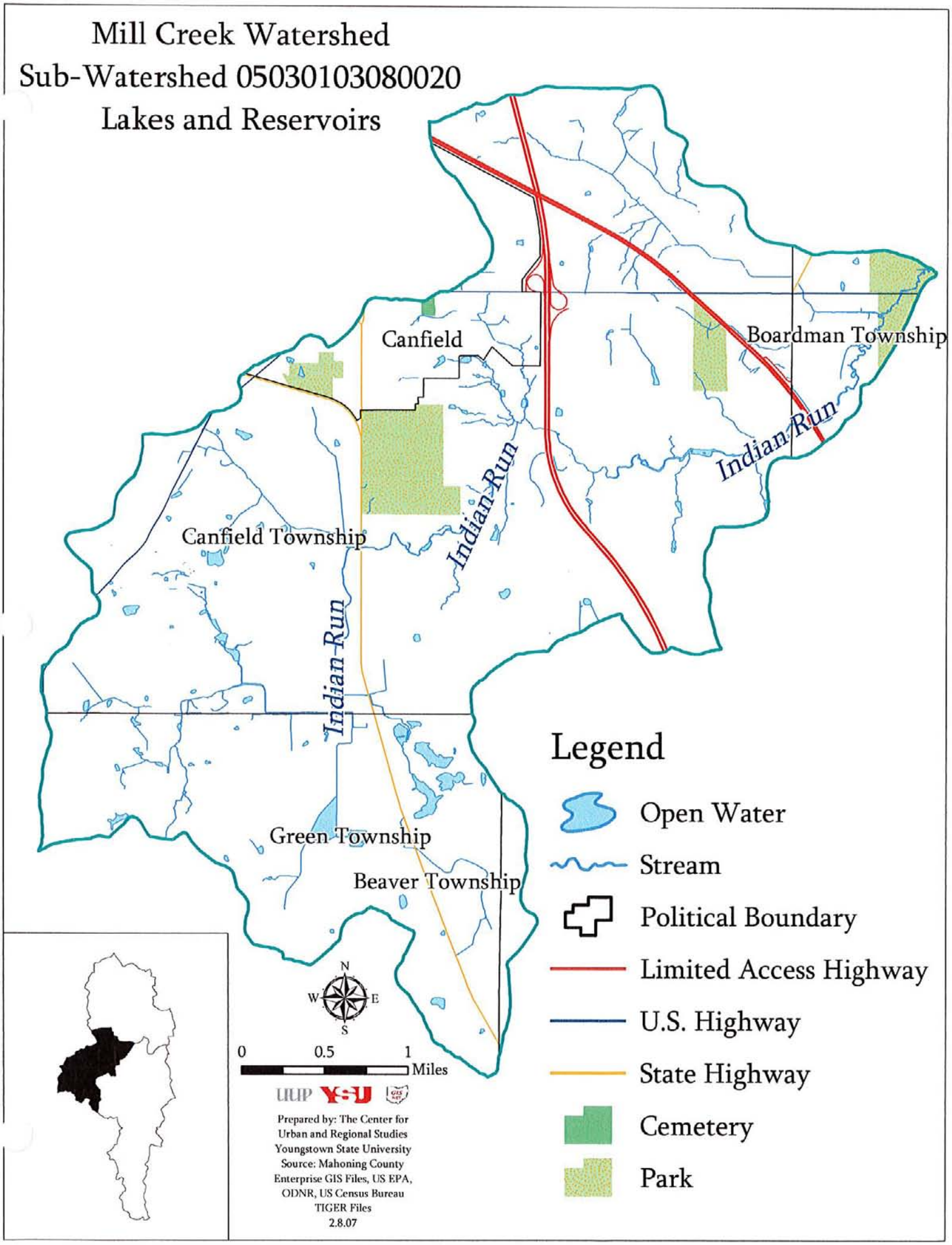
Mill Creek Watershed
Sub-Watershed 05030103080030
Lakes and Reservoirs

Legend

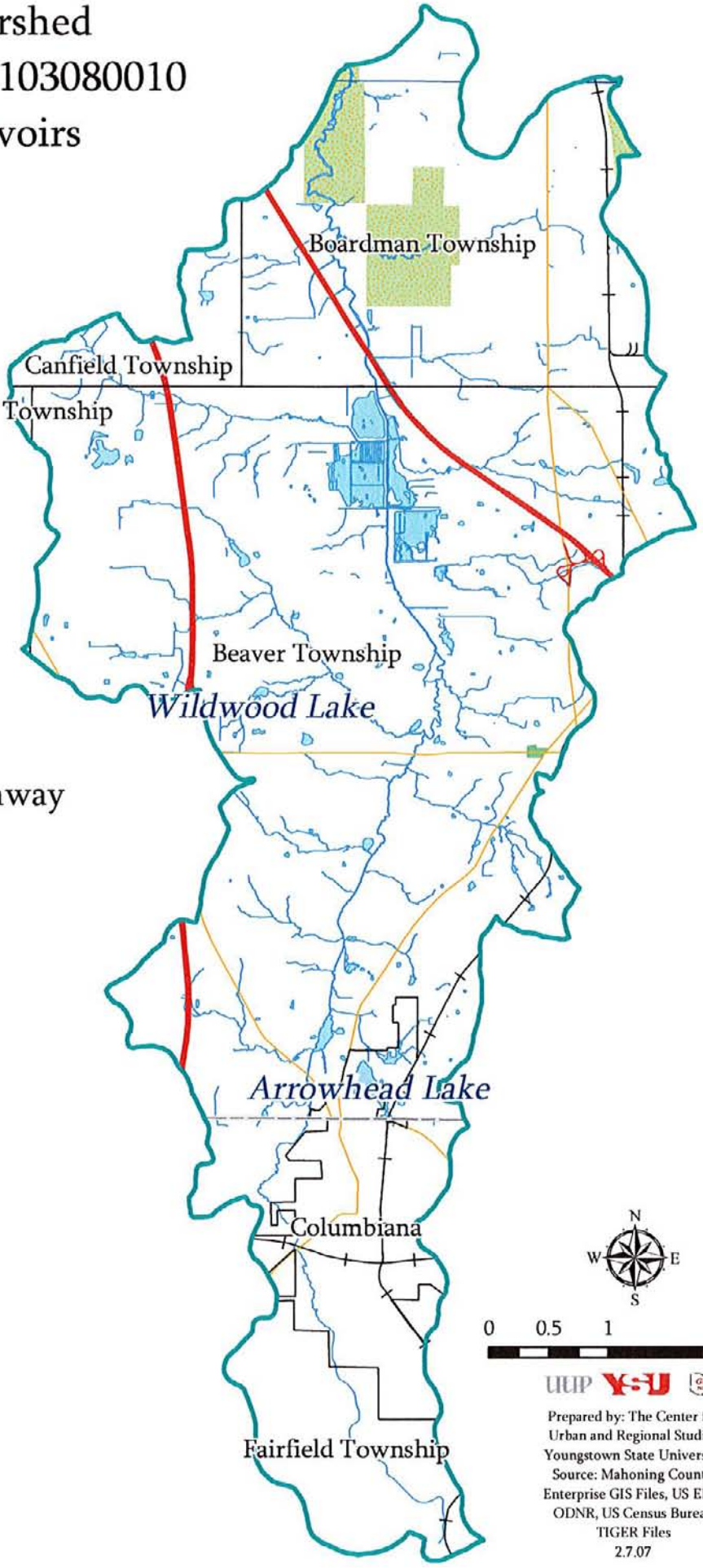
- Lake, Reservoir or other Open Water
- Stream
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Cemetery
- Park



Mill Creek Watershed
Sub-Watershed 05030103080020
Lakes and Reservoirs

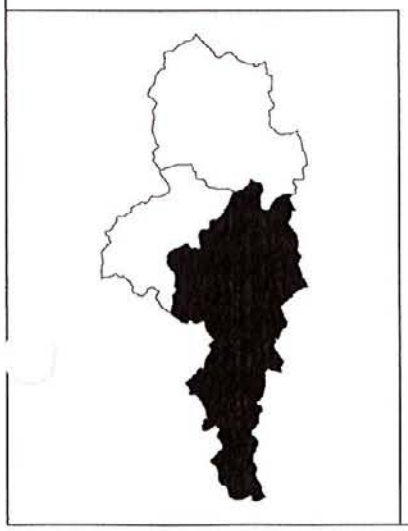


Mill Creek Watershed
Sub-Watershed 05030103080010
Lakes and Reservoirs



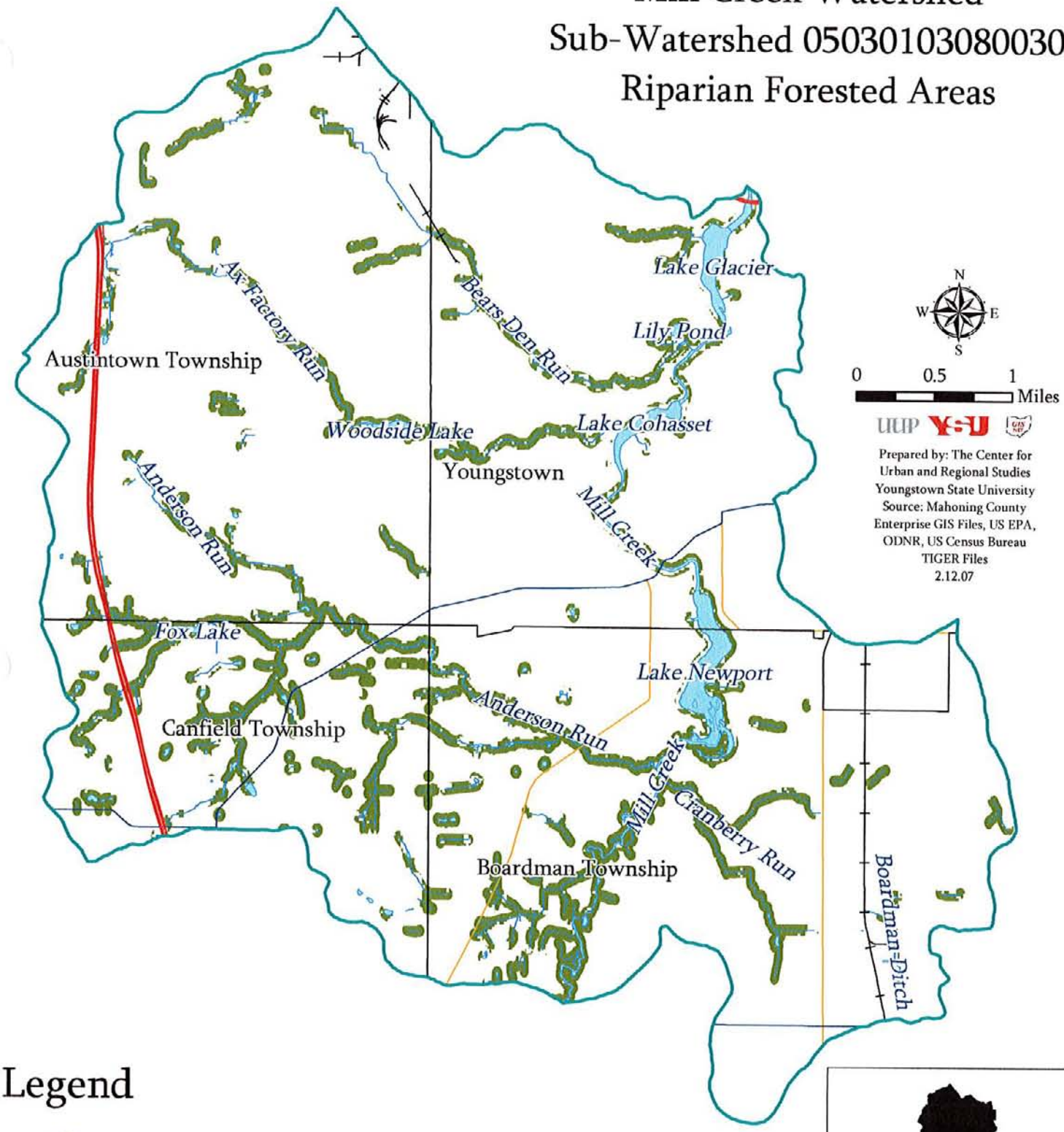
Legend

- Lake, Reservoir or other Open Water
- Stream
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Cemetery
- Park



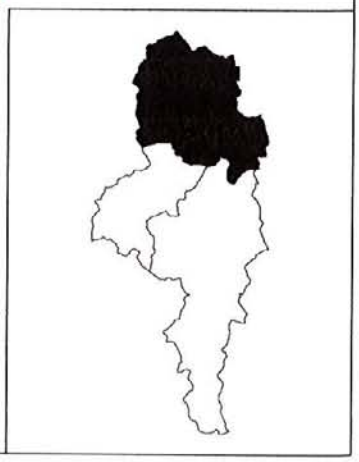
Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

Mill Creek Watershed
Sub-Watershed 05030103080030
Riparian Forested Areas

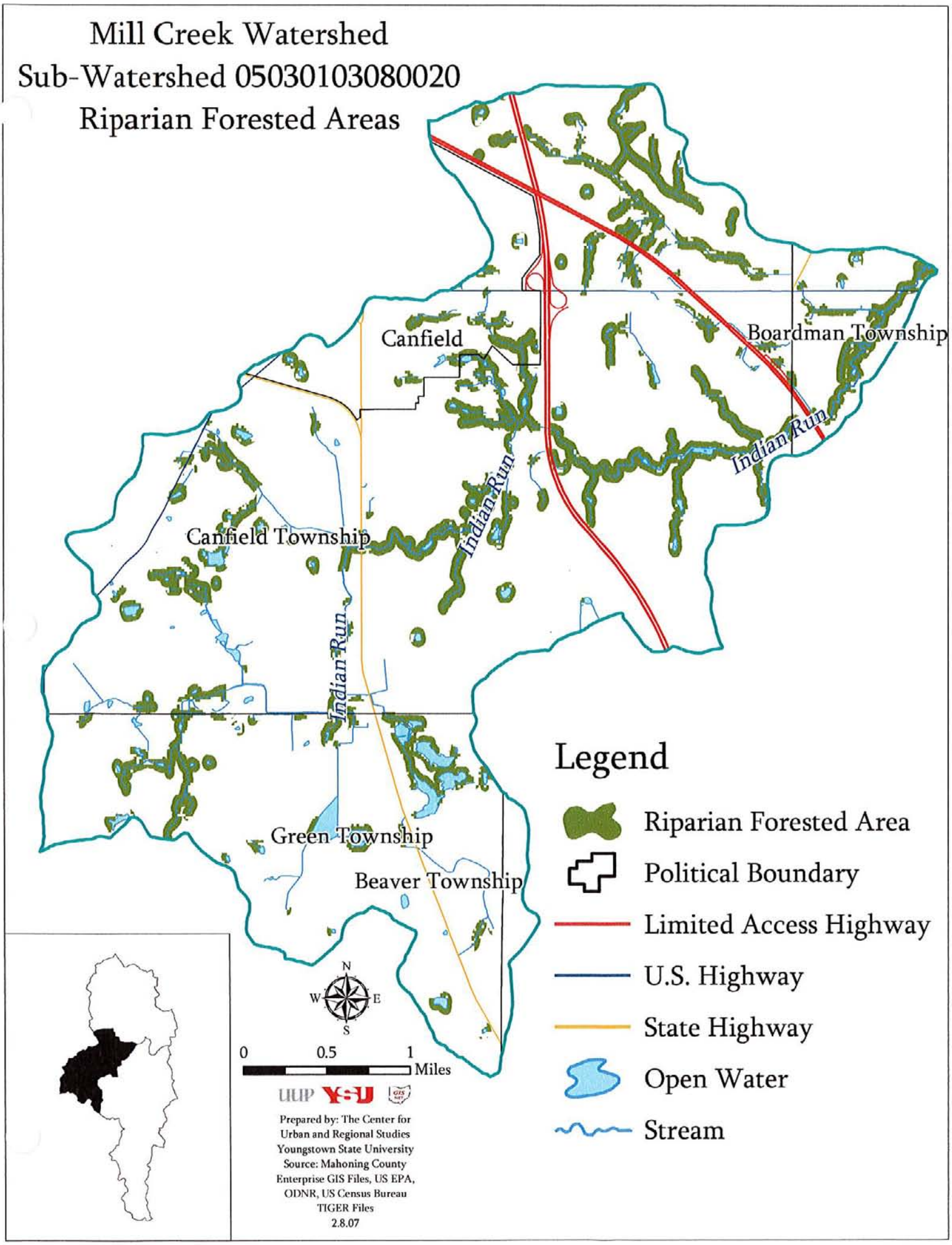


Legend

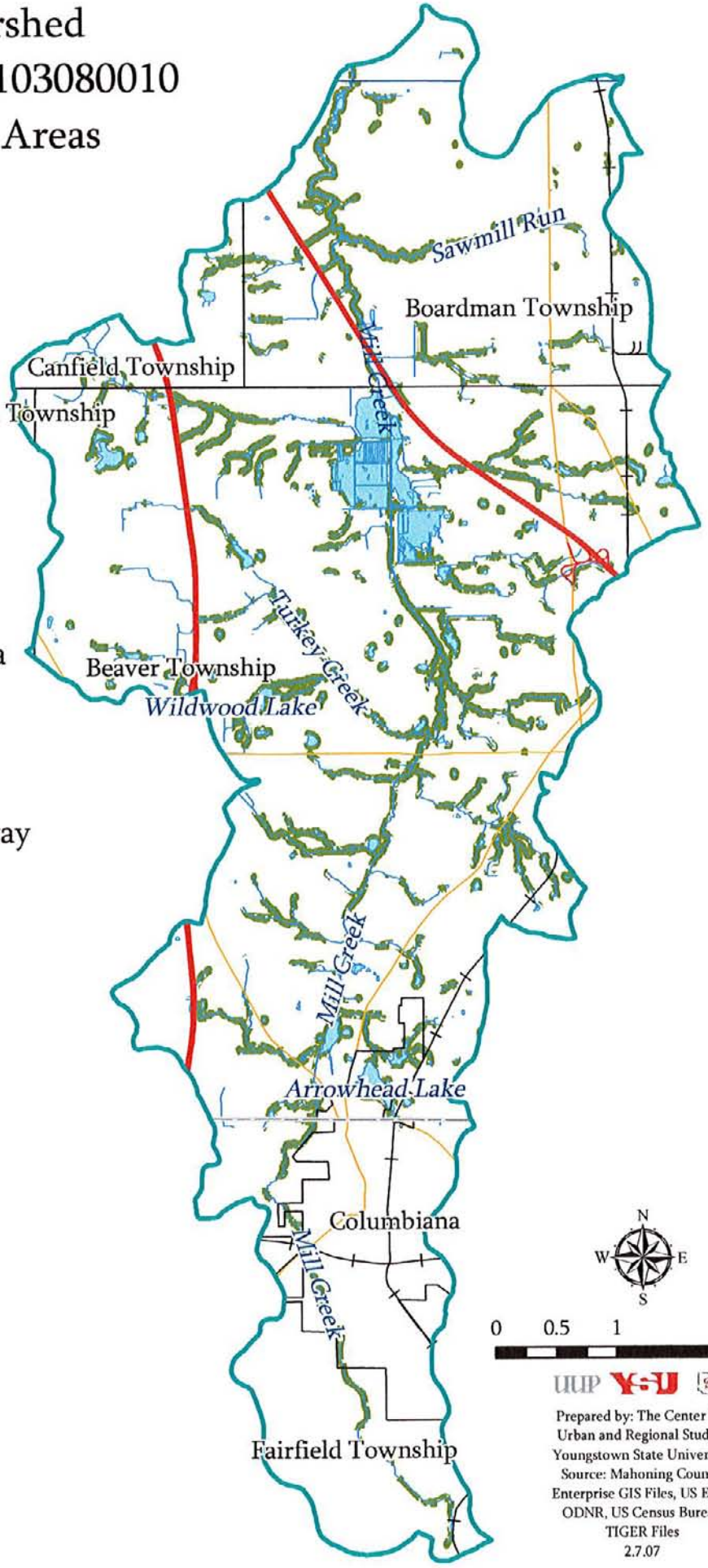
- Riparian Forested Area
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



Mill Creek Watershed
Sub-Watershed 05030103080020
Riparian Forested Areas

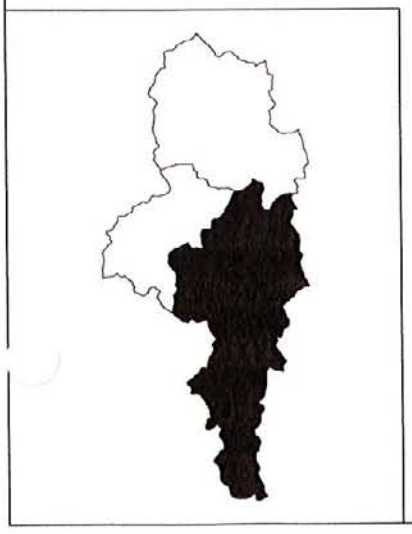


Mill Creek Watershed
Sub-Watershed 05030103080010
Riparian Forested Areas



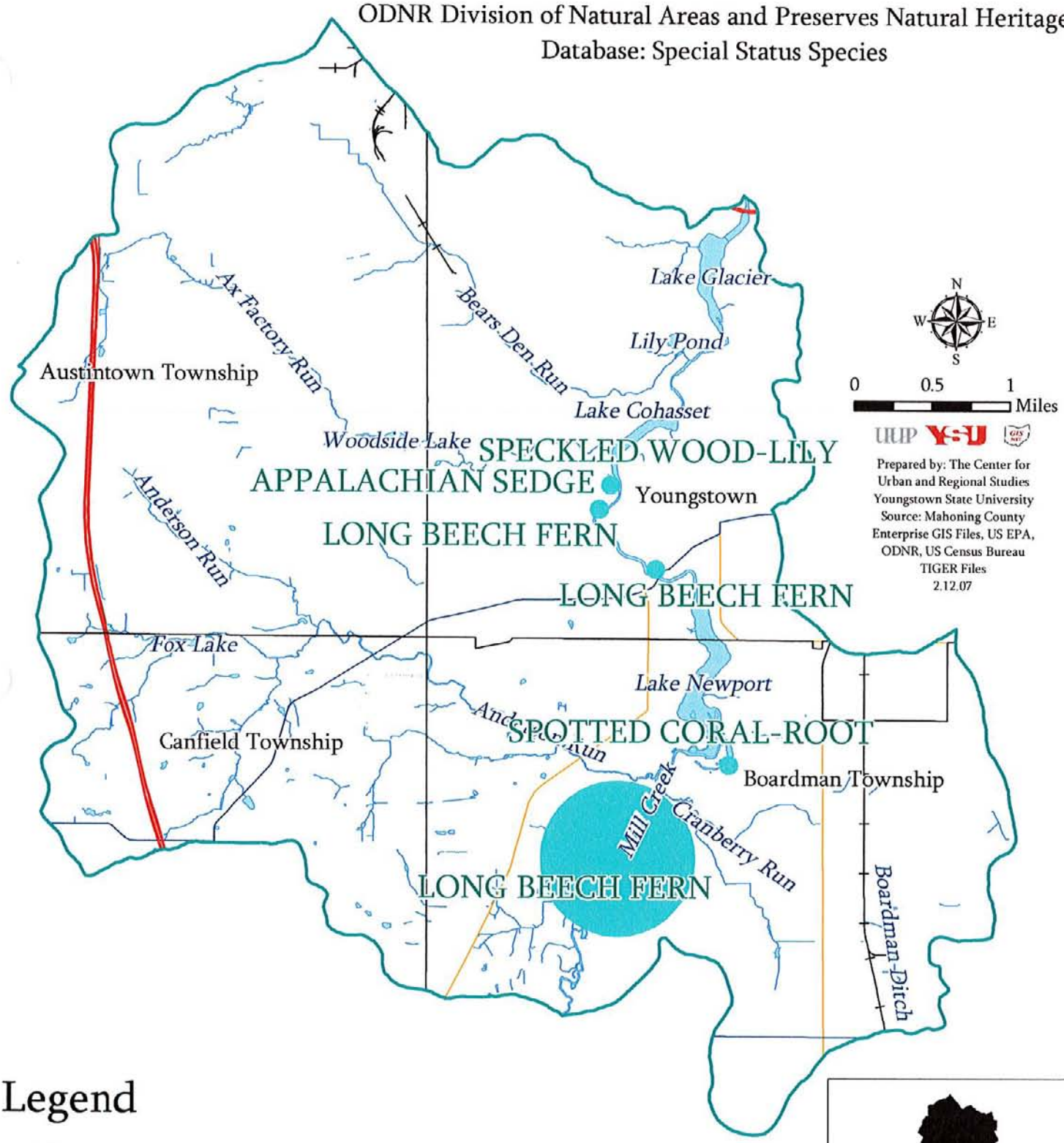
Legend

- Riparian Forested Area
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



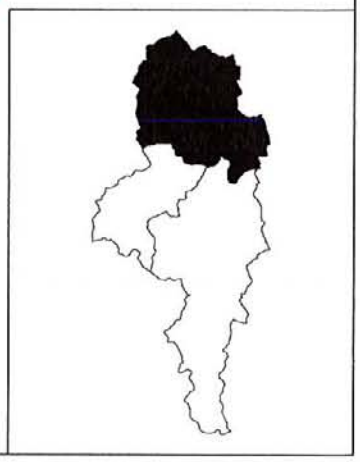
Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

Mill Creek Watershed Sub-Watershed 05030103080030
ODNR Division of Natural Areas and Preserves Natural Heritage Database: Special Status Species

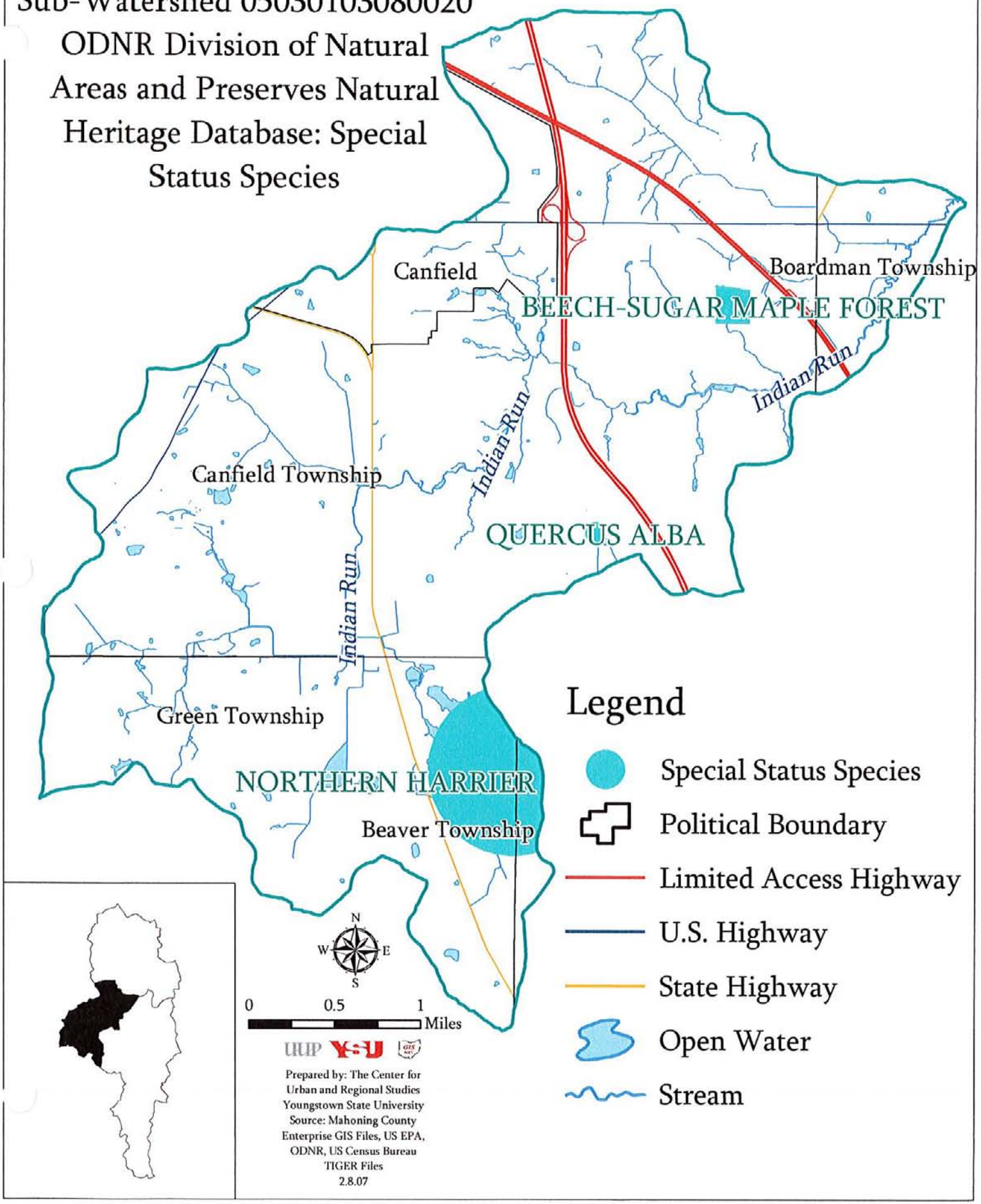


Legend

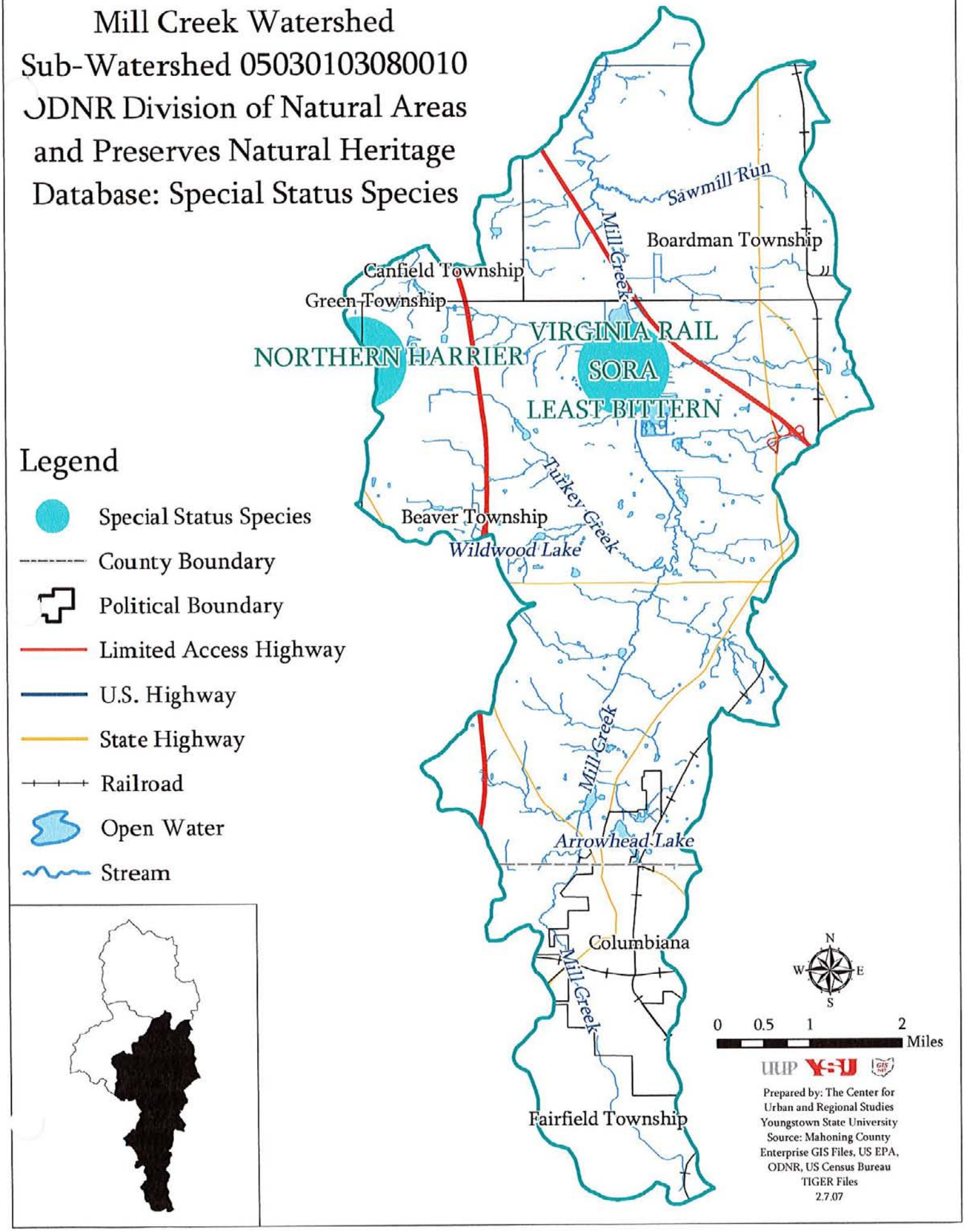
- Special Status Species
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



Mill Creek Watershed
Sub-Watershed 05030103080020
ODNR Division of Natural Areas and Preserves Natural Heritage Database: Special Status Species



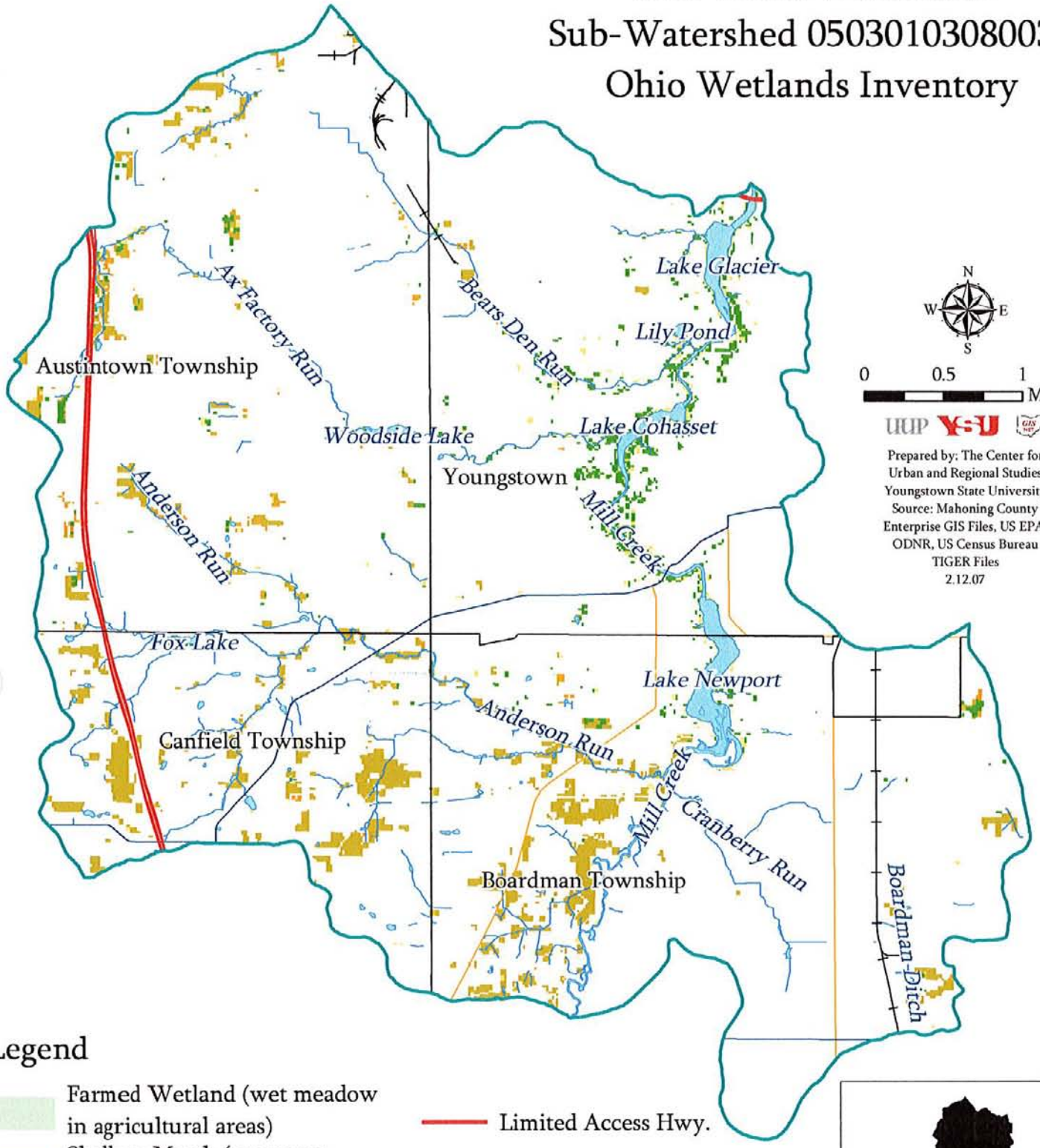
Mill Creek Watershed
Sub-Watershed 05030103080010
ODNR Division of Natural Areas and Preserves Natural Heritage Database: Special Status Species



Appendix D.

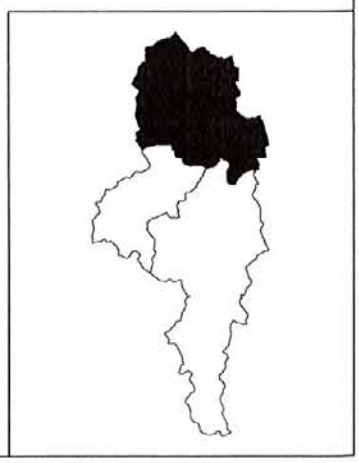
Wetlands

Mill Creek Watershed
Sub-Watershed 05030103080030
Ohio Wetlands Inventory

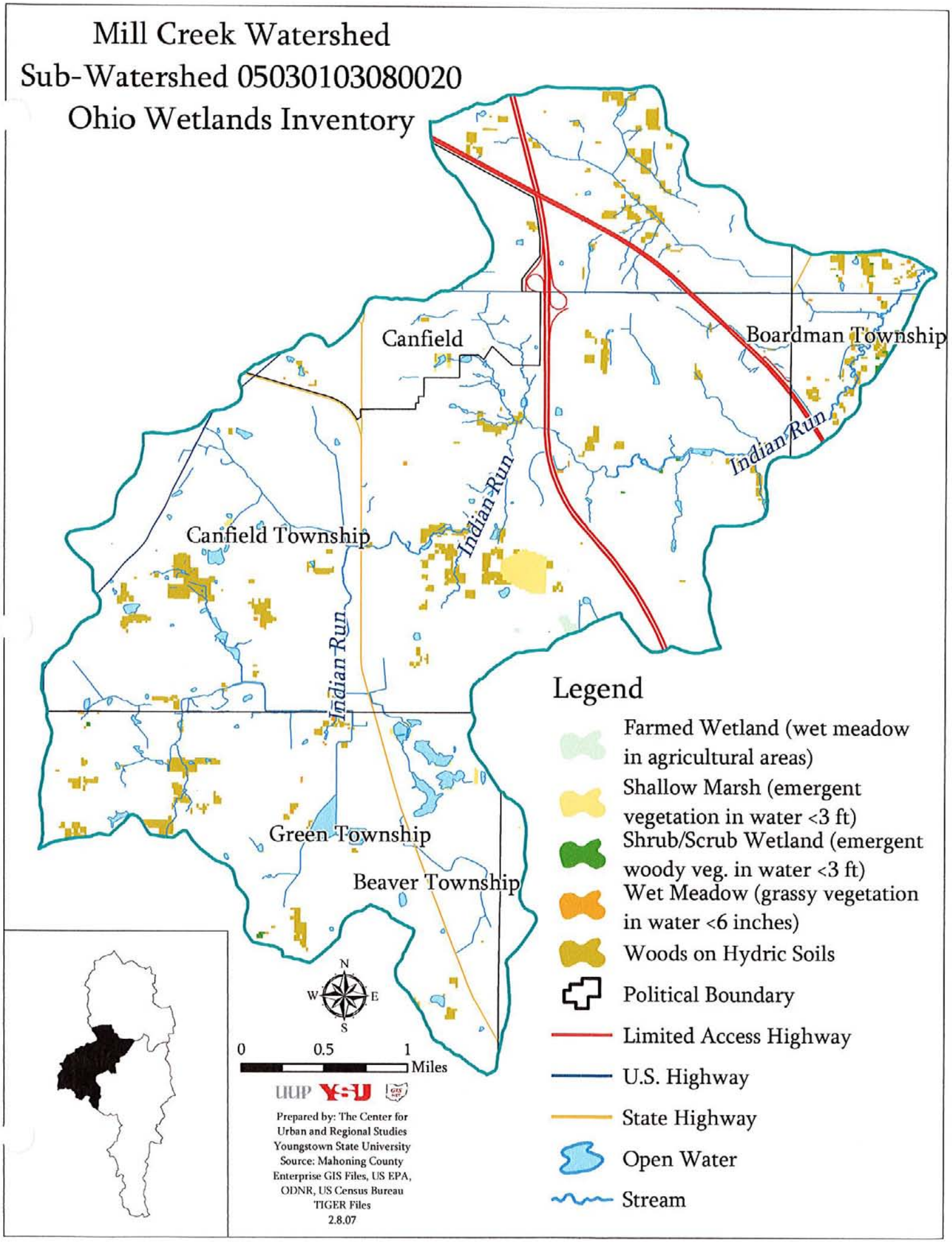


Legend

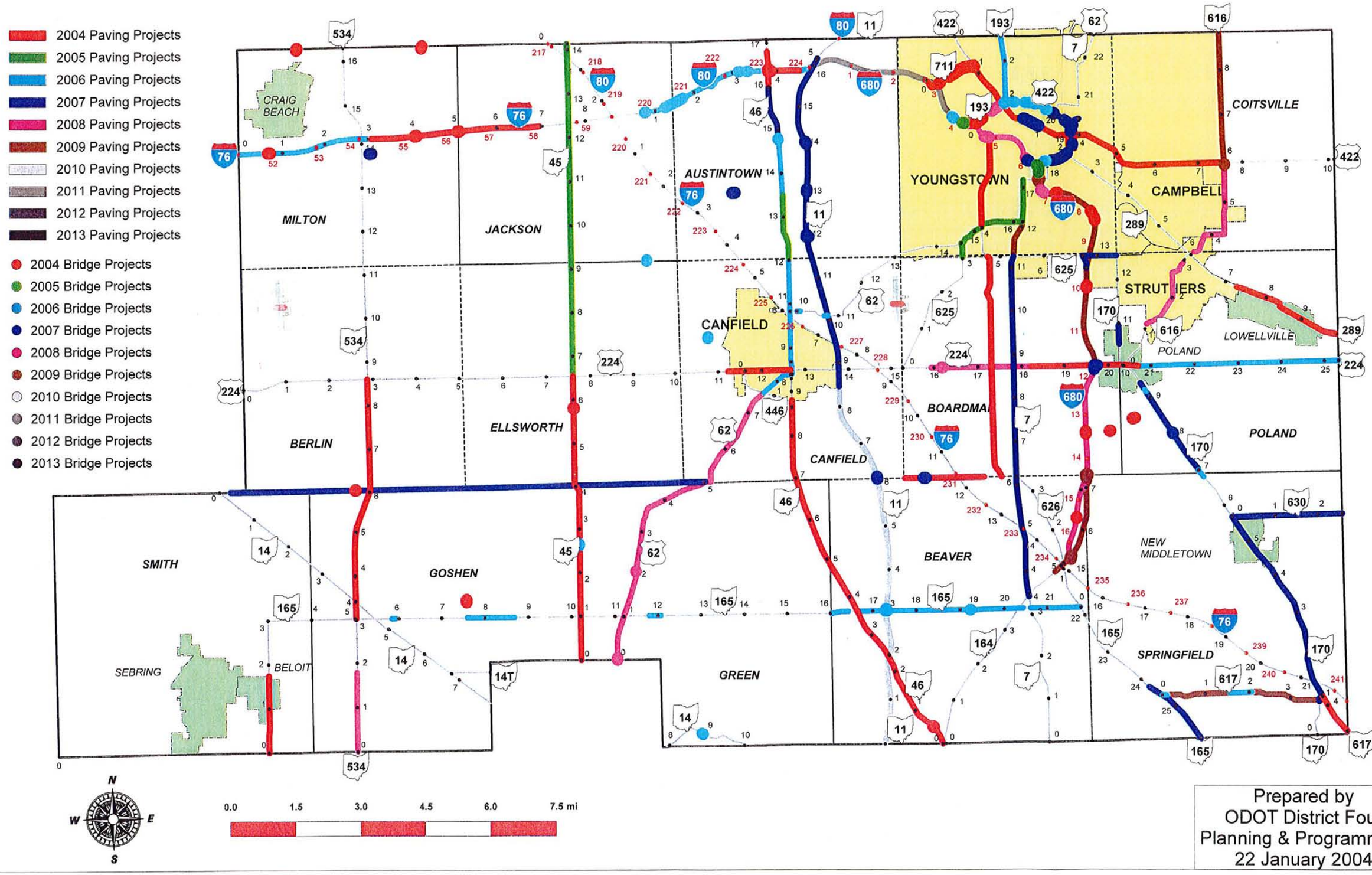
- Farmed Wetland (wet meadow in agricultural areas)
- Shallow Marsh (emergent vegetation in water <3 ft)
- Shrub/Scrub Wetland (emergent woody veg. in water <3 ft)
- Wet Meadow (grassy vegetation in water <6 inches)
- Woods on Hydric Soils
- Political Boundary
- Limited Access Hwy.
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



Mill Creek Watershed
Sub-Watershed 05030103080020
Ohio Wetlands Inventory



Mahoning County 2004 - 2013 Paving and Bridge Projects



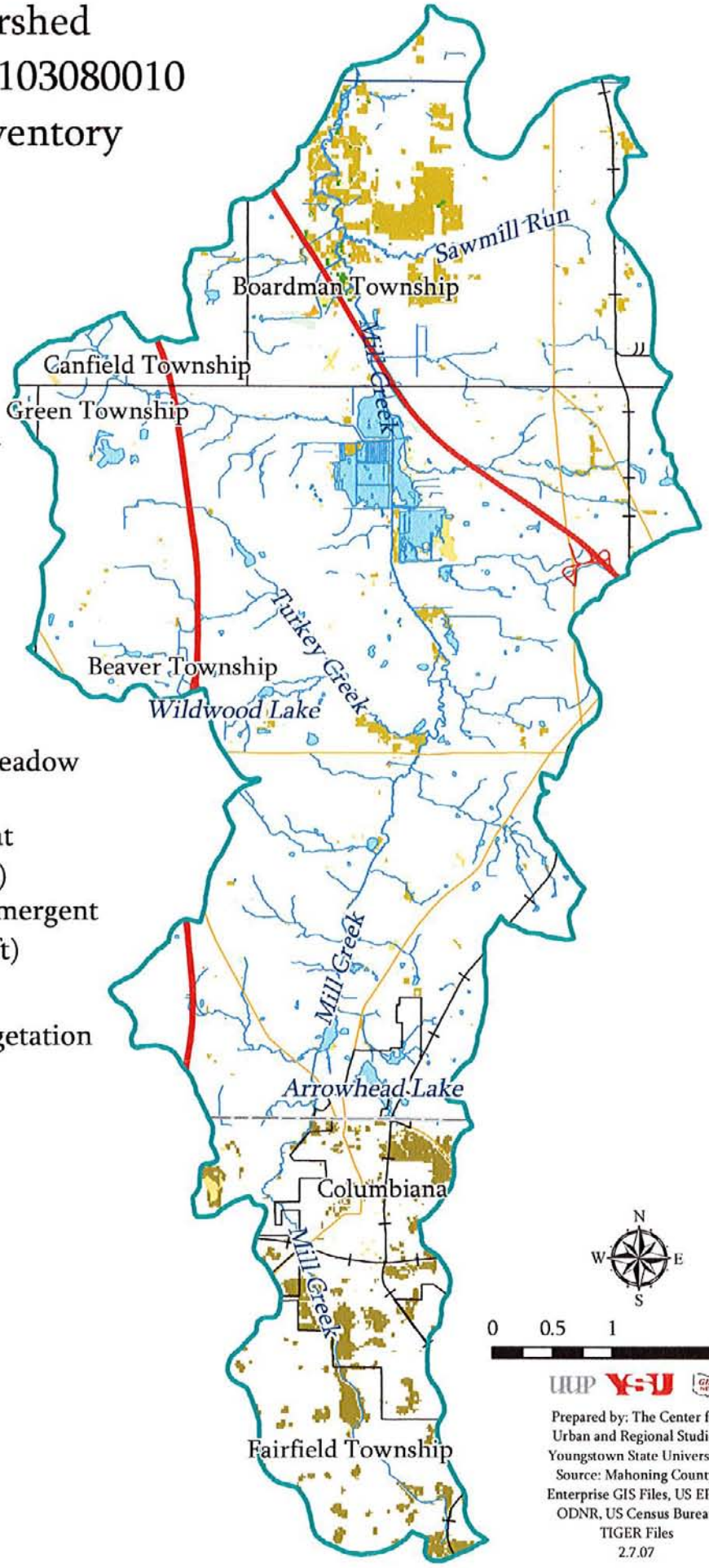
Prepared by
ODOT District Four
Planning & Programming
22 January 2004

Mahoning County 2004 - 2013 Ellis Paving and Bridge Projects

1/22/04

Fiscal Year	PID	County	Route	Begin SLM	End SLM	Project Length	Treatment Category	Work Group	Project Category	Contract Amount	Letting Type	Project Status
2007	22567	MAH	00007	3.42	11.26	7.84	3	Preservation	Resurfacing, Undivided System	1,420,000	ODOT Let	Active
2009	76318	MAH	00007	11.26	12.12	0.86	3	Preservation	Minor Rehabilitation - Pavement	215,000	ODOT Let	Active
2010	76319	MAH	00011	0.00	8.46	8.46	3	Preservation	Minor Rehabilitation - Pavement	2,538,000	ODOT Let	Active
2007	25288	MAH	00011	8.46	16.19	7.73	3	Preservation	Minor Rehabilitation - Pavement	3,050,000	ODOT Let	Active
2007	20496	MAH	00032	0.00	10.94	10.94	3	Expansion	Minor Widening	3,160,000	Local Let	Active
2004	14598	MAH	00032	15.56	17.37	1.81	3	Expansion	Minor Widening	2,491,000	Local Let	Sold
2004	19849	MAH	00045	0.00	6.54	6.54	3	Preservation	Resurfacing, Undivided System	1,963,959	ODOT Let	Sold
2006	19281	MAH	00045	0.18	0.99	0.81	3	Safety	Spot Safety	1,295,000	ODOT Let	Active
2005	22566	MAH	00045	6.54	14.15	7.61	3	Preservation	Resurfacing, Undivided System	1,300,000	ODOT Let	Active
2004	19849	MAH	00046	0.00	8.80	8.80	3	Preservation	Resurfacing, Undivided System	1,963,959	ODOT Let	Sold
2006	25063	MAH	00046	10.83	12.01	1.18	3	Preservation	Minor Rehabilitation - Pavement	310,000	ODOT Let	Active
2005	22568	MAH	00046	12.04	13.48	1.44	3	Preservation	Resurfacing, Undivided System	225,000	ODOT Let	Active
2006	24243	MAH	00046	13.45	14.65	1.20	3	Expansion	Major Widening	3,100,000	ODOT Let	Active
2007	24244	MAH	00046	14.69	15.99	1.30	3	Expansion	Major Widening	2,900,000	ODOT Let	Active
2004	9016	MAH	00046	16.07	16.80	0.73	4	Expansion	Major Widening	7,180,000	ODOT Let	Sold
2007	25279	MAH	00062	0.00	0.54	0.54	3	Preservation	Minor Rehabilitation - Pavement	2,000,000	ODOT Let	Active
2007	25279	MAH	00062		0.64	0.64	3	Preservation	Minor Rehabilitation - Pavement	2,000,000	ODOT Let	Active
2008	76320	MAH	00062	0.00	7.61	7.61	3	Preservation	Resurfacing, Undivided System	1,000,000	ODOT Let	Active
2006	25063	MAH	00062	7.61	9.67	2.06	3	Preservation	Minor Rehabilitation - Pavement	310,000	ODOT Let	Active
2006	25063	MAH	00062	9.68	9.84	0.16	3	Preservation	Minor Rehabilitation - Pavement	310,000	ODOT Let	Active
2006	21187	MAH	00062	10.00	10.09	0.09	3	Safety	Spot Safety	1,095,000	ODOT Let	Active
2006	21187	MAH	00062	10.66	10.75	0.09	3	Safety	Spot Safety	1,095,000	ODOT Let	Active
2005	23884	MAH	00062	14.57	17.18	2.61	3	Preservation	Resurfacing, Undivided System	470,000	ODOT Let	Active
2007	25279	MAH	00062	18.19	20.12	1.93	3	Preservation	Minor Rehabilitation - Pavement	2,000,000	ODOT Let	Active
2006	22459	MAH	00076	0.00	3.08	3.08	3	Preservation	Resurfacing, Divided System	1,300,000	ODOT Let	Active
2004	18696	MAH	00076	3.08	6.95	3.87	4	Expansion	Major Reconstruction	16,430,586	ODOT Let	Sold
2006	6080	MAH	00080	0.97	4.71	3.74	4	Preservation	Bridge Replacement	68,200,000	ODOT Let	Active
2004	9016	MAH	00080	3.81	4.54	0.73	4	Expansion	Major Widening	7,180,000	ODOT Let	Sold
2013	77259	MAH	00080	4.00	5.00	1.00	4	Expansion	Major Reconstruction	52,100,000	ODOT Let	Candidate
2013	77260	MAH	00080	4.50	5.75	1.25	4	Expansion	Major Widening	71,900,000	ODOT Let	Candidate
2004	20958	MAH	00100	4.01	4.21	0.20	4	Expansion	Intersection	485,000	Local Let	Active
2009	76321	MAH	00164	4.79	7.43	2.64	3	Preservation	Minor Rehabilitation - Pavement	1,840,000	ODOT Let	Active
2004	22465	MAH	00165	0.00	0.66	0.66	3	Preservation	Resurfacing, Undivided System	720,000	ODOT Let	Active
2004	22465	MAH	00165	0.66	1.67	1.01	3	Preservation	Resurfacing, Undivided System	720,000	ODOT Let	Active
2004	22465	MAH	00165	1.67	1.74	0.07	3	Preservation	Resurfacing, Undivided System	720,000	ODOT Let	Active
2006	21187	MAH	00165	5.85	5.95	0.10	3	Safety	Spot Safety	1,095,000	ODOT Let	Active
2006	21187	MAH	00165	7.60	8.69	1.09	3	Safety	Spot Safety	1,095,000	ODOT Let	Active
2006	21187	MAH	00165	11.80	12.08	0.28	3	Safety	Spot Safety	1,095,000	ODOT Let	Active
2006	21187	MAH	00165	16.03	16.44	0.41	3	Safety	Spot Safety	1,095,000	ODOT Let	Active
2006	25292	MAH	00165	16.64	20.45	3.81	3	Preservation	Minor Rehabilitation - Pavement	1,600,000	ODOT Let	Active
2006	21187	MAH	00165	20.62	21.80	1.18	3	Safety	Spot Safety	1,095,000	ODOT Let	Active
2007	25580	MAH	00165	24.26	25.95	1.69	3	Preservation	Minor Rehabilitation - Pavement	1,250,000	ODOT Let	Active
2007	25580	MAH	00170	0.80	1.49	0.69	3	Preservation	Minor Rehabilitation - Pavement	1,250,000	ODOT Let	Active
2009	76321	MAH	00170	0.86	0.95	0.09	3	Preservation	Minor Rehabilitation - Pavement	1,840,000	ODOT Let	Active
2007	25580	MAH	00170	1.49	5.60	4.11	3	Preservation	Minor Rehabilitation - Pavement	1,250,000	ODOT Let	Active
2006	21187	MAH	00170	6.80	7.00	0.20	3	Safety	Spot Safety	1,095,000	ODOT Let	Active
2007	25580	MAH	00170	6.93	9.40	2.47	3	Preservation	Minor Rehabilitation - Pavement	1,250,000	ODOT Let	Active
2006	21187	MAH	00170	9.18	9.22	0.04	3	Safety	Spot Safety	1,095,000	ODOT Let	Active
2007	25580	MAH	00170	10.52	10.94	0.42	3	Preservation	Minor Rehabilitation - Pavement	1,250,000	ODOT Let	Active
2007	25580	MAH	00170	12.56	13.62	1.06	3	Preservation	Minor Rehabilitation - Pavement	1,250,000	ODOT Let	Active
2006	25479	MAH	00193	1.03	2.57	1.54	3	Preservation	Minor Rehabilitation - Pavement	308,000	ODOT Let	Active
2004	19849	MAH	00224	11.24	11.40	0.16	3	Preservation	Resurfacing, Undivided System	1,963,959	ODOT Let	Sold
2004	19849	MAH	00224	11.41	12.68	1.27	3	Preservation	Resurfacing, Undivided System	1,963,959	ODOT Let	Sold
2008	25506	MAH	00224	15.95	18.23	2.28	3	Preservation	Minor Rehabilitation - Pavement	1,030,000	ODOT Let	Active
2004	20728	MAH	00224	18.22	20.16	1.94	3	Safety	Spot Safety	594,639	ODOT Let	Sold
2004	20728	MAH	00224	20.16	20.72	0.56	3	Safety	Spot Safety	594,639	ODOT Let	Sold
2006	19828	MAH	00224	20.72	20.80	0.08	3	Preservation	Resurfacing, Undivided System	2,510,000	ODOT Let	Active
2006	19828	MAH	00224	20.80	25.35	4.55	3	Preservation	Resurfacing, Undivided System	2,510,000	ODOT Let	Active
2004	77079	MAH	00289	0.00	2.05	2.05	3	Preservation	Resurfacing, Divided System	536,000	ODOT Let	Sold
2004	77079	MAH	00289	0.15	0.60	0.45	3	Preservation	Resurfacing, Divided System	536,000	ODOT Let	Sold
2004	24310	MAH	00289	7.28	9.57	2.29	3	Preservation	Resurfacing, Undivided System	265,396	ODOT Let	Sold
2004	24310	MAH	00289	9.58	9.93	0.35	3	Preservation	Resurfacing, Undivided System	265,396	ODOT Let	Sold
2004	77079	MAH	00422	0.86	1.89	1.03	3	Preservation	Resurfacing, Divided System	536,000	ODOT Let	Sold
2007	25279	MAH	00422	1.94	3.13	1.19	3	Preservation	Minor Rehabilitation - Pavement	2,000,000	ODOT Let	Active
2007	25279	MAH	00422	3.13	3.29	0.16	3	Preservation	Minor Rehabilitation - Pavement	2,000,000	ODOT Let	Active
2007	25279	MAH	00422	3.67	3.90	0.23	3	Preservation	Minor Rehabilitation - Pavement	2,000,000	ODOT Let	Active
2004	23941	MAH	00422	3.90	7.58	3.68	3	Preservation	Minor Rehabilitation - Pavement	835,000	ODOT Let	Active
2008	25507	MAH	00534	0.00	1.79	1.79	3	Preservation	Minor Rehabilitation - Pavement	189,000	ODOT Let	Active
2004	22465	MAH	00534	3.02	8.62	5.58	3	Preservation	Resurfacing, Undivided System	720,000	ODOT Let	Active
2008	25506	MAH	00616	1.12	2.94	1.82	3	Preservation	Minor Rehabilitation - Pavement	1,030,000	ODOT Let	Active
2008	25506	MAH	00616	3.30	5.81	2.51	3	Preservation	Minor Rehabilitation - Pavement	1,030,000	ODOT Let	Active
2009	76326	MAH	00616	5.41	8.88	3.47	3	Preservation	Minor Rehabilitation - Pavement	955,000	ODOT Let	Active
2006	21187	MAH	00617	0.00	0.10	0.10	3	Safety	Spot Safety	1,095,000	ODOT Let	Active
2009	76321	MAH	00617	0.00	3.68	3.68	3	Preservation	Minor Rehabilitation - Pavement	1,840,000	ODOT Let	Active
2006	21187	MAH	00617	1.56	2.06	0.50	3	Safety	Spot Safety	1,095,000	ODOT Let	Active
2004	22465	MAH	00617	3.77	4.74	0.97	3	Preservation	Resurfacing, Undivided System	720,000	ODOT Let	Active
2005	23884	MAH	00625	3.04	3.36	0.32	3	Preservation	Resurfacing, Undivided System	470,000	ODOT Let	Active
2007	25580	MAH	00630	0.00	2.56	2.56	3	Preservation	Minor Rehabilitation - Pavement	1,250,000	ODOT Let	Active
2011	76328	MAH	00680	0.00	4.06	4.06	3	Preservation	Minor Rehabilitation - Pavement	1,624,000	ODOT Let	Active
2008	25508	MAH	00680	4.06	6.98	2.92	3	Preservation	Minor Rehabilitation - Pavement	7,601,200	ODOT Let	Active
2009	22466	MAH	00680	6.98	11.98	5.00	3	Preservation	Resurfacing, Divided System	2,273,000	ODOT Let	Active
2008	23905	MAH	00680	11.85	16.43	4.58	3	Preservation	Resurfacing, Divided System	1,832,000	ODOT Let	Active
2004	20754	MAH	00711	0.00	1.40	1.40	4	New Alignment/Profil	New Construction	34,837,801	ODOT Let	Sold

Mill Creek Watershed
Sub-Watershed 05030103080010
Ohio Wetlands Inventory

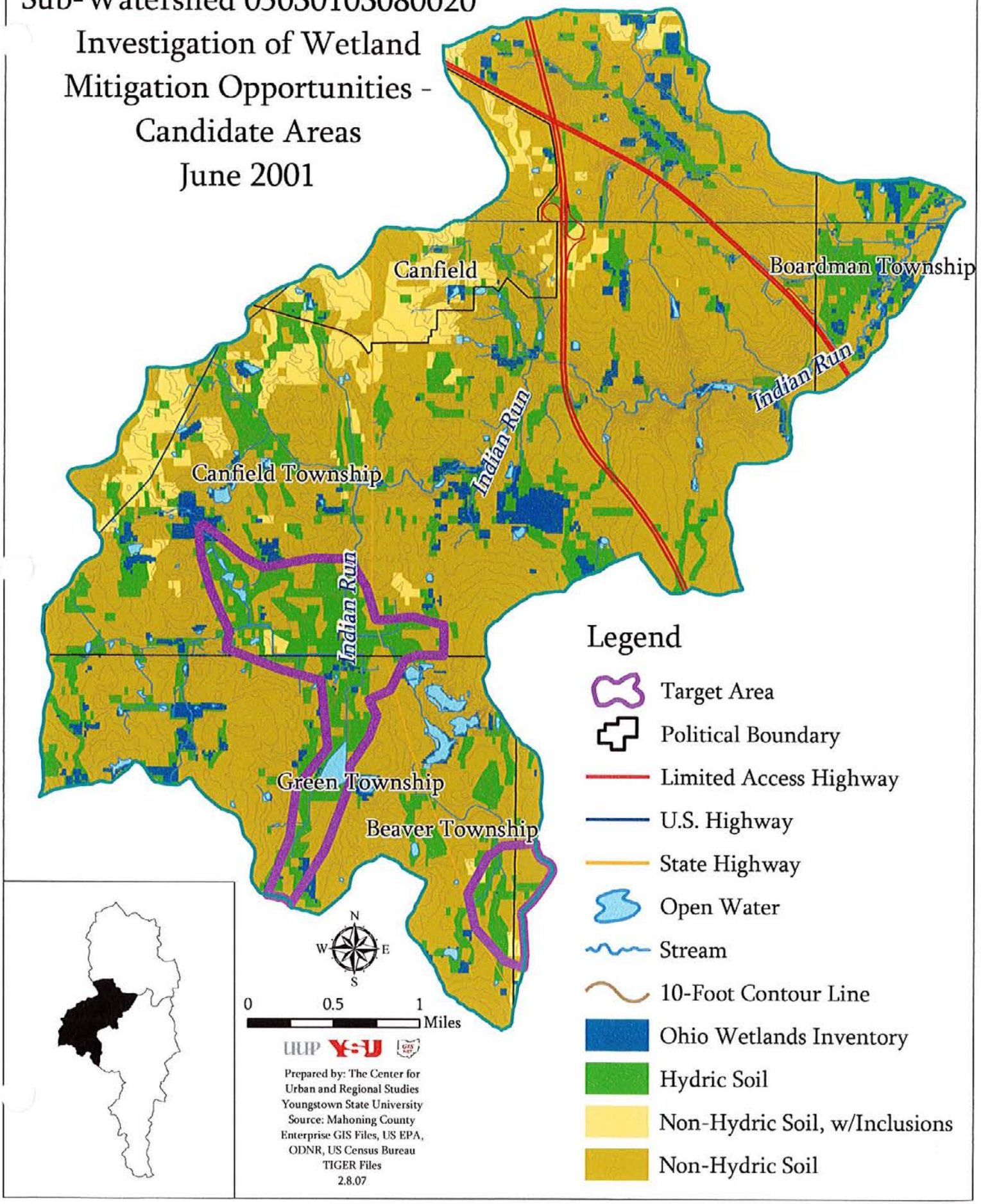


Legend

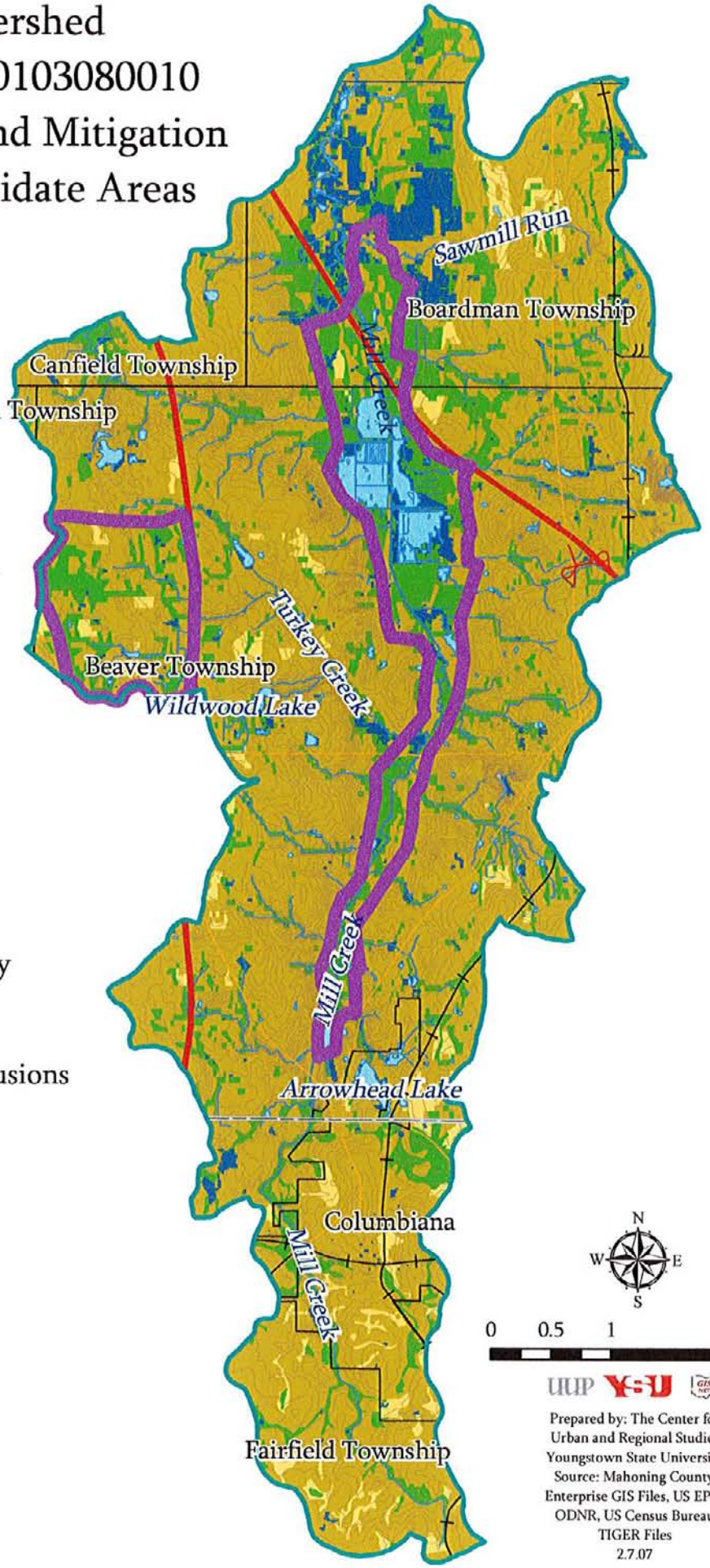
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream
- Farmed Wetland (wet meadow in agricultural areas)
- Shallow Marsh (emergent vegetation in water <3 ft)
- Shrub/Scrub Wetland (emergent woody veg. in water <3 ft)
- Upland Woods
- Wet Meadow (grassy vegetation in water <6 inches)
- Woods on Hydric Soils

Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

Mill Creek Watershed
Sub-Watershed 05030103080020
Investigation of Wetland Mitigation Opportunities - Candidate Areas
June 2001



Mill Creek Watershed
Sub-Watershed 05030103080010
Investigation of Wetland Mitigation Opportunities - Candidate Areas
June 2001



Legend

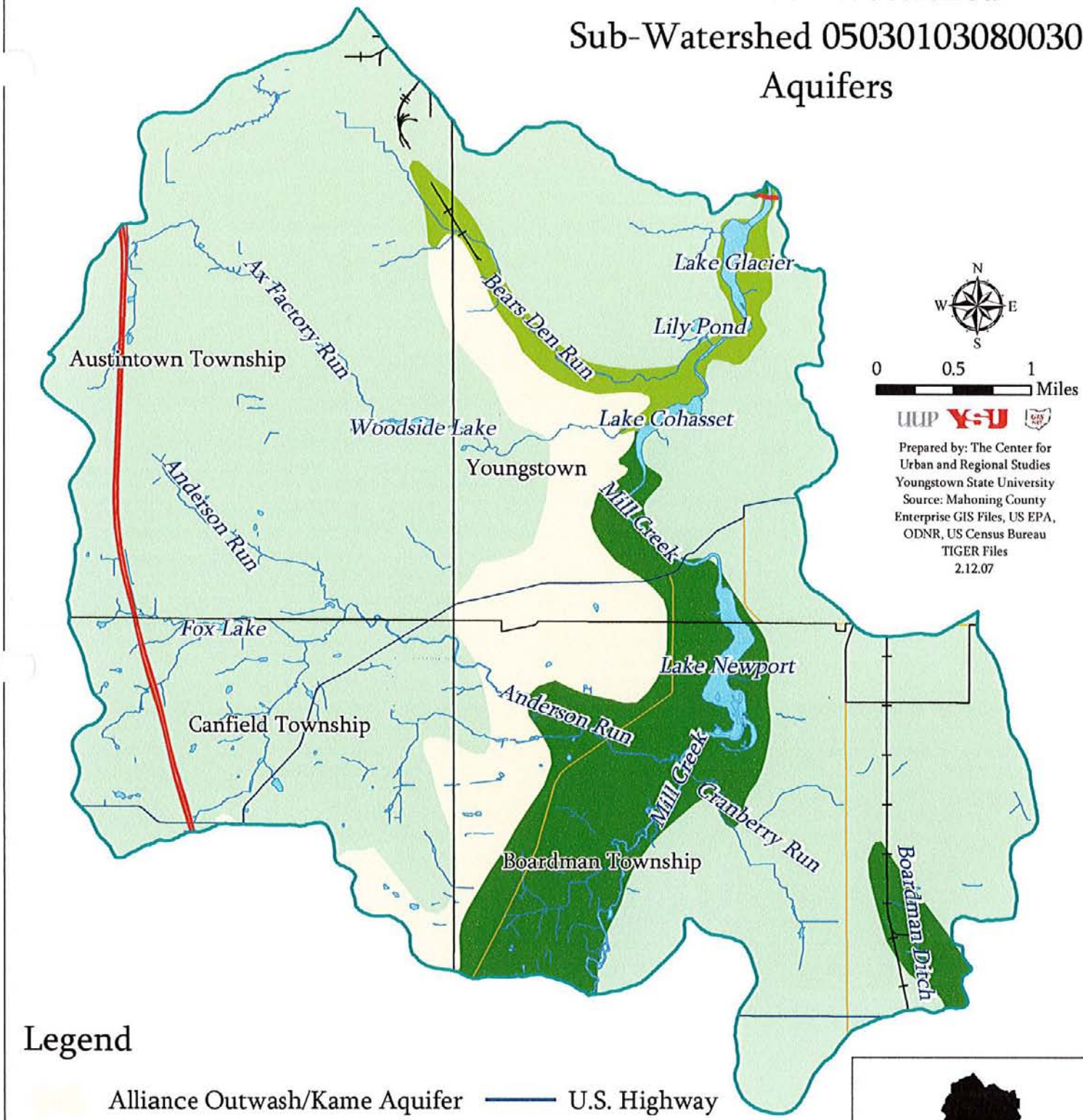
- Target Area
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream
- 10-Foot Contour Line
- Ohio Wetlands Inventory
- Hydric Soil
- Non-Hydric Soil, w/Inclusions
- Non-Hydric Soil

Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

Appendix E.

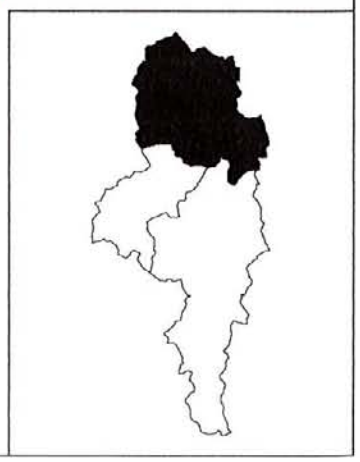
Groundwater and Aquifers

Mill Creek Watershed
Sub-Watershed 05030103080030
Aquifers

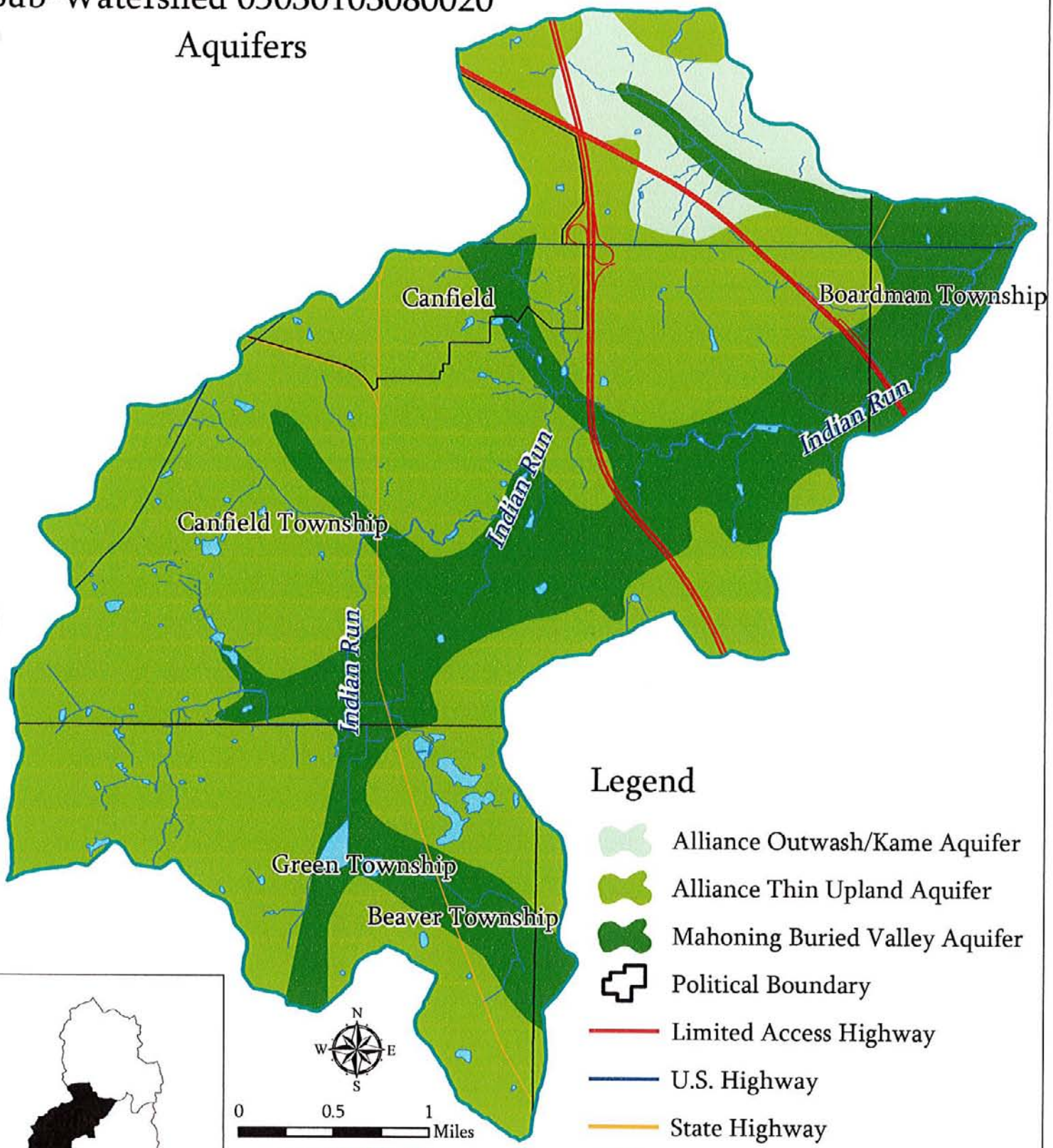


Legend

- Alliance Outwash/Kame Aquifer
- Alliance Thin Upland Aquifer
- Mahoning Alluvial Aquifer
- Mahoning Buried Valley Aquifer
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream

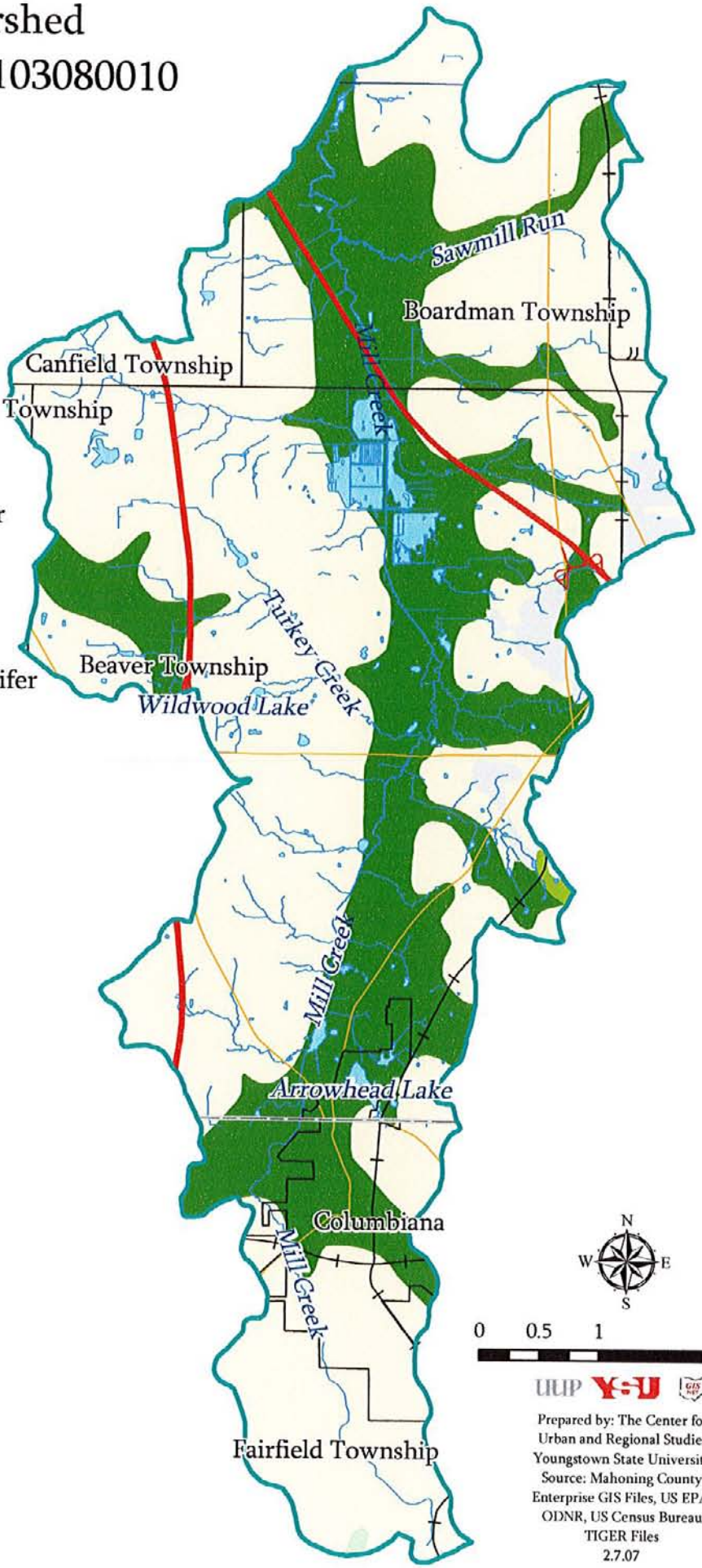


Mill Creek Watershed
Sub-Watershed 05030103080020
Aquifers



Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.8.07

Mill Creek Watershed
Sub-Watershed 05030103080010
Aquifers



Legend

- Alliance Thin Upland Aquifer
- Lisbon Thin Upland Aquifer
- Little Beaver Ck Buried Valley Aquifer
- Mahoning Buried Valley Aquifer
- N/A
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream

Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
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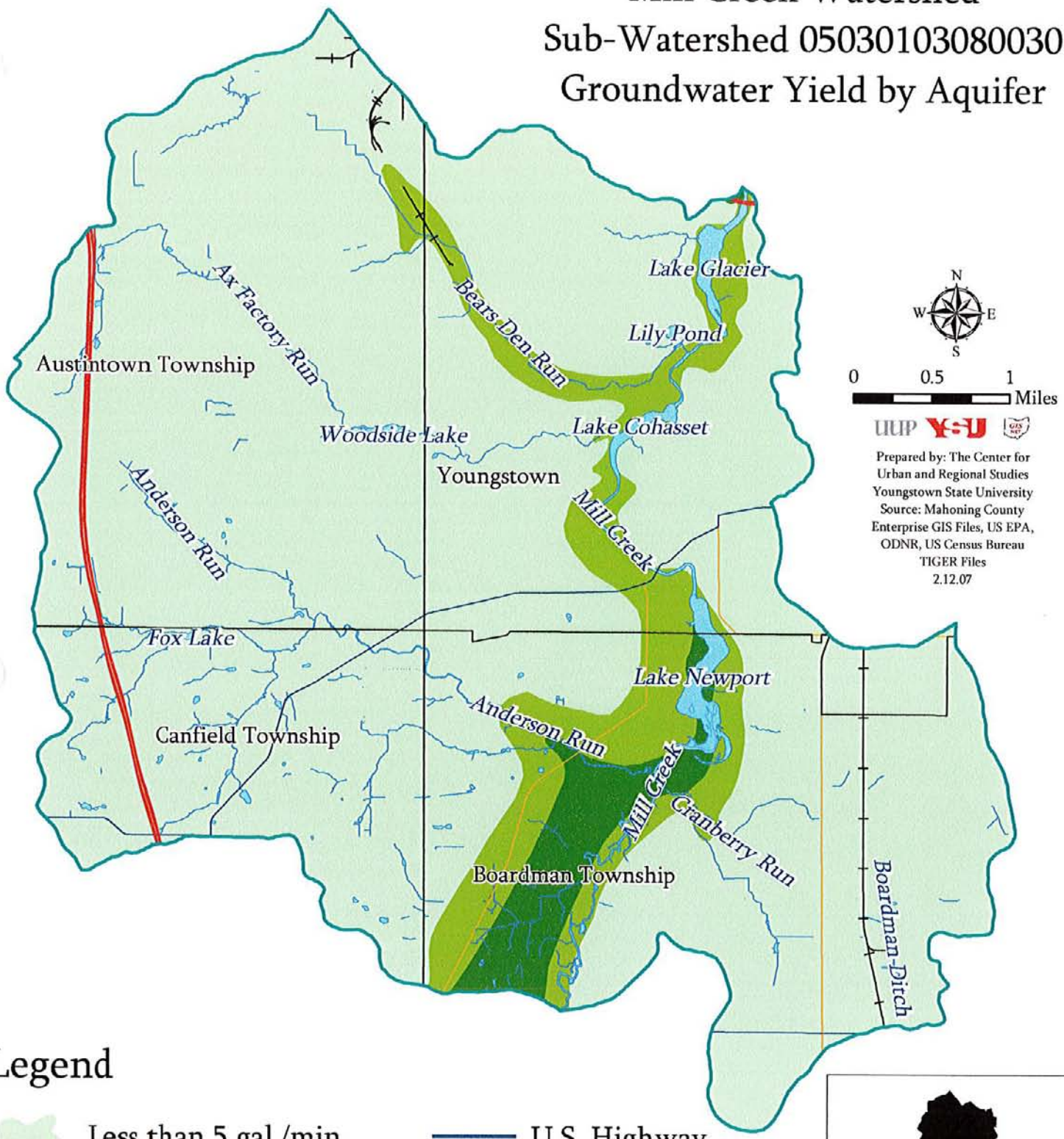
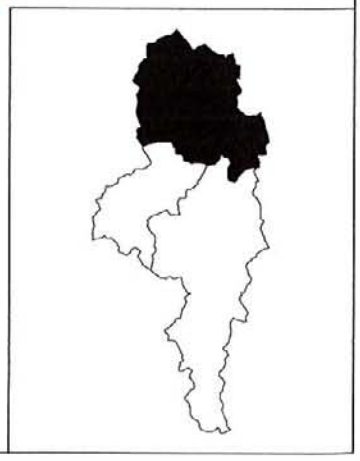
Mill Creek Watershed
Sub-Watershed 05030103080030
Groundwater Yield by Aquifer



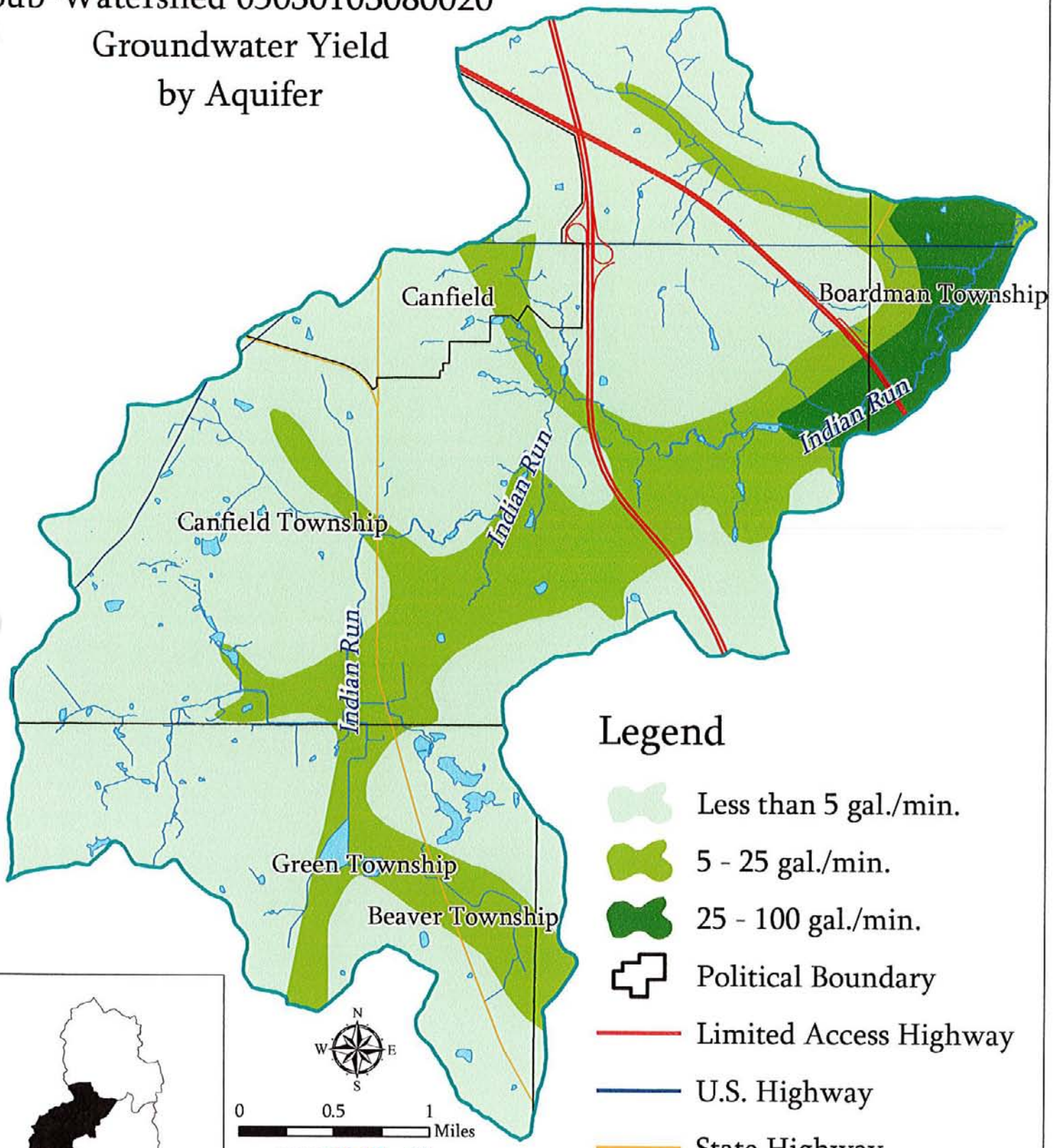
Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.12.07

Legend

- Less than 5 gal./min.
- 5 - 25 gal./min.
- 25 - 100 gal./min.
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



Mill Creek Watershed
Sub-Watershed 05030103080020
Groundwater Yield
by Aquifer

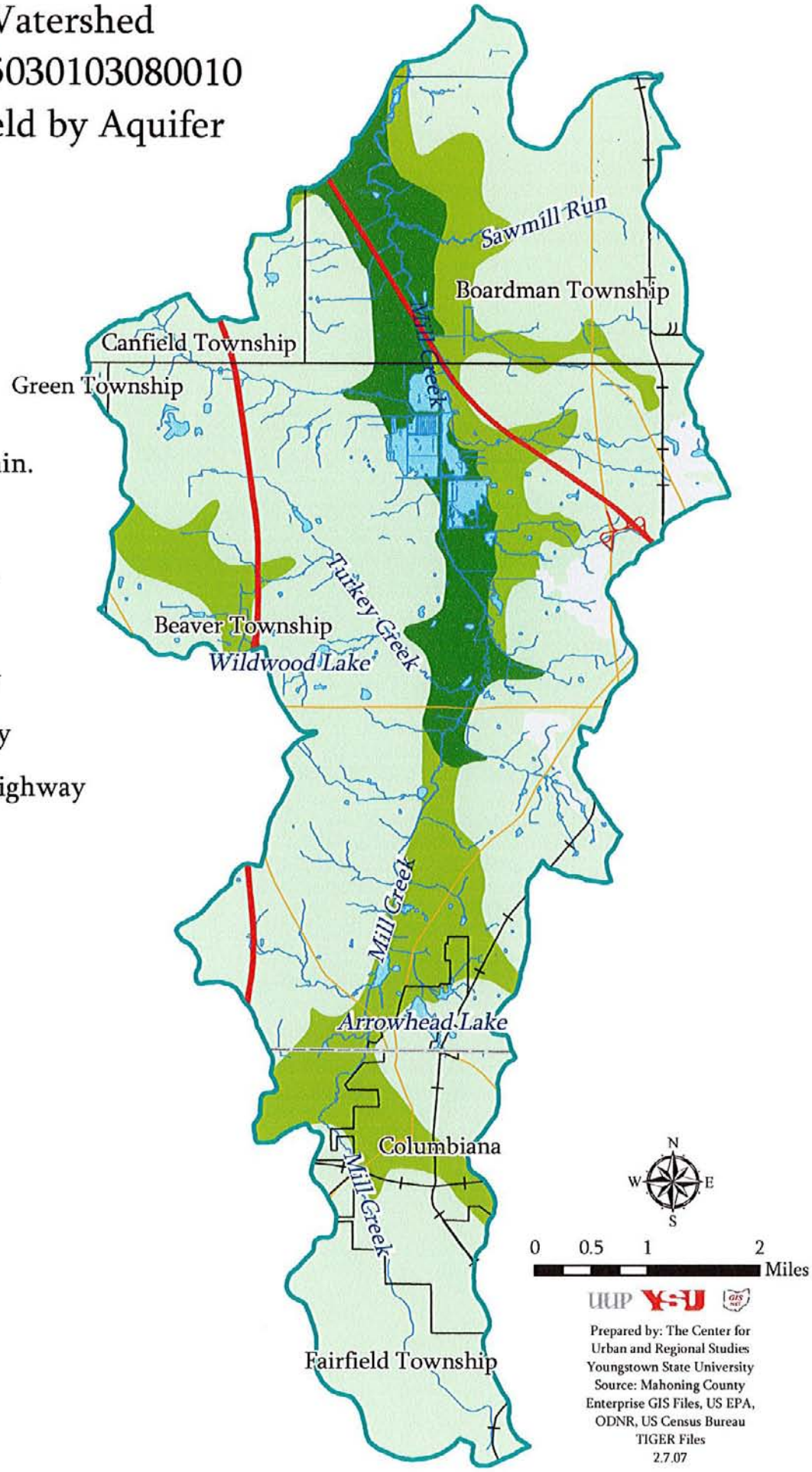


Legend

- Less than 5 gal./min.
- 5 - 25 gal./min.
- 25 - 100 gal./min.
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Open Water
- Stream

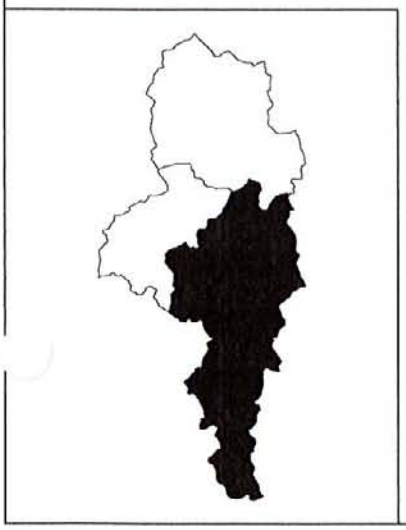
Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.8.07

Mill Creek Watershed
Sub-Watershed 05030103080010
Groundwater Yield by Aquifer

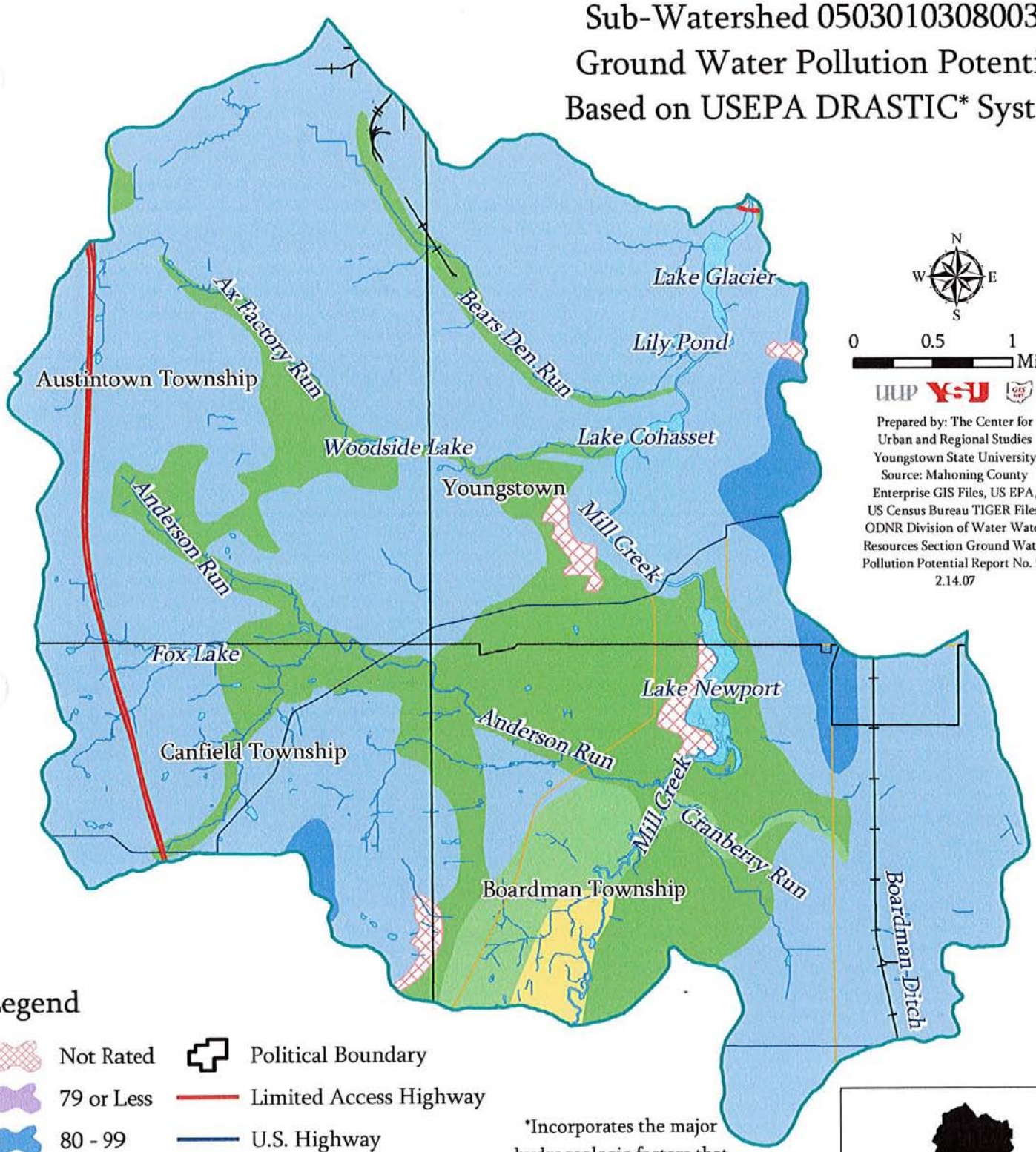


Legend

- Less than 5 gal./min.
- 5 - 25 gal./min.
- 25 - 100 gal./min.
- N/A
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



Mill Creek Watershed
Sub-Watershed 05030103080030
Ground Water Pollution Potential
Based on USEPA DRASTIC* System



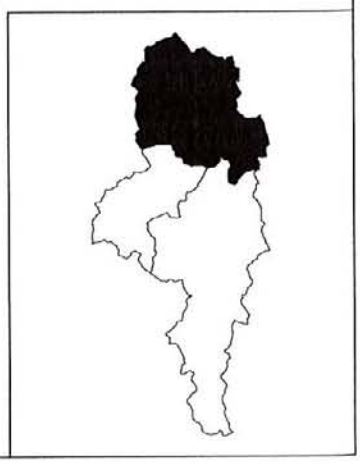
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, US Census Bureau TIGER Files, ODNR Division of Water Water Resources Section Ground Water Pollution Potential Report No. 51
2.14.07

Legend

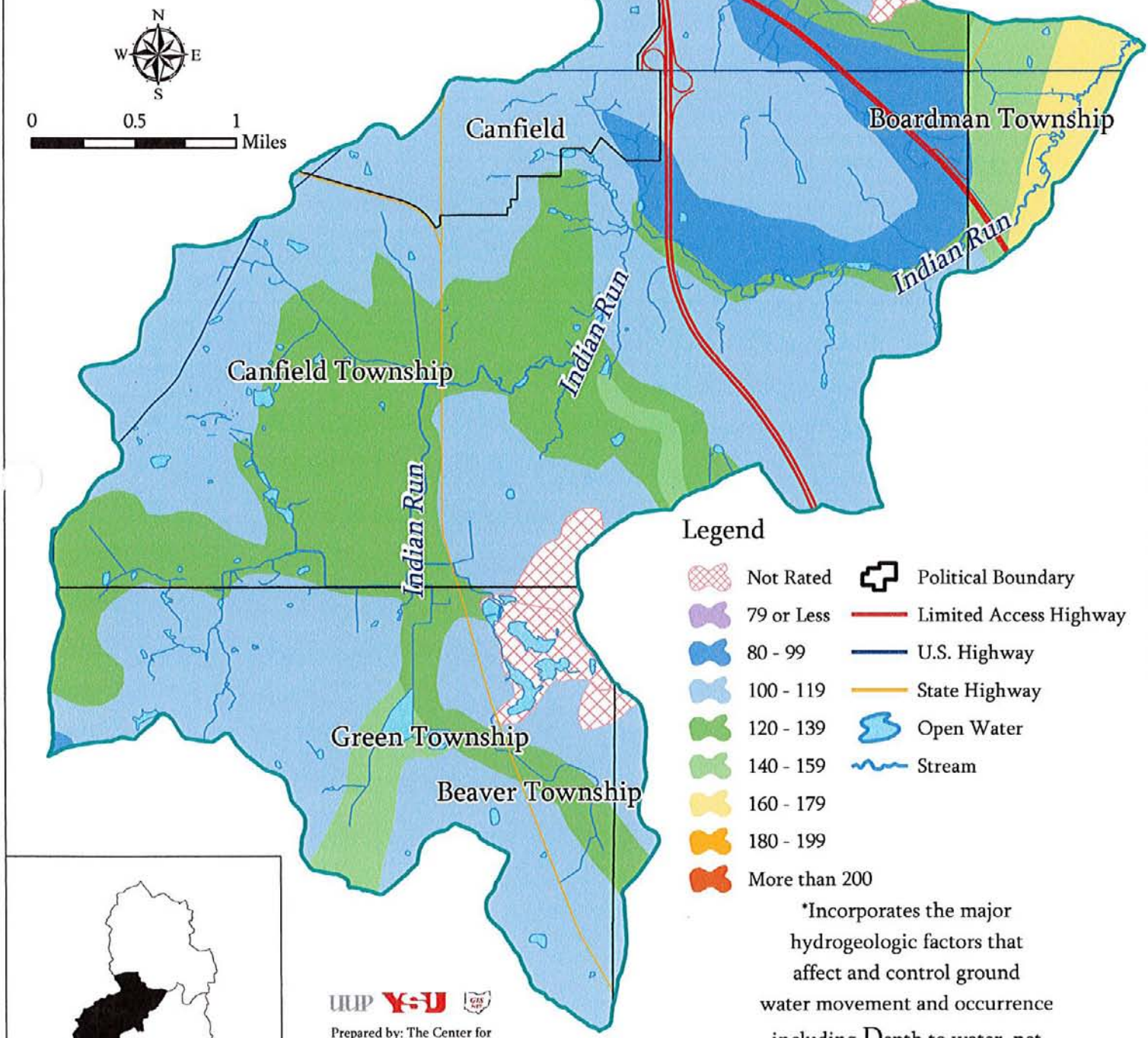
- Not Rated
- 79 or Less
- 80 - 99
- 100 - 119
- 120 - 139
- 140 - 159
- 160 - 179
- 180 - 199
- More than 200

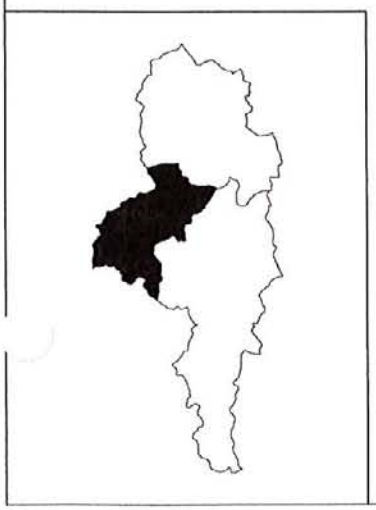
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream

*Incorporates the major hydrogeologic factors that affect and control ground water movement and occurrence including Depth to water, net Recharge, Aquifer media, Soil media, Topography, Impact of the vadose zone media, and hydraulic Conductivity of the aquifer (ODNR)



Mill Creek Watershed
Sub-Watershed 05030103080020
Ground Water Pollution Potential Based on USEPA DRASTIC* System

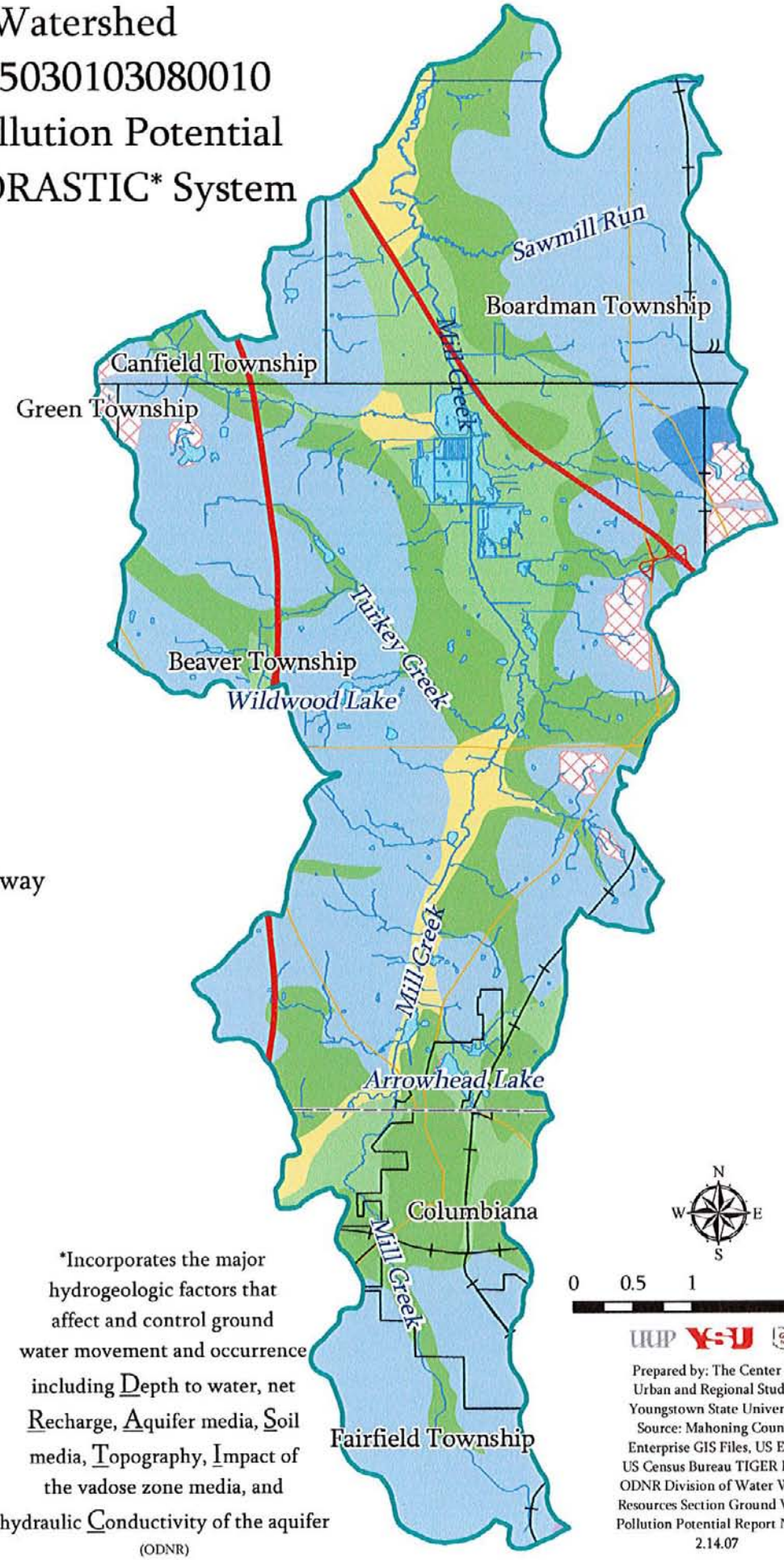




Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, US Census Bureau TIGER Files, ODNR Division of Water Water Resources Section Ground Water Pollution Potential Report No. 51
2.14.07

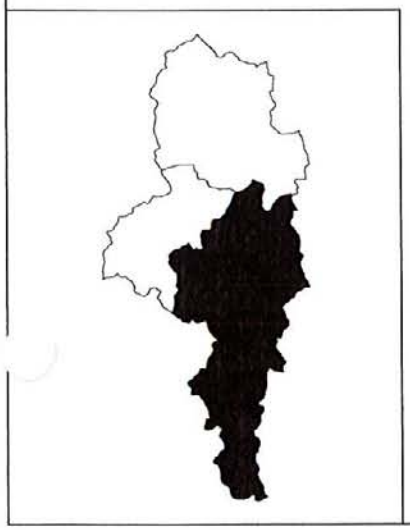
*Incorporates the major hydrogeologic factors that affect and control ground water movement and occurrence including Depth to water, net Recharge, Aquifer media, Soil media, Topography, Impact of the vadose zone media, and hydraulic Conductivity of the aquifer (ODNR)

Mill Creek Watershed
Sub-Watershed 05030103080010
Ground Water Pollution Potential
Based on USEPA DRASTIC* System



Legend

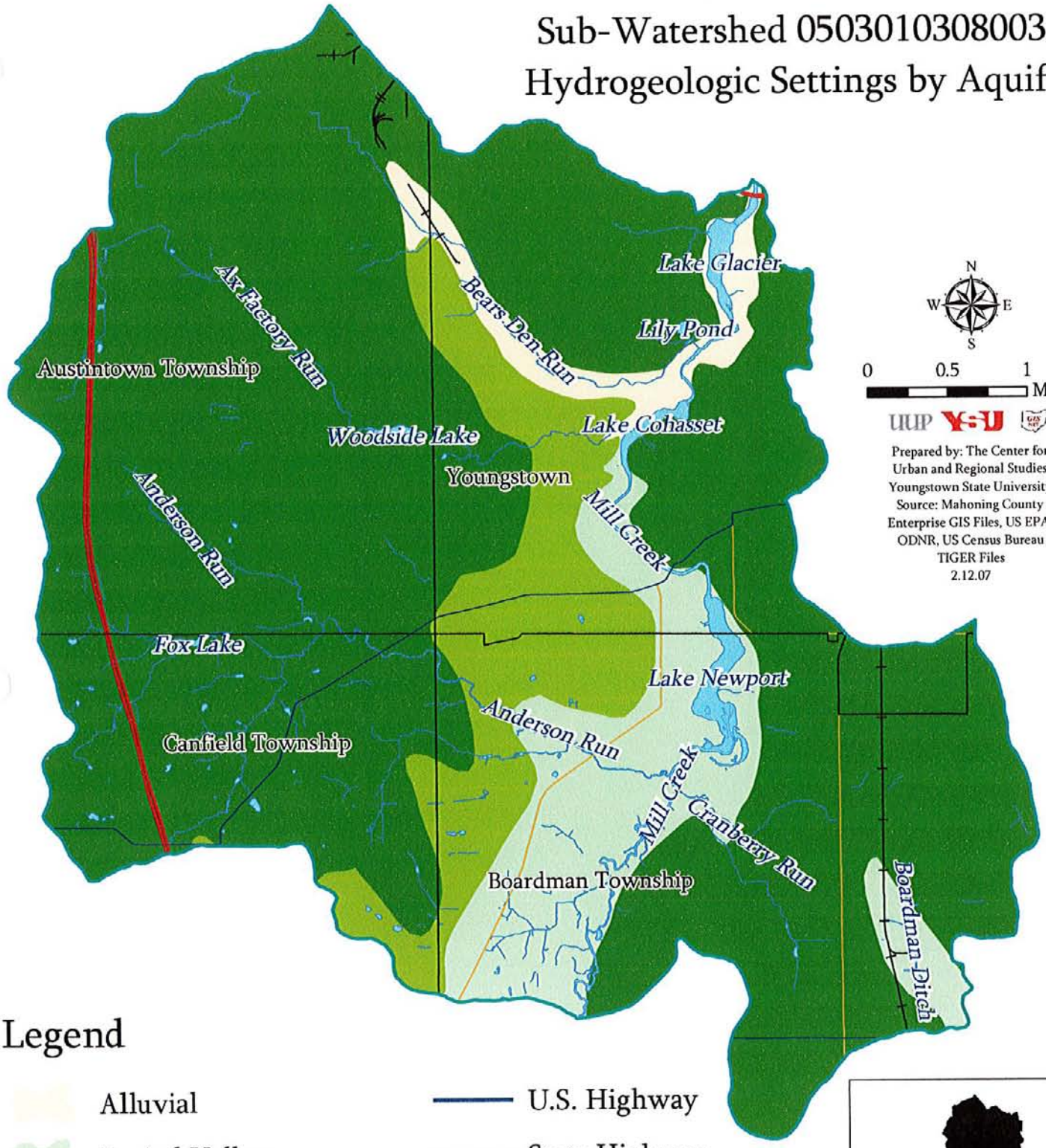
- Not Rated
- 79 or Less
- 80 - 99
- 100 - 119
- 120 - 139
- 140 - 159
- 160 - 179
- 180 - 199
- More than 200
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



*Incorporates the major hydrogeologic factors that affect and control ground water movement and occurrence including Depth to water, net Recharge, Aquifer media, Soil media, Topography, Impact of the vadose zone media, and hydraulic Conductivity of the aquifer (ODNR)

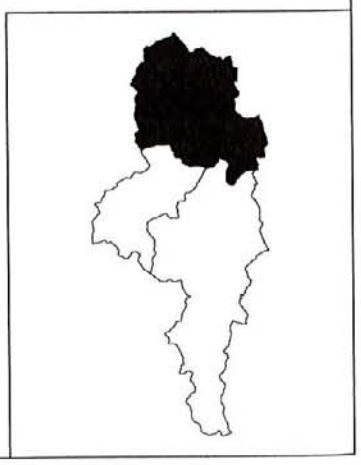
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, US Census Bureau TIGER Files, ODNR Division of Water Water Resources Section Ground Water Pollution Potential Report No. 51
2.14.07

Mill Creek Watershed
Sub-Watershed 05030103080030
Hydrogeologic Settings by Aquifer

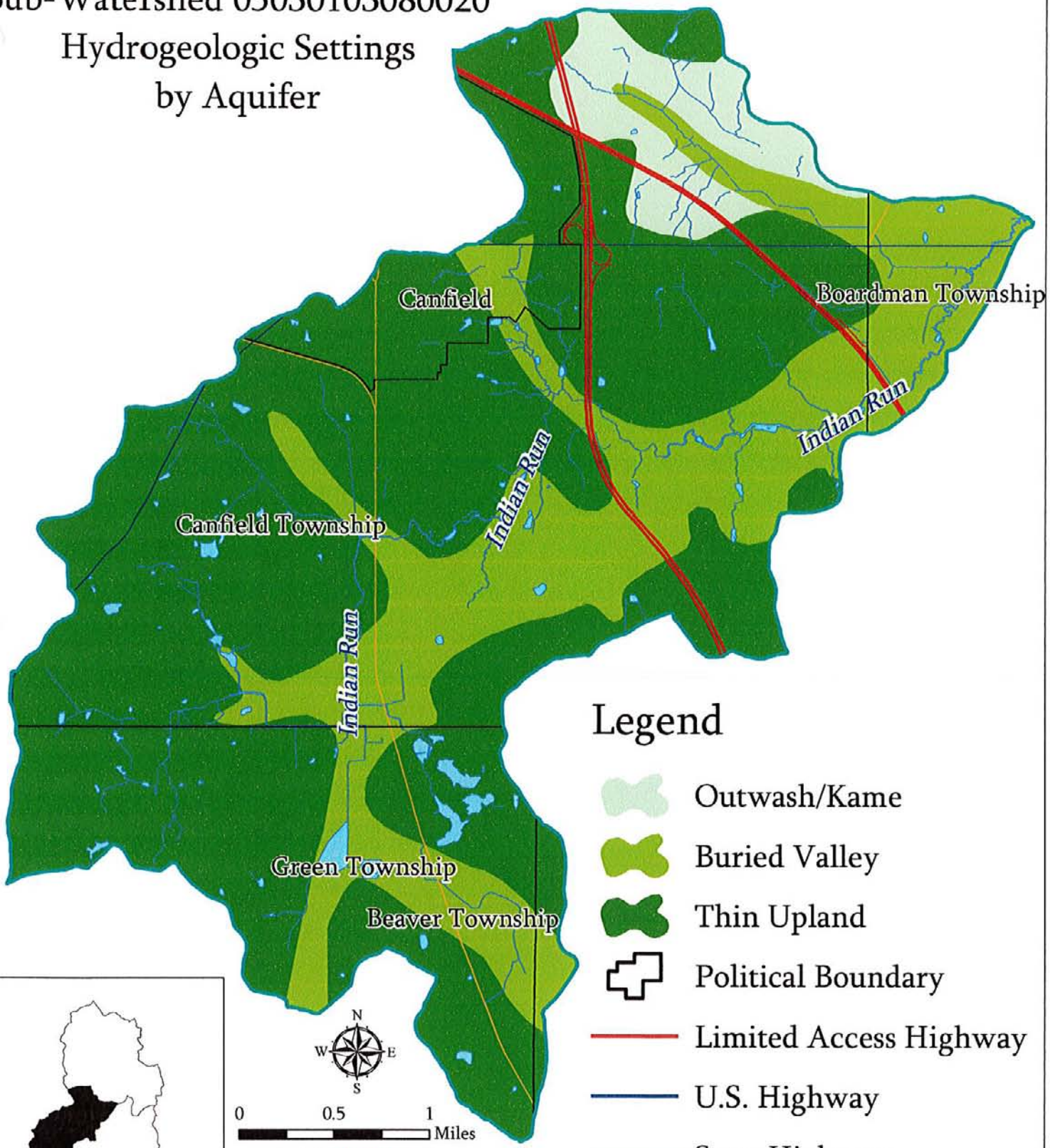


Legend

- Alluvial
- Buried Valley
- Outwash/Kame
- Thin Upland
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



Mill Creek Watershed
Sub-Watershed 05030103080020
Hydrogeologic Settings by Aquifer

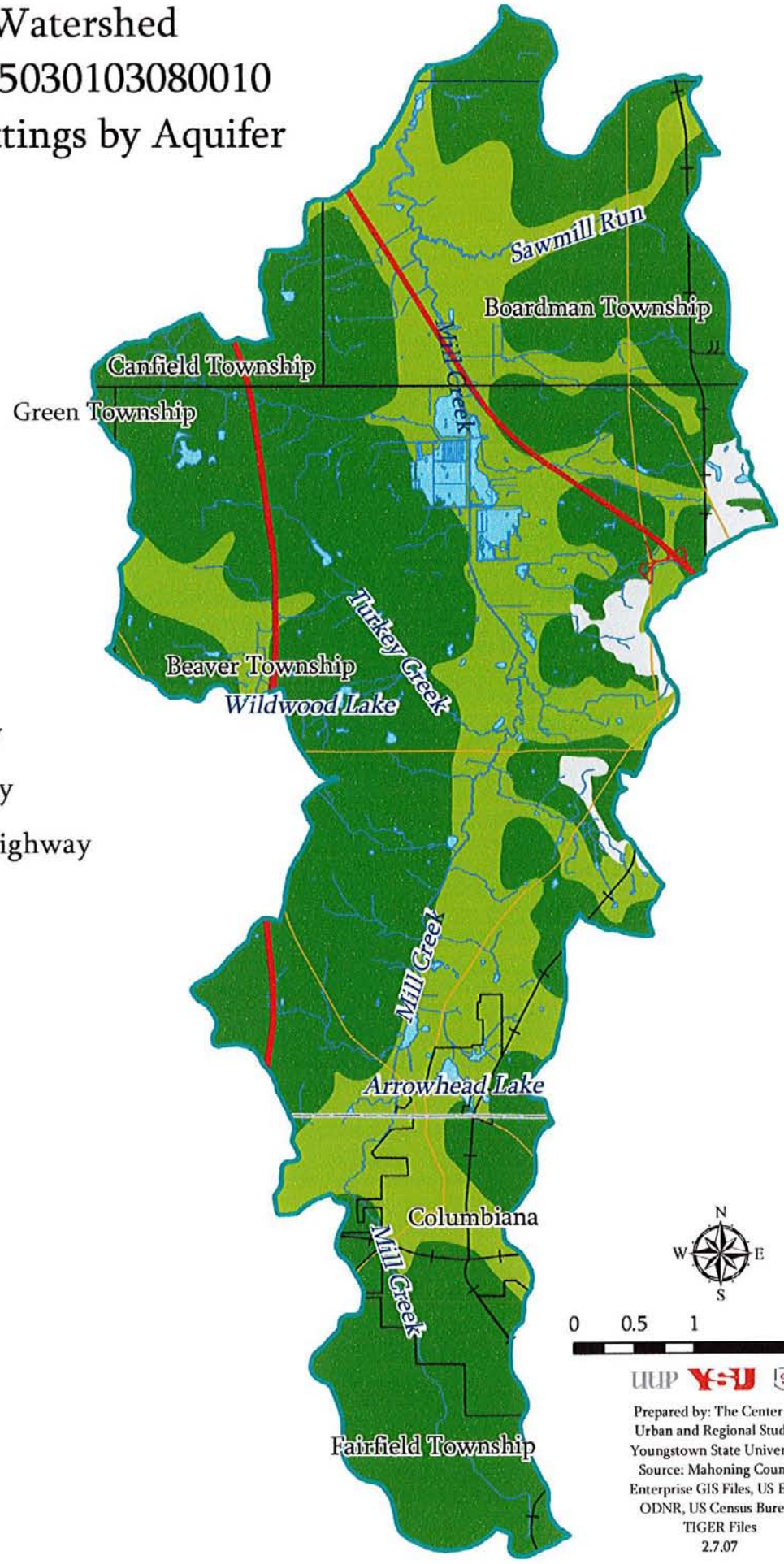


Legend

- Outwash/Kame
- Buried Valley
- Thin Upland
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Open Water
- Stream

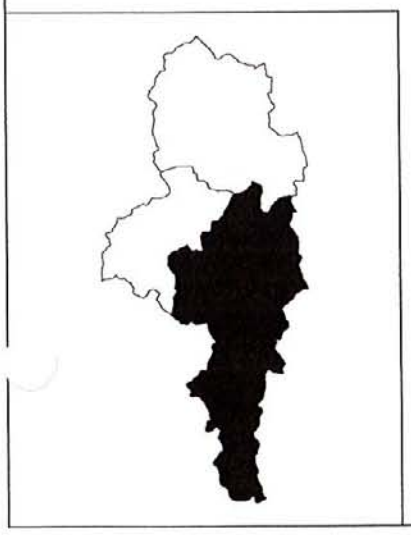
Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.8.07

Mill Creek Watershed
Sub-Watershed 05030103080010
Hydrogeologic Settings by Aquifer

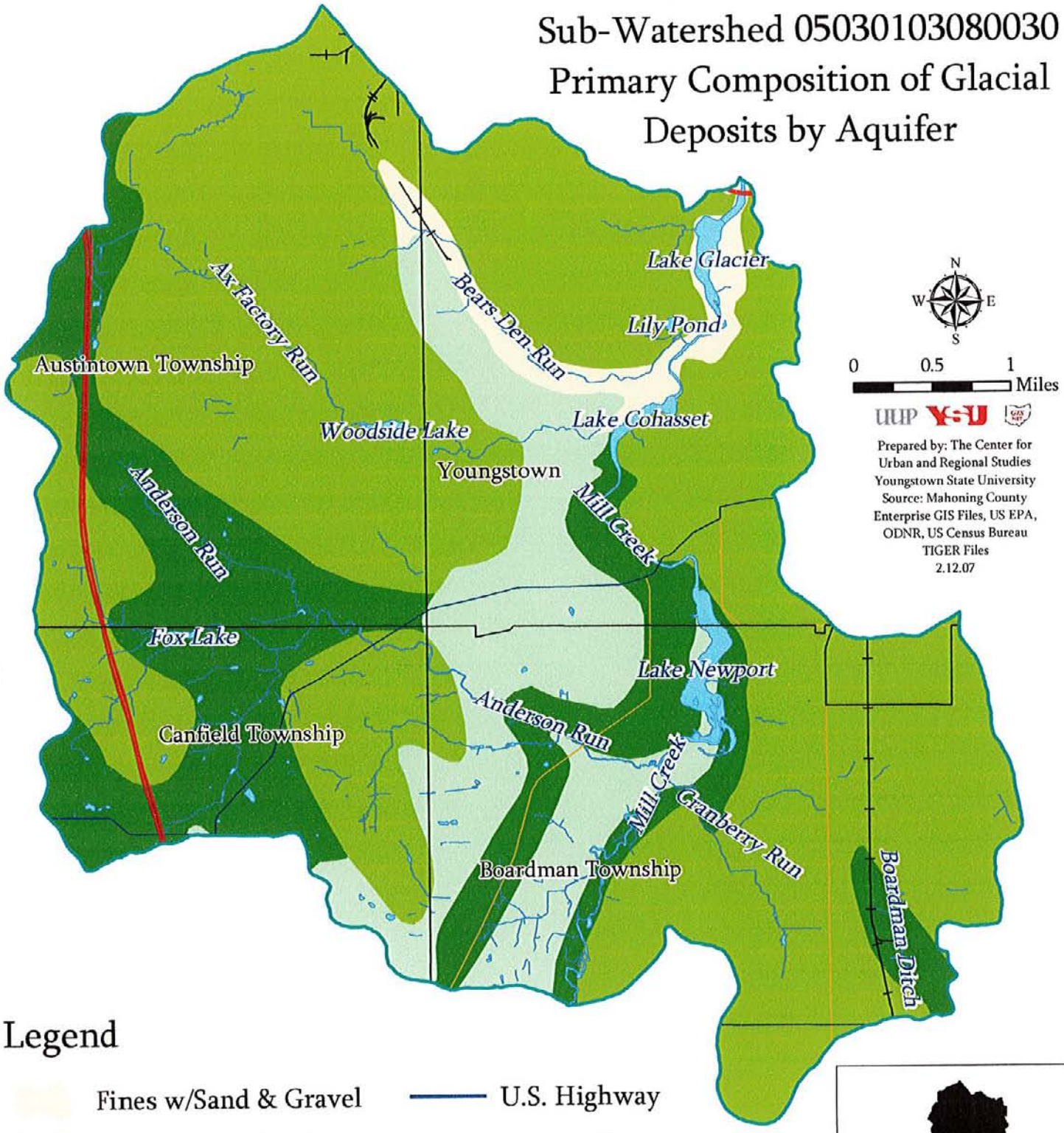


Legend

- Buried Valley
- Thin Upland
- N/A
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream

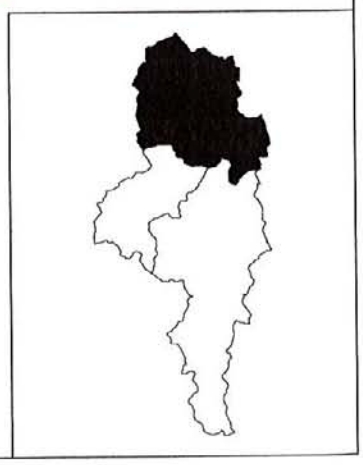


Mill Creek Watershed
Sub-Watershed 05030103080030
Primary Composition of Glacial Deposits by Aquifer

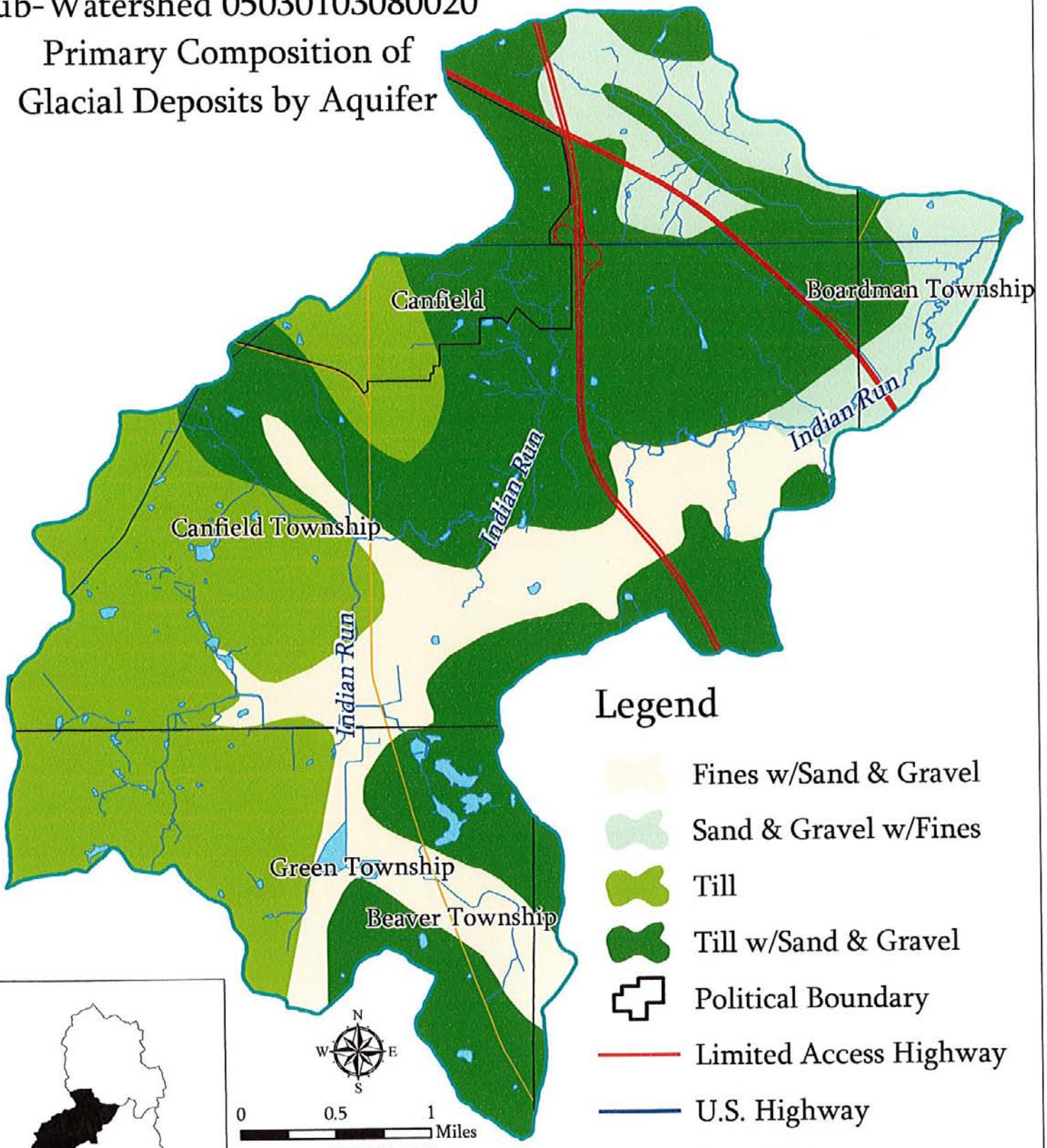


Legend

- Fines w/Sand & Gravel
- Sand & Gravel w/Fines
- Till
- Till w/Sand & Gravel
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream

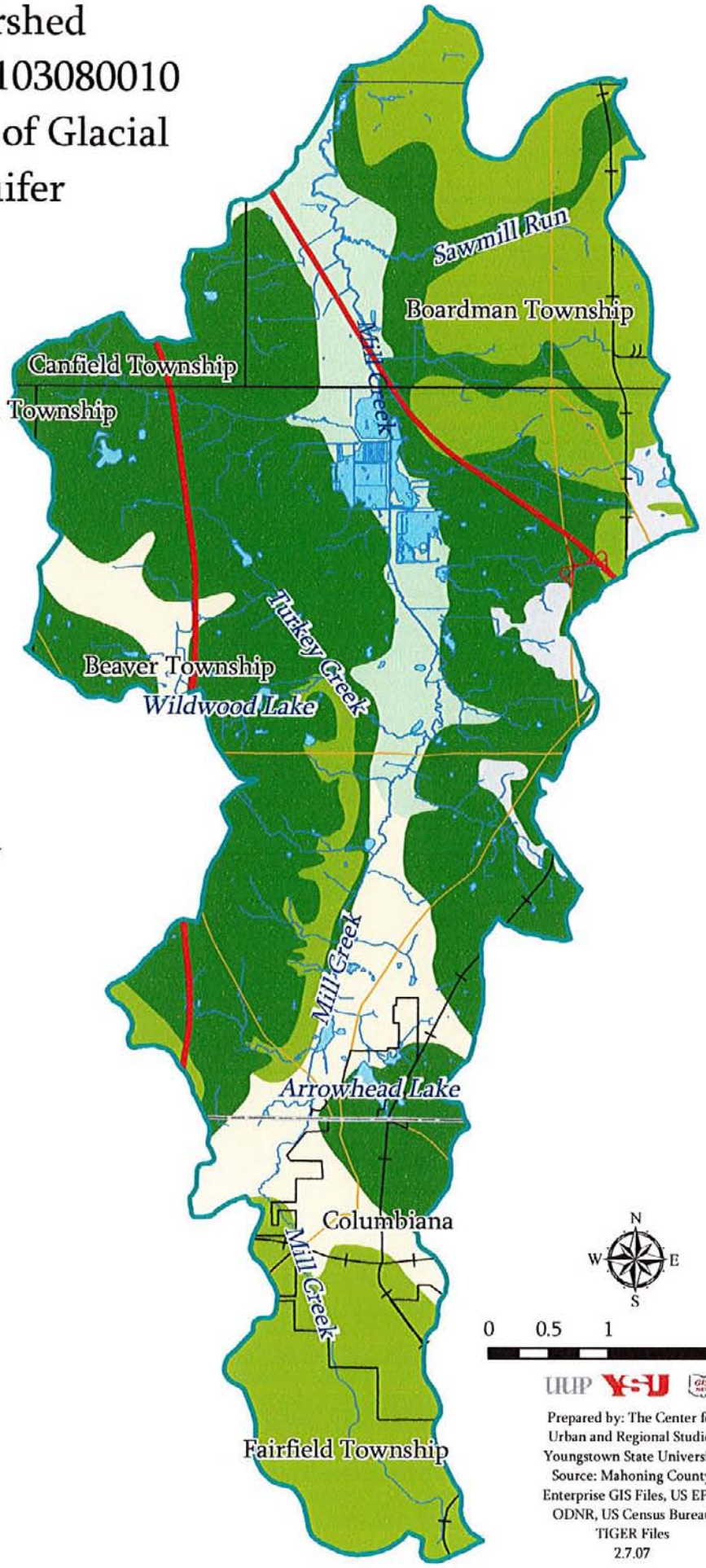


Mill Creek Watershed
Sub-Watershed 05030103080020
Primary Composition of Glacial Deposits by Aquifer



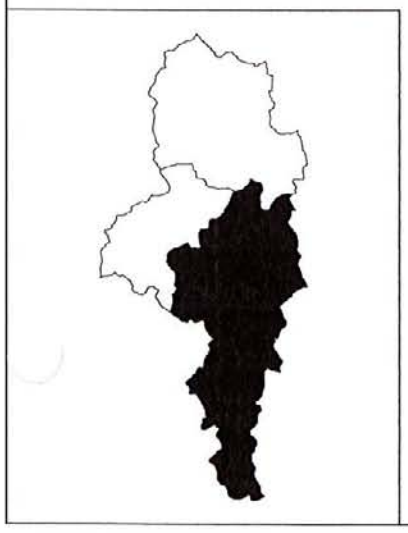
Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.8.07

Mill Creek Watershed
Sub-Watershed 05030103080010
Primary Composition of Glacial Deposits by Aquifer



Legend

- Fines w/Sand & Gravel
- Sand & Gravel w/Fines
- Till
- Till w/Sand & Gravel
- N/A
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



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Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
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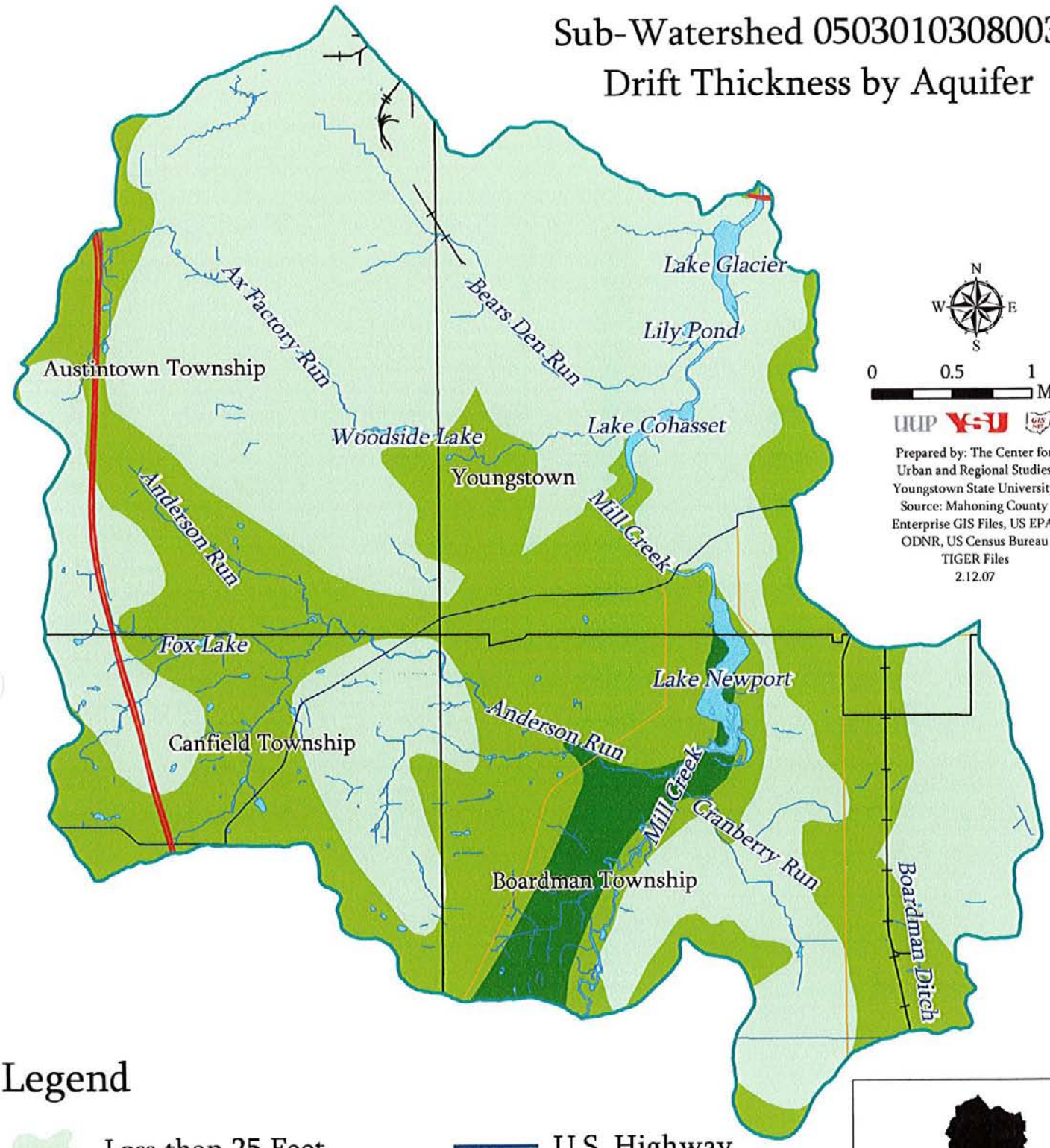
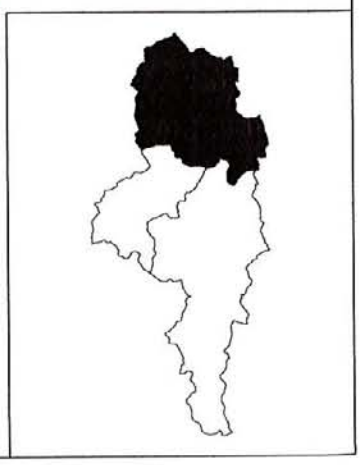
Mill Creek Watershed
Sub-Watershed 05030103080030
Drift Thickness by Aquifer

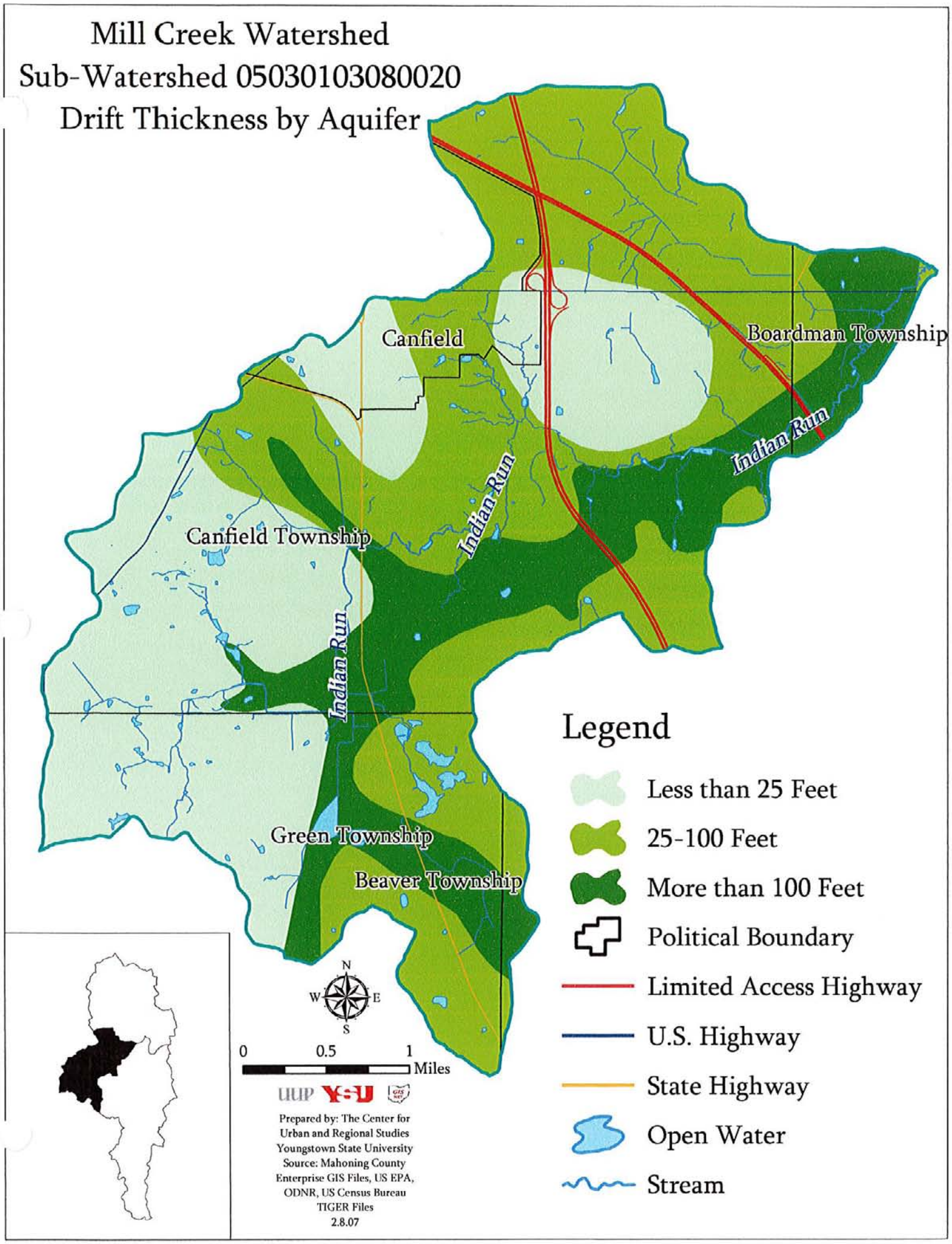


Legend

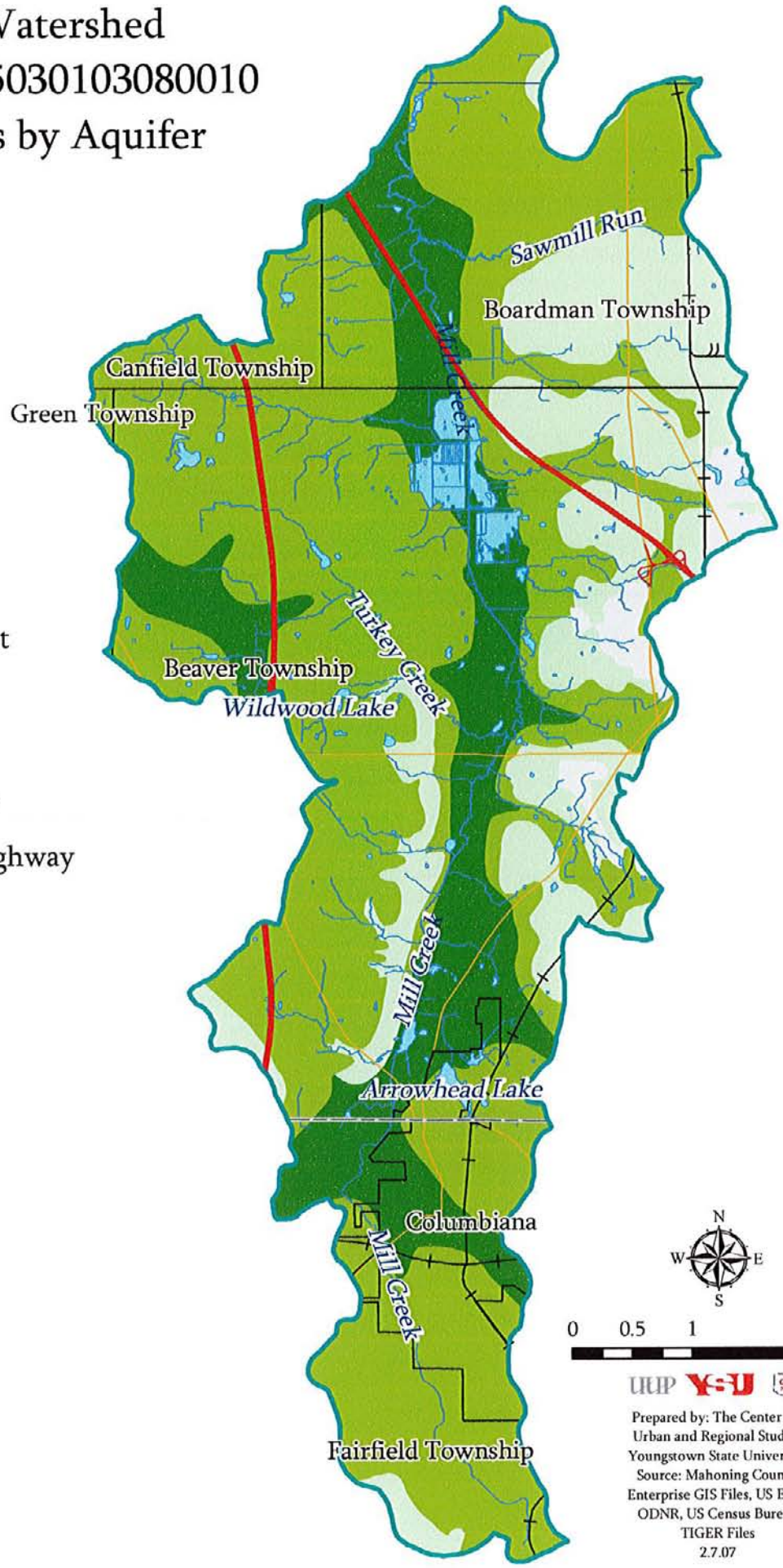
- Less than 25 Feet
- 25-100 Feet
- More than 100 Feet
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



Mill Creek Watershed
Sub-Watershed 05030103080020
Drift Thickness by Aquifer

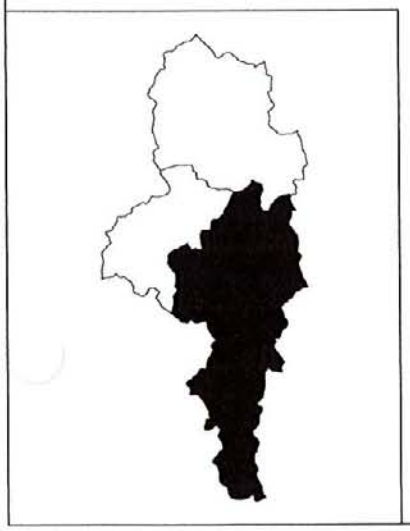


Mill Creek Watershed
Sub-Watershed 05030103080010
Drift Thickness by Aquifer



Legend

- Less than 25 Feet
- 25-100 Feet
- More than 100 Feet
- N/A
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



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Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
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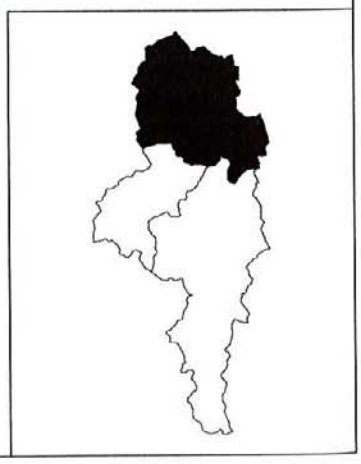
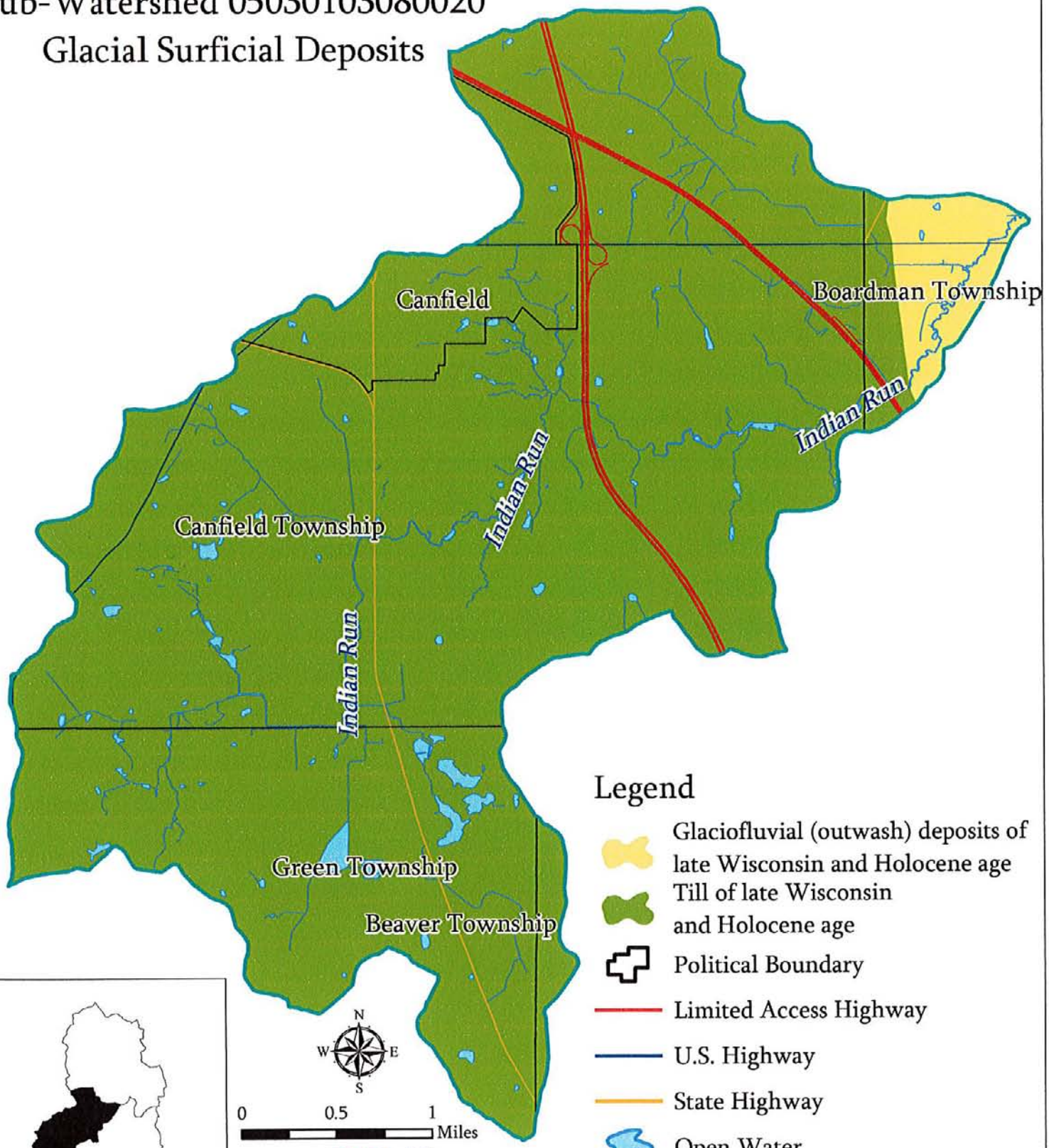
Mill Creek Watershed
Sub-Watershed 05030103080030
Glacial Surficial Deposits

Legend

- Glaciofluvial (outwash) deposits of late Wisconsin and Holocene age
- Till of late Wisconsin and Holocene age
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream

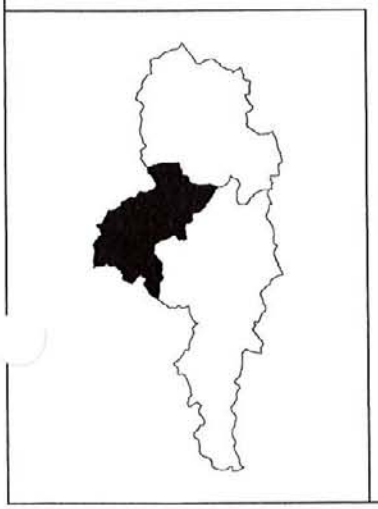


Mill Creek Watershed
Sub-Watershed 05030103080020
Glacial Surficial Deposits



Legend

- Glaciofluvial (outwash) deposits of late Wisconsin and Holocene age
- Till of late Wisconsin and Holocene age
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Open Water
- Stream



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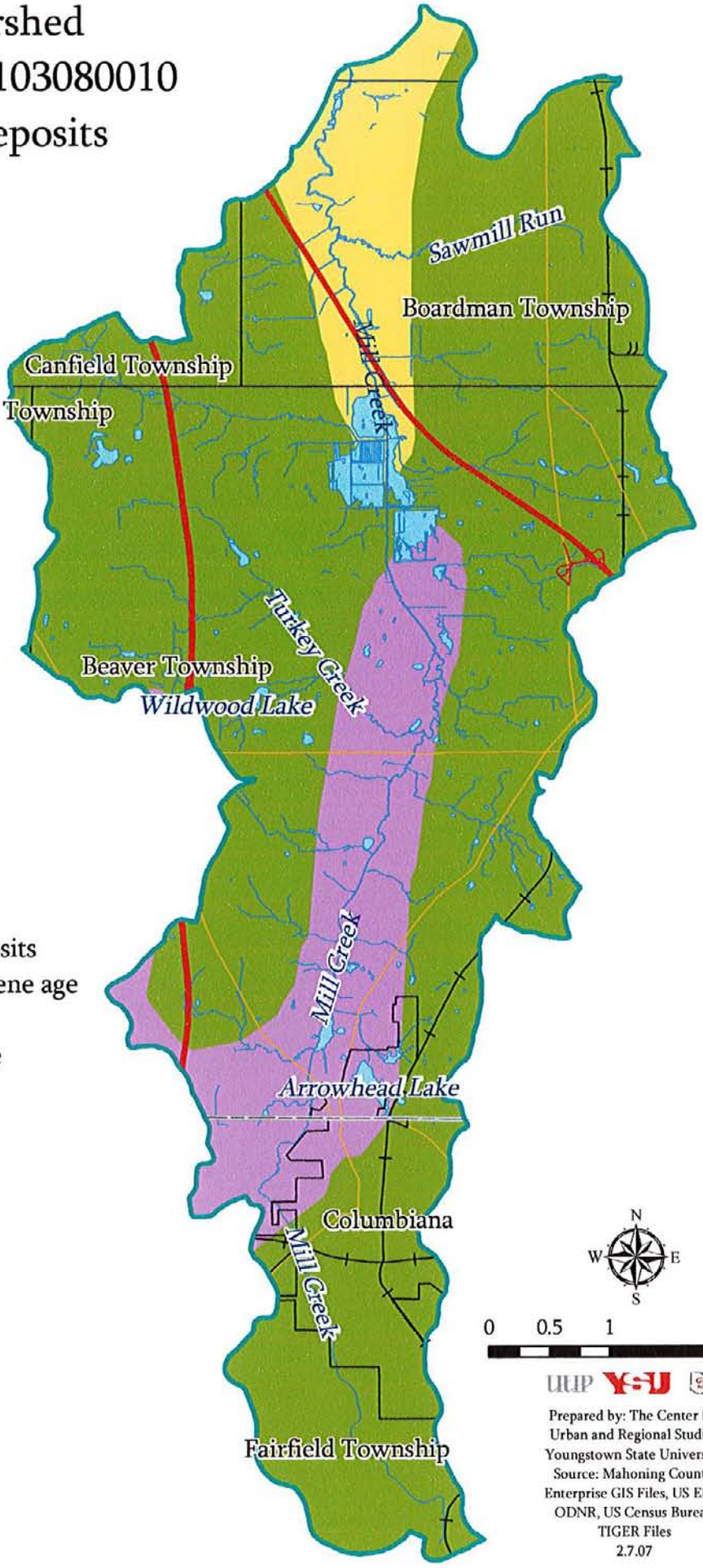
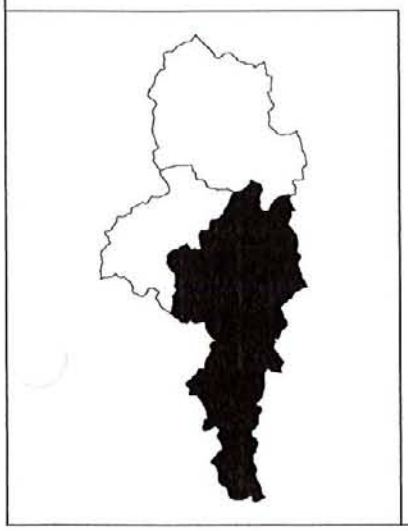
Mill Creek Watershed
Sub-Watershed 05030103080010
Glacial Surficial Deposits



Legend

- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream
- Glaciofluvial (outwash) deposits of late Wisconsin and Holocene age
- Ice-contact deposits of late Wisconsin and Holocene age
- Till of late Wisconsin and Holocene age



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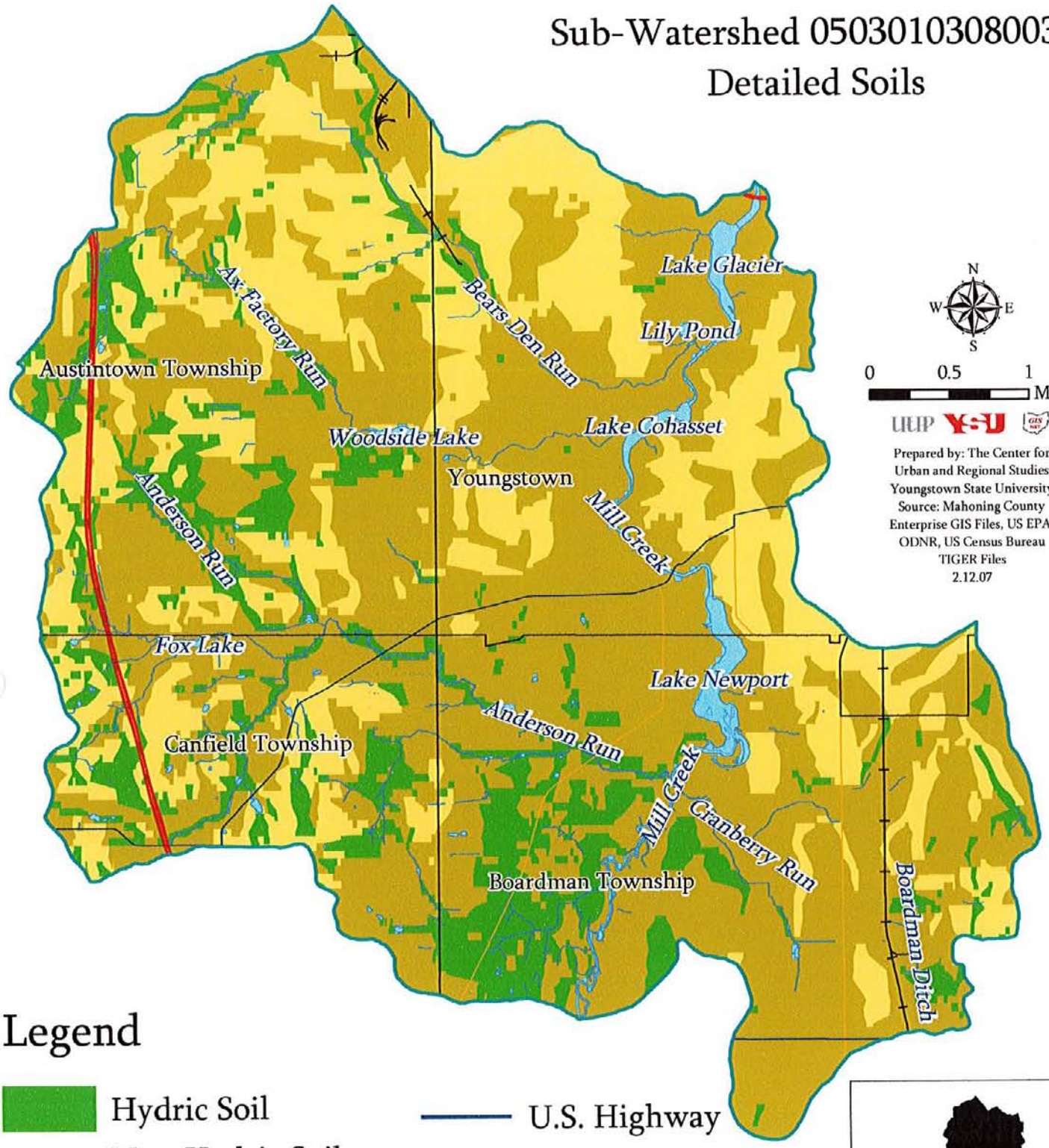
Appendix F.

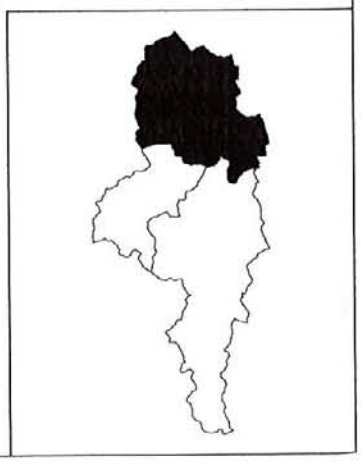
Soils

Mill Creek Watershed
Sub-Watershed 05030103080030
Detailed Soils



Legend

- Hydric Soil
- Non-Hydric Soil, w/Inclusions
- Non-Hydric Soil
- Political Boundary
- Limited Access Hwy.
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



Soils for Subwatershed 030

TOTAL ACREAGE BY SOIL SYMBOL

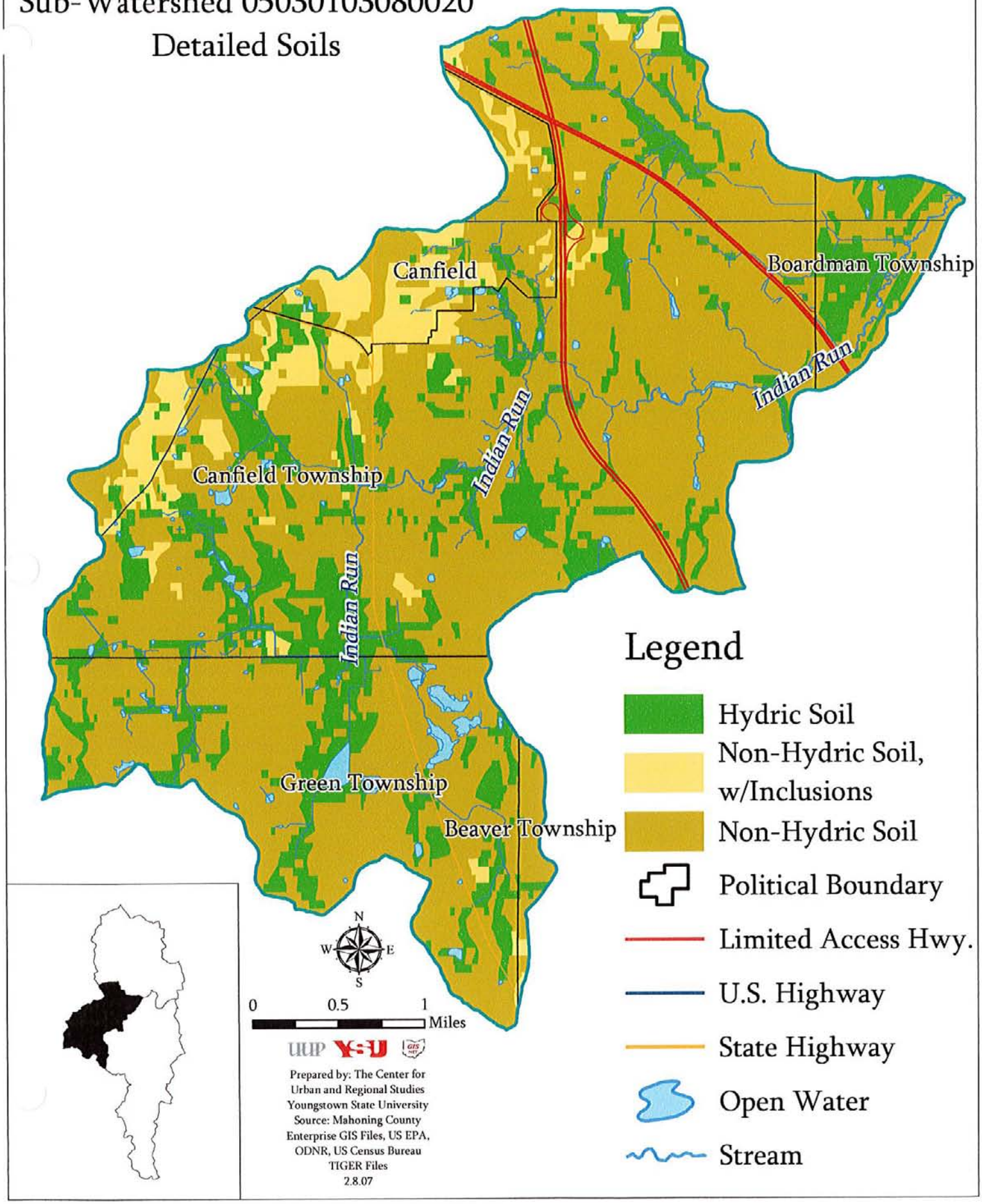
Soil Symbol	Type	Acreage	Percent of Total
BgB	Non-Hydric	374.8	2.2%
BgC	Non-Hydric	60.1	0.3%
BtB	Non-Hydric	32.0	0.2%
Ca	Non-Hydric	20.9	0.1%
CdB	Non-Hydric	226.7	1.3%
CdC	Non-Hydric	41.0	0.2%
CdC2	Non-Hydric	67.8	0.4%
CeB	Non-Hydric	208.1	1.2%
Ch	Hydric	15.1	0.1%
Ck	Non-Hydric	141.0	0.8%
ClB	Non-Hydric	14.7	0.1%
ClC	Non-Hydric	13.4	0.1%
ClD	Non-Hydric	17.4	0.1%
CmB	Non-Hydric	90.7	0.5%
CmC	Non-Hydric	130.6	0.8%
CnE	Non-Hydric	10.6	0.1%
CnF	Non-Hydric	12.5	0.1%
CoB	Non-Hydric	695.1	4.0%
CoC	Non-Hydric	207.5	1.2%
Da	Hydric	243.2	1.4%
DkC	Non-Hydric	29.8	0.2%
DkE	Non-Hydric	13.5	0.1%
DkF	Non-Hydric	314.1	1.8%
ElB	Non-Hydric	67.2	0.4%
ElC	Non-Hydric	3.3	0.0%
ElC2	Non-Hydric	16.8	0.1%
EuB	Non-Hydric	135.5	0.8%
FcA	Non-Hydric, w/Inclusions	12.8	0.1%
FcB	Non-Hydric	211.9	1.2%
FhB	Non-Hydric	14.8	0.1%
FlB	Non-Hydric	74.7	0.4%
Fr	Hydric	532.0	3.1%
GbB	Non-Hydric	12.6	0.1%
GfB	Non-Hydric	5.7	0.0%
GfC2	Non-Hydric	6.0	0.0%
HoB	Non-Hydric	2.5	0.0%
JtA	Non-Hydric	2.6	0.0%
JtB	Non-Hydric	350.8	2.0%
JwB	Non-Hydric	1,040.0	6.0%
Lb	Non-Hydric	148.2	0.9%
Lc	Hydric	91.4	0.5%
LdB	Non-Hydric	71.0	0.4%
LdC2	Non-Hydric	110.5	0.6%
LdD2	Non-Hydric	40.8	0.2%
LdE2	Non-Hydric	12.6	0.1%
LrB	Non-Hydric	452.9	2.6%
LrC	Non-Hydric	480.9	2.8%
Ls	Hydric	71.1	0.4%
Ly	Hydric	91.4	0.5%
Ma	Non-Hydric	15.1	0.1%
MgB	Non-Hydric	110.3	0.6%
MhB	Non-Hydric, w/Inclusions	348.3	2.0%
Mn	Hydric	32.3	0.2%
MsB	Non-Hydric	5.9	0.0%
MsC2	Non-Hydric	9.4	0.1%
MsD2	Non-Hydric	4.2	0.0%
MsF2	Non-Hydric	5.0	0.0%
Od	Hydric	8.0	0.0%
Ov	Non-Hydric	63.8	0.4%
Pa	Hydric	24.1	0.1%

TOTAL ACREAGE BY TYPE

Soil Type	Acreage	Percent of Total
Hydric	2,379.1	13.7%
Non-Hydric	10,052.9	58.0%
Non-Hydric, w/Inclusions	4,689.8	27.1%
Open Water	200.8	1.2%
Total	**17,322.7**	

Pc	Hydric	63.2	0.4%
RaB	Non-Hydric	62.8	0.4%
ReA	Non-Hydric, w/Inclusions	7.1	0.0%
ReB	Non-Hydric, w/Inclusions	5.5	0.0%
RmB	Non-Hydric	145.5	0.8%
RsB	Non-Hydric	459.3	2.7%
RsC	Non-Hydric	72.4	0.4%
RsC2	Non-Hydric	181.3	1.0%
RsD2	Non-Hydric	8.4	0.0%
RuB	Non-Hydric, w/Inclusions	2,955.9	17.1%
Sb	Hydric	633.5	3.7%
Sg	Non-Hydric	220.9	1.3%
SsC	Non-Hydric	1.2	0.0%
StB	Non-Hydric	51.7	0.3%
StC	Non-Hydric	8.4	0.0%
TrA	Hydric	62.9	0.4%
TrB	Hydric	14.7	0.1%
W	Open Water	200.8	1.2%
WaA	Non-Hydric, w/Inclusions	92.0	0.5%
WaB	Non-Hydric, w/Inclusions	1,268.0	7.3%
WbB	Non-Hydric	2,636.6	15.2%
Wc	Hydric	496.1	2.9%
WsC2	Non-Hydric	6.9	0.0%
	Total for Watershed	**17,322.7**	

Mill Creek Watershed
Sub-Watershed 05030103080020
Detailed Soils



Soils for Subwatershed 020

TOTAL ACREAGE BY SOIL SYMBOL

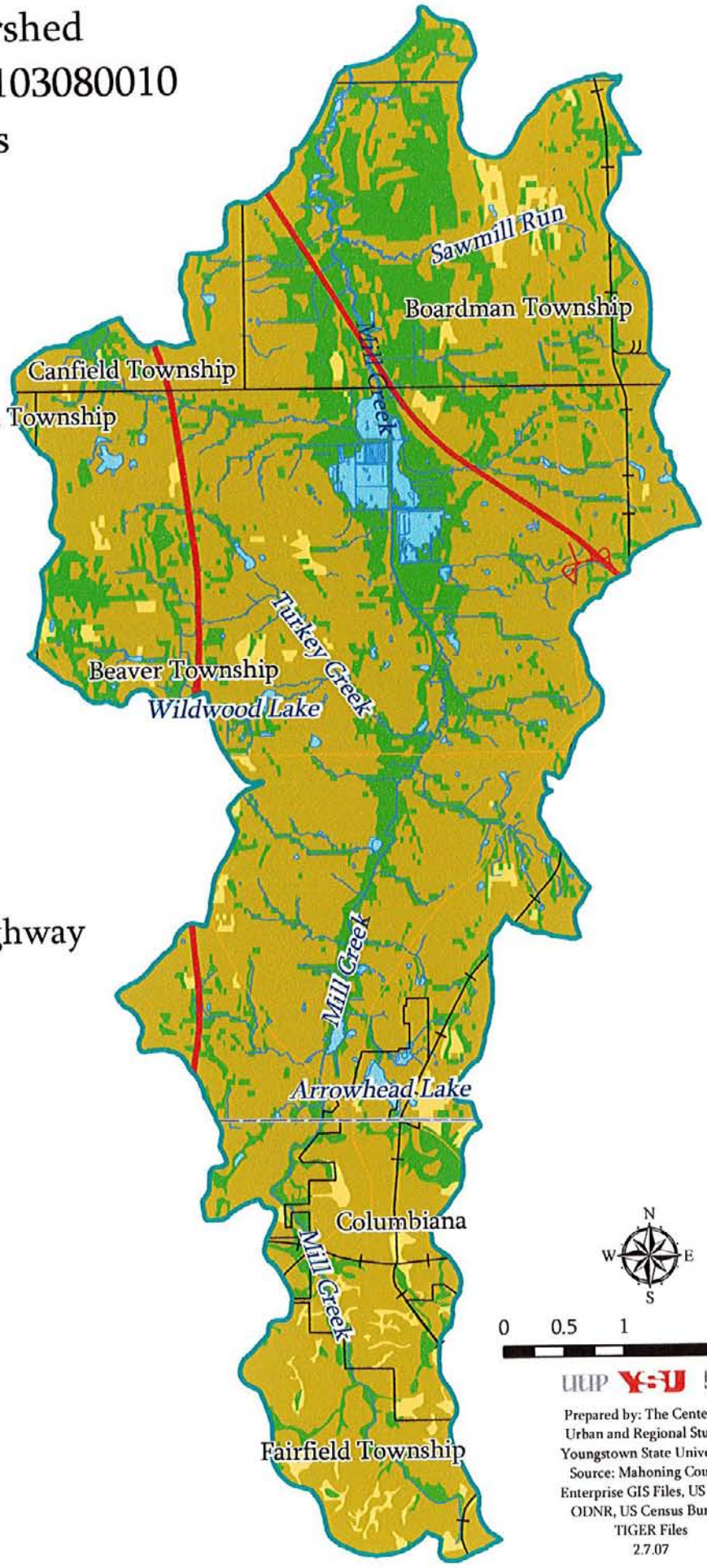
Soil Symbol	Type	Acreage	Percent of Total
BgB	Non-Hydric	329.8	3.6%
BgC	Non-Hydric	97.5	1.1%
BtB	Non-Hydric	15.1	0.2%
Ca	Non-Hydric	38.8	0.4%
CdB	Non-Hydric	1,842.3	19.9%
CdC	Non-Hydric	107.2	1.2%
CdC2	Non-Hydric	321.9	3.5%
CeB	Non-Hydric	43.5	0.5%
Ch	Hydric	20.8	0.2%
Ck	Non-Hydric	62.5	0.7%
ClB	Non-Hydric	20.5	0.2%
ClC	Non-Hydric	11.9	0.1%
ClD	Non-Hydric	26.4	0.3%
CmB	Non-Hydric	70.0	0.8%
CmC	Non-Hydric	187.9	2.0%
CnE	Non-Hydric	52.4	0.6%
CnF	Non-Hydric	4.2	0.0%
Da	Hydric	34.5	0.4%
DkF	Non-Hydric	9.8	0.1%
EtB	Non-Hydric	13.3	0.1%
EtC2	Non-Hydric	3.1	0.0%
FcA	Non-Hydric, w/Inclusions	33.3	0.4%
FcB	Non-Hydric	147.5	1.6%
FhB	Non-Hydric	86.7	0.9%
FlB	Non-Hydric	33.4	0.4%
Fr	Hydric	234.8	2.5%
GfB	Non-Hydric	25.8	0.3%
GfC2	Non-Hydric	18.5	0.2%
JtA	Non-Hydric	6.8	0.1%
JtB	Non-Hydric	165.3	1.8%
JuB	Non-Hydric	27.9	0.3%
Lb	Non-Hydric	41.9	0.5%
Lc	Hydric	143.7	1.6%
LdB	Non-Hydric	16.2	0.2%
LdC2	Non-Hydric	36.3	0.4%
LdD2	Non-Hydric	14.6	0.2%
LdE2	Non-Hydric	62.9	0.7%
Ls	Hydric	90.6	1.0%
Ly	Hydric	196.6	2.1%
Ma	Non-Hydric	102.1	1.1%
Mn	Hydric	64.8	0.7%
MsF2	Non-Hydric	2.6	0.0%
Od	Hydric	37.2	0.4%
Ov	Non-Hydric	138.2	1.5%
Pa	Hydric	57.8	0.6%
Pc	Hydric	137.8	1.5%
RaA	Non-Hydric, w/Inclusions	21.0	0.2%
RaB	Non-Hydric	1,059.4	11.5%
ReB	Non-Hydric, w/Inclusions	3.7	0.0%
RsB	Non-Hydric	399.2	4.3%
RsC	Non-Hydric	35.2	0.4%
RsC2	Non-Hydric	132.5	1.4%
RsD2	Non-Hydric	21.9	0.2%
RuB	Non-Hydric, w/Inclusions	113.5	1.2%
Sb	Hydric	505.5	5.5%
Se	Hydric	77.4	0.8%
Sg	Non-Hydric	2.6	0.0%
SsC	Non-Hydric	136.4	1.5%
StC	Non-Hydric	12.4	0.1%
StF	Non-Hydric	1.5	0.0%
W	Open Water	39.5	0.4%
WaA	Non-Hydric, w/Inclusions	61.4	0.7%
WaB	Non-Hydric, w/Inclusions	434.4	4.7%
WbB	Non-Hydric	128.9	1.4%

TOTAL ACREAGE BY TYPE

Soil Type	Acreage	Percent of Total
Hydric	1,934.9	20.9%
Non-Hydric	6,595.5	71.4%
Non-Hydric, w/Inclusions	667.2	7.2%
Open Water	39.5	0.4%
Total	**9,237.1**	

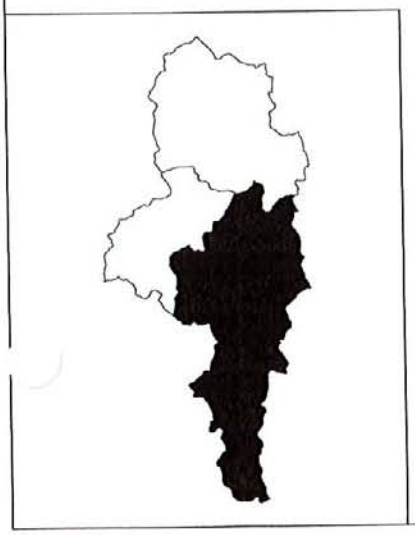
Wc	Hydric	333.4	3.6%
WrF2	Non-Hydric	22.5	0.2%
WsB	Non-Hydric	58.4	0.6%
WsC2	Non-Hydric	331.6	3.6%
WsD2	Non-Hydric	37.9	0.4%
WsE2	Non-Hydric	30.3	0.3%
	Total for Watershed	**9,237.1**	

Mill Creek Watershed
Sub-Watershed 05030103080010
Detailed Soils



Legend

- Hydric Soil
- Non-Hydric Soil, w/Inclusions
- Non-Hydric Soil
- Open Water
- Stream
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad



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2.7.07

Soils for Subwatershed 010

TOTAL ACREAGE BY SOIL SYMBOL

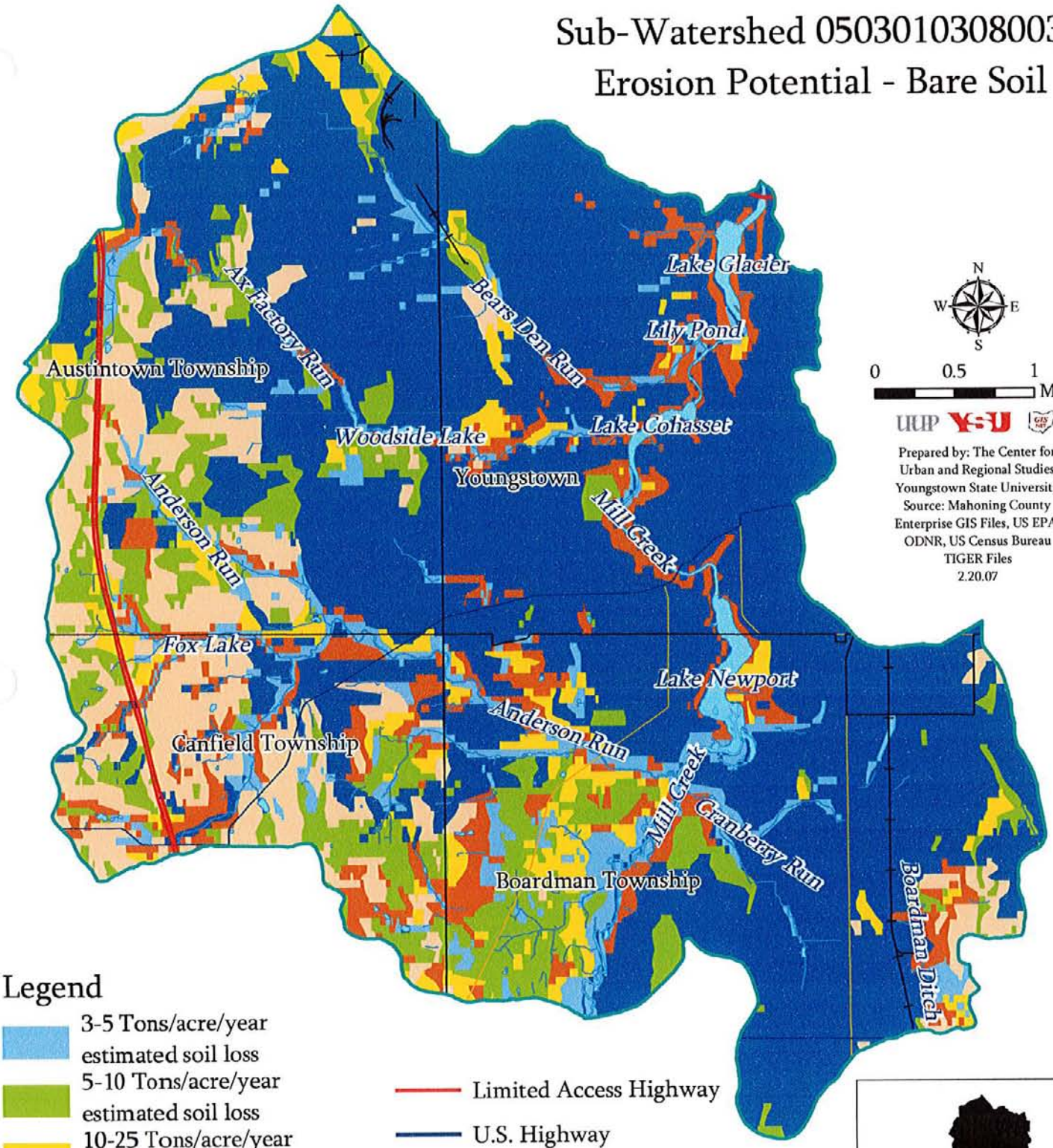
Soil Symbol	Type	Acreage	Percent of Total
BeB	Non-Hydric, w/Inclusions	137.7	0.6%
BgB	Non-Hydric	1,037.8	4.4%
BgC	Non-Hydric	172.6	0.7%
BoB	Non-Hydric	72.7	0.3%
BtB	Non-Hydric	200.6	0.9%
BtC2	Non-Hydric	56.1	0.2%
Ca	Non-Hydric	0.5	0.0%
CaB	Non-Hydric	1,332.1	5.7%
CaB2	Non-Hydric	74.1	0.3%
CaC	Non-Hydric	29.4	0.1%
CaC2	Non-Hydric	209.3	0.9%
Cc	Hydric	9.9	0.0%
CdB	Non-Hydric	3,795.2	16.1%
CdC	Non-Hydric	81.6	0.3%
CdC2	Non-Hydric	517.5	2.2%
CeB	Non-Hydric	211.5	0.9%
CgB	Non-Hydric	88.9	0.4%
CgC2	Non-Hydric	24.7	0.1%
Ch	Hydric	30.7	0.1%
ChB	Non-Hydric	58.2	0.2%
ChC2	Non-Hydric	53.6	0.2%
Ck	Non-Hydric	10.9	0.0%
ClB	Non-Hydric	188.0	0.8%
ClC	Non-Hydric	76.3	0.3%
ClC2	Non-Hydric	30.2	0.1%
ClD	Non-Hydric	154.6	0.7%
CmB	Non-Hydric	376.6	1.6%
CmC	Non-Hydric	627.6	2.7%
CnE	Non-Hydric	25.3	0.1%
CnF	Non-Hydric	7.1	0.0%
CoB	Non-Hydric	26.5	0.1%
CoC	Non-Hydric	16.0	0.1%
Da	Hydric	786.9	3.3%
Dc	Hydric	44.8	0.2%
FcA	Non-Hydric, w/Inclusions	73.4	0.3%
FcB	Non-Hydric	407.8	1.7%
FhB	Non-Hydric	122.1	0.5%
FlB	Non-Hydric	5.4	0.0%
Fr	Hydric	445.9	1.9%
GfB	Non-Hydric	56.8	0.2%
GfC2	Non-Hydric	12.2	0.1%
Gp	Non-Hydric	6.2	0.0%
JtA	Non-Hydric	85.1	0.4%
JtB	Non-Hydric	855.7	3.6%
JuB	Non-Hydric	52.3	0.2%
JwA	Non-Hydric	6.6	0.0%
JwB	Non-Hydric	188.7	0.8%
Km	Hydric	3.4	0.0%
Lb	Non-Hydric	93.6	0.4%
Lc	Hydric	194.5	0.8%
LdB	Non-Hydric	140.9	0.6%
LdC2	Non-Hydric	149.0	0.6%
LdD2	Non-Hydric	13.5	0.1%
LdE2	Non-Hydric	2.7	0.0%
LoB	Non-Hydric	10.4	0.0%
Ls	Hydric	176.9	0.8%
LuC2	Non-Hydric	52.5	0.2%
Lv	Hydric	108.3	0.5%
Lw	Hydric	45.1	0.2%
Ly	Hydric	279.1	1.2%
Ma	Non-Hydric	210.8	0.9%
Mn	Hydric	44.9	0.2%
MsD2	Non-Hydric	5.3	0.0%
MsF2	Non-Hydric	16.1	0.1%
Od	Hydric	77.0	0.3%

TOTAL ACREAGE BY TYPE

Soil Type	Acreage	Percent of Total
Hydric	5,618.6	23.9%
Non-Hydric	16,963.8	72.0%
Non-Hydric, w/Inclusions	821.0	3.5%
Open Water	151.4	0.6%
Total	**23,554.8**	

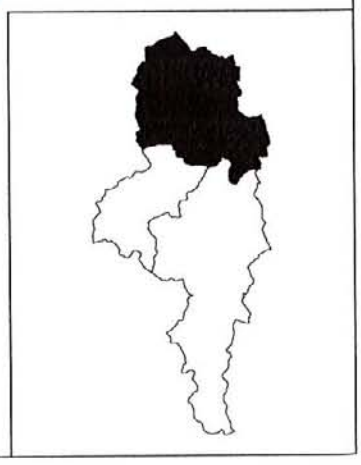
Om	Hydric	12.9	0.1%
Ov	Non-Hydric	383.0	1.6%
Pa	Hydric	166.7	0.7%
Pc	Hydric	466.9	2.0%
RaA	Non-Hydric, w/Inclusions	168.0	0.7%
RaB	Non-Hydric	2,277.4	9.7%
RnA	Non-Hydric, w/Inclusions	4.8	0.0%
RnB	Non-Hydric, w/Inclusions	269.0	1.1%
RsB	Non-Hydric	12.5	0.1%
RsC2	Non-Hydric	32.8	0.1%
RuB	Non-Hydric, w/Inclusions	1.6	0.0%
Sb	Hydric	1,185.2	5.0%
Se	Hydric	30.9	0.1%
Sg	Non-Hydric	29.3	0.1%
SgD	Non-Hydric	60.0	0.3%
SsB	Non-Hydric	45.0	0.2%
SsC	Non-Hydric	96.1	0.4%
SsF	Non-Hydric	65.4	0.3%
StB	Non-Hydric	61.3	0.3%
StC	Non-Hydric	72.6	0.3%
StF	Non-Hydric	136.6	0.6%
W	Open Water	151.4	0.6%
WaB	Non-Hydric, w/Inclusions	166.4	0.7%
WbB	Non-Hydric	223.7	0.9%
Wc	Hydric	1,508.7	6.4%
WrF2	Non-Hydric	25.4	0.1%
WsB	Non-Hydric	313.7	1.3%
WsB2	Non-Hydric	29.2	0.1%
WsC	Non-Hydric	26.0	0.1%
WsC2	Non-Hydric	811.0	3.4%
WsD2	Non-Hydric	150.7	0.6%
WsE2	Non-Hydric	6.2	0.0%
WtD2	Non-Hydric	41.5	0.2%
WtE2	Non-Hydric	13.8	0.1%
WtF2	Non-Hydric	1.4	0.0%
	Total for Watershed	**23,554.8**	

Mill Creek Watershed
Sub-Watershed 05030103080030
Erosion Potential - Bare Soil

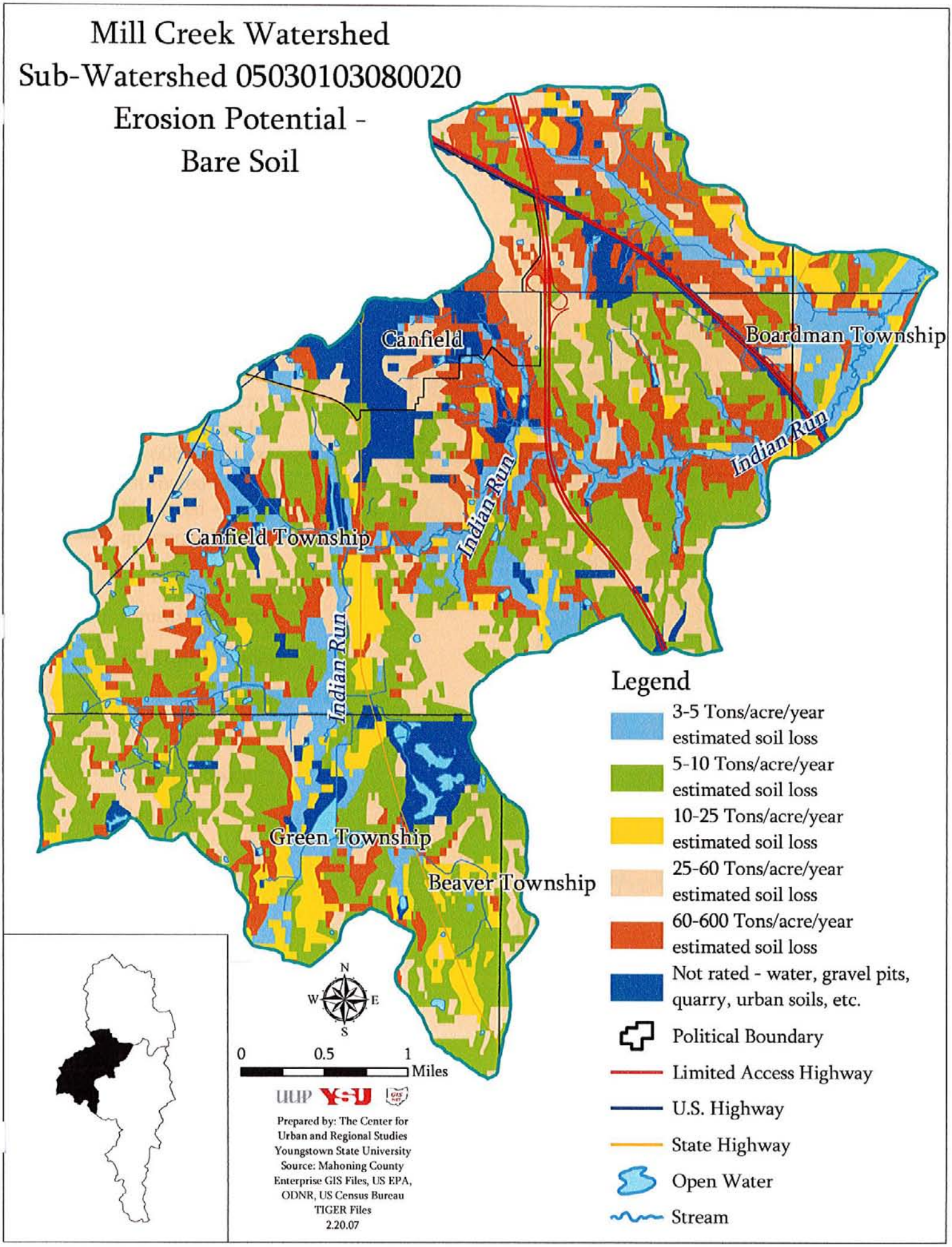


Legend

- 3-5 Tons/acre/year estimated soil loss
- 5-10 Tons/acre/year estimated soil loss
- 10-25 Tons/acre/year estimated soil loss
- 25-60 Tons/acre/year estimated soil loss
- 60-600 Tons/acre/year estimated soil loss
- Not rated - water, gravel pits, quarry, urban soils, etc.
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



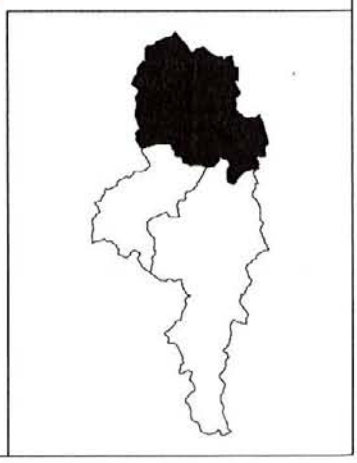
Mill Creek Watershed
Sub-Watershed 05030103080020
Erosion Potential - Bare Soil



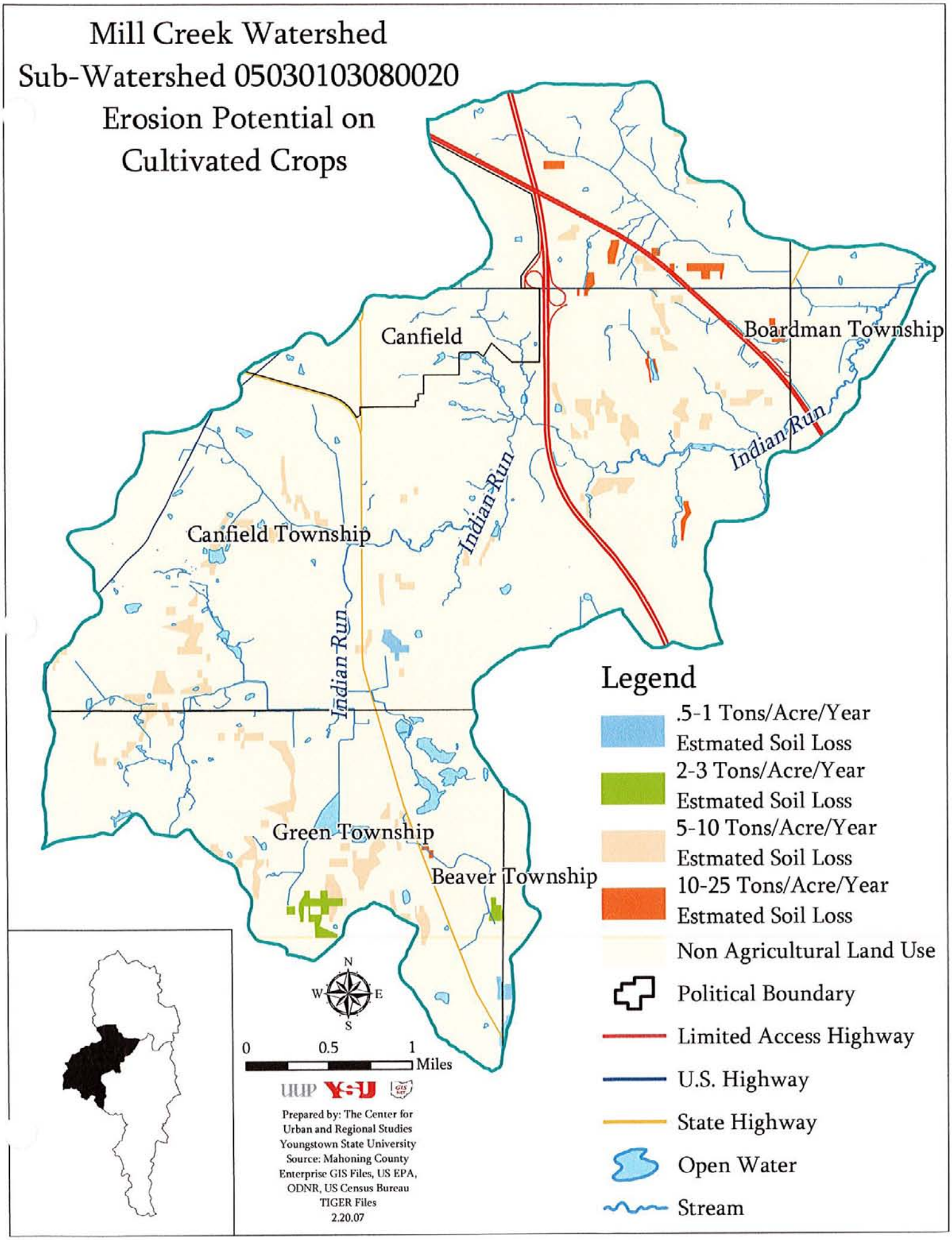
Mill Creek Watershed
Sub-Watershed 05030103080030
Erosion Potential on Cultivated Crops

Legend

- 2-3 Tons/Acre/Year Estmated Soil Loss
- 5-10 Tons/Acre/Year Estmated Soil Loss
- Non Agricultural Land Use
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



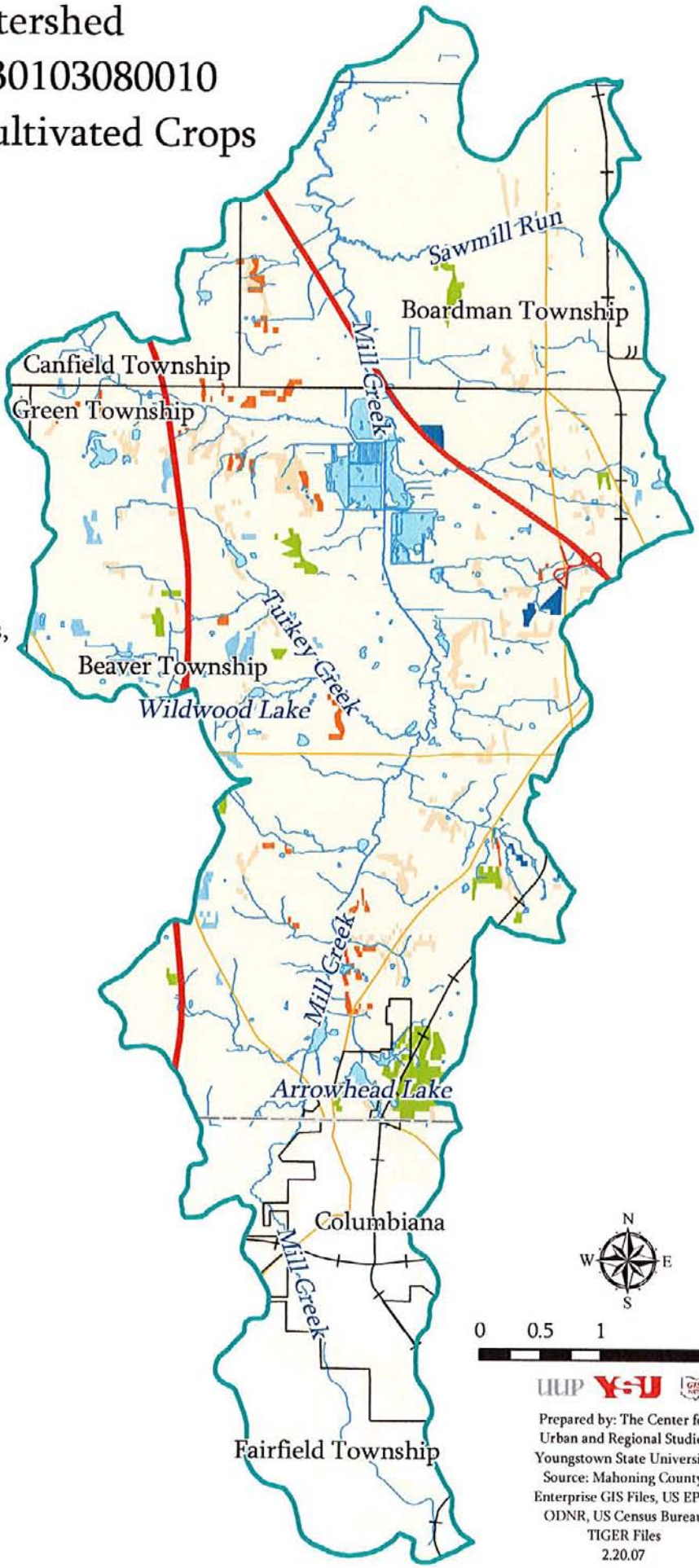
Mill Creek Watershed
Sub-Watershed 05030103080020
Erosion Potential on Cultivated Crops

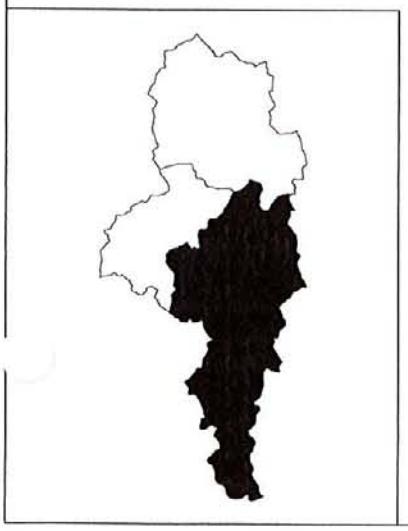


Mill Creek Watershed
Sub-Watershed 05030103080010
Erosion Potential on Cultivated Crops

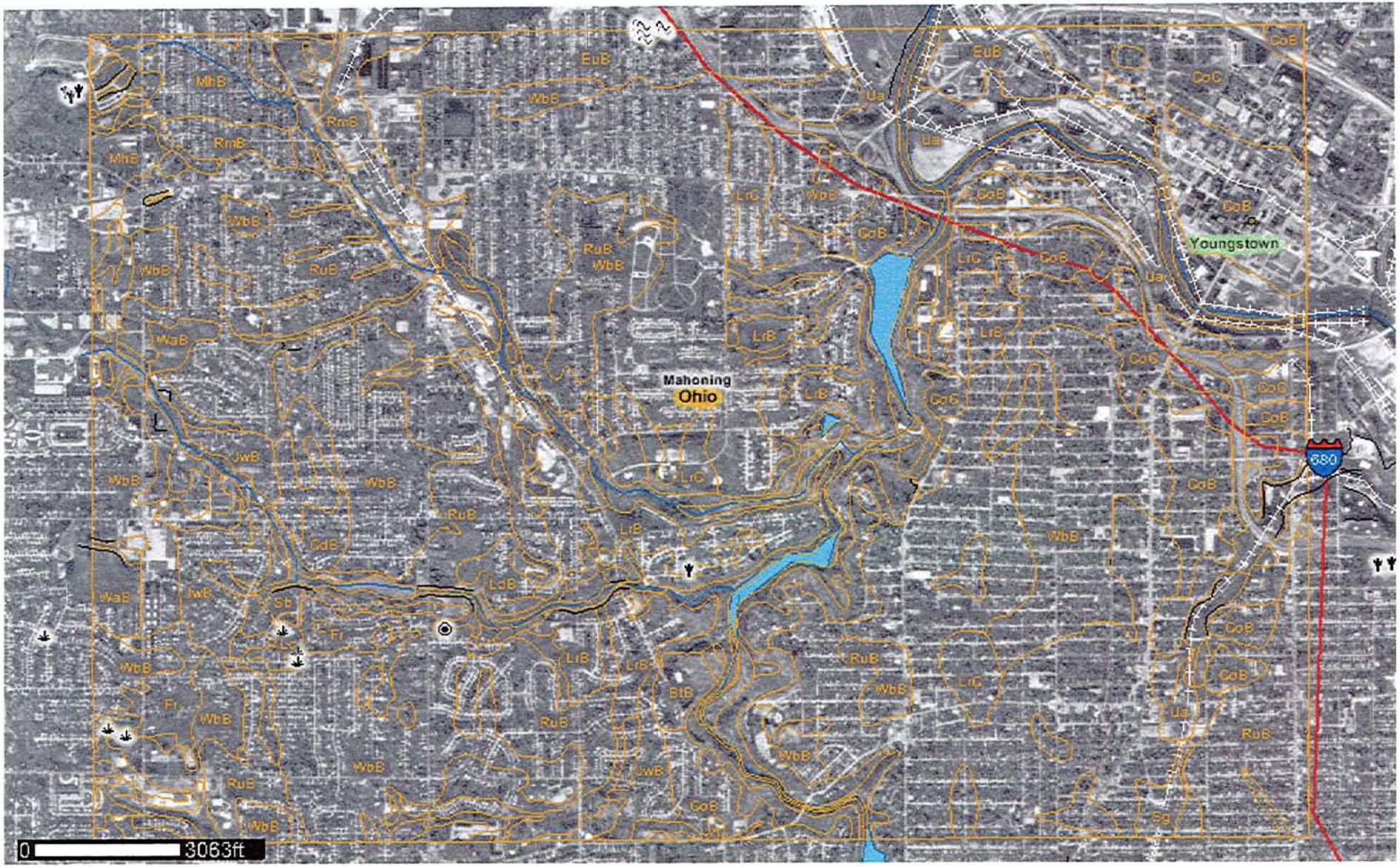
Legend

- .5-1 Tons/Acre/Year Estmated Soil Loss
- 2-3 Tons/Acre/Year Estmated Soil Loss
- 5-10 Tons/Acre/Year Estmated Soil Loss
- 10-25 Tons/Acre/Year Estmated Soil Loss
- Non Agricultural Land Use
- Not Rated water, gravel pits, quarry, urban soils, etc.
- N/A
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream





Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.20.07


Mahoning
Ohio
Youngstown
680
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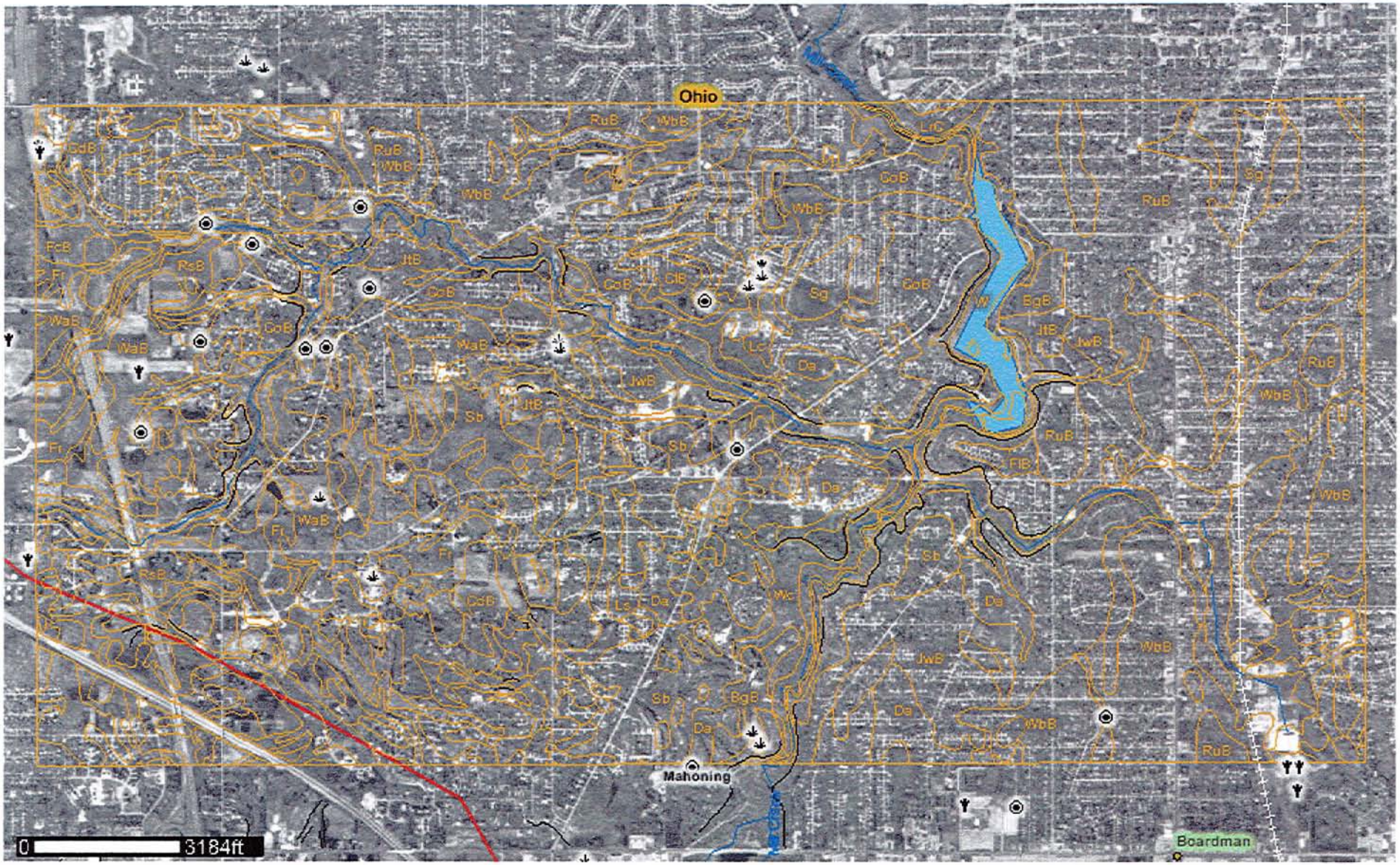
3063ft

Mahoning County, Ohio

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BgB	Bogart loam, 2 to 6 percent slopes	19.4	0.2
BtB	Bogart loam, till substratum, 2 to 6 percent slopes	33.5	0.3
Ca	Canadice silty clay loam	13.3	0.1
CdB	Canfield silt loam, 2 to 6 percent slopes	32.9	0.3
CeB	Canfield-Urban land complex	56.7	0.6
Ck	Chagrin loam	46.4	0.5
CID	Chili gravelly loam, 12 to 18 percent slopes	6.4	0.1
CmB	Chili loam, 2 to 6 percent slopes	16.8	0.2
CnF	Chili and Conotton gravelly soils, 25 to 50 percent slopes	4.1	0.0
CoB	Chili-Urban land complex, undulating	655.6	6.8
CoC	Chili-Urban land complex, rolling	475.4	4.9
DkC	Dekalb very stony loam, 2 to 12 percent slopes	19.3	0.2
DkE	Dekalb very stony loam, 12 to 25 percent slopes	12.8	0.1
DkF	Dekalb very stony loam, 25 to 50 percent slopes	324.4	3.4
EIB	Ellsworth silt loam, 2 to 6 percent slopes	19.7	0.2
EIC	Ellsworth silt loam, 6 to 12 percent slopes	3.0	0.0
EuB	Ellsworth-Urban land complex	377.8	3.9
FcA	Fitchville silt loam, 0 to 2 percent slopes	6.7	0.1
FcB	Fitchville silt loam, 2 to 6 percent slopes	20.0	0.2
FIB	Fitchville-Urban land complex	8.8	0.1
Fr	Frenchtown silt loam	118.0	1.2
JtB	Jimtown loam, 2 to 6 percent slopes	6.4	0.1
JwB	Jimtown-Urban land complex	171.4	1.8
Lc	Lorain silty clay loam	22.1	0.2
LdB	Loudonville loam, 2 to 6 percent slopes	61.5	0.6
LdC2	Loudonville loam, 6 to 12 percent slopes, moderately eroded	52.6	0.5
LdD2	Loudonville loam, 12 to 18 percent slopes, moderately eroded	10.4	0.1
LdE2	Loudonville loam, 18 to 25 percent slopes, moderately eroded	0.8	0.0
LrB	Loudonville-Urban land complex, undulating	453.2	4.7
LrC	Loudonville-Urban land complex, rolling	560.9	5.8
Ly	Luray silty clay loam	24.3	0.3
MgB	Mahoning silt loam, 2 to 6 percent slopes	31.4	0.3
MhB	Mahoning-Urban land complex	184.4	1.9
Mn	Marengo silty clay loam	1.2	0.0
MsB	Muskingum channery silt loam, 2 to 6 percent slopes	6.4	0.1
MsC2	Muskingum channery silt loam, 6 to 12 percent slopes, moderately eroded	6.3	0.1
MsD2	Muskingum channery silt loam, 12 to 18 percent slopes, moderately eroded	16.2	0.2
MsF2	Muskingum channery silt loam, 25 to 50 percent slopes, moderately eroded	25.8	0.3
Ov	Orrville silt loam	31.2	0.3
Pa	Papakating silt loam	14.3	0.1
Pc	Papakating silty clay loam	8.4	0.1

	Mahoning County, Ohio		
ReB	Remsen silt loam, 2 to 6 percent slopes	1.6	0.0
RmB	Remsen-Urban land complex	100.5	1.0
RsB	Rittman silt loam, 2 to 6 percent slopes	50.1	0.5
RsC	Rittman silt loam, 6 to 12 percent slopes	33.7	0.3
RsC2	Rittman silt loam, 6 to 12 percent slopes, moderately eroded	13.2	0.1
RsD2	Rittman silt loam, 12 to 18 percent slopes, moderately eroded	3.5	0.0
RuB	Rittman-Urban land complex	2,776.0	28.7
Sb	Sebring silt loam	52.0	0.5
Sg	Sebring-Urban land complex	34.3	0.4
TrA	Trumbull silt loam, 0 to 2 percent slopes	24.1	0.2
TrB	Trumbull silt loam, 2 to 6 percent slopes	1.0	0.0
Ua	Udorthents, loamy, 2 to 25 percent slopes	557.1	5.8
UsC	Udorthents, shale and sandstone materials, rolling	3.1	0.0
UtB	Udorthents, loamy till materials, undulating	21.9	0.2
UtC	Udorthents, loamy till materials, rolling	13.4	0.1
W	Water	151.0	1.6
WaA	Wadsworth silt loam, 0 to 2 percent slopes	11.1	0.1
WaB	Wadsworth silt loam, 2 to 6 percent slopes	129.2	1.3
WbB	Wadsworth-Urban land complex	1,616.9	16.7
Wc	Wayland silt loam	114.1	1.2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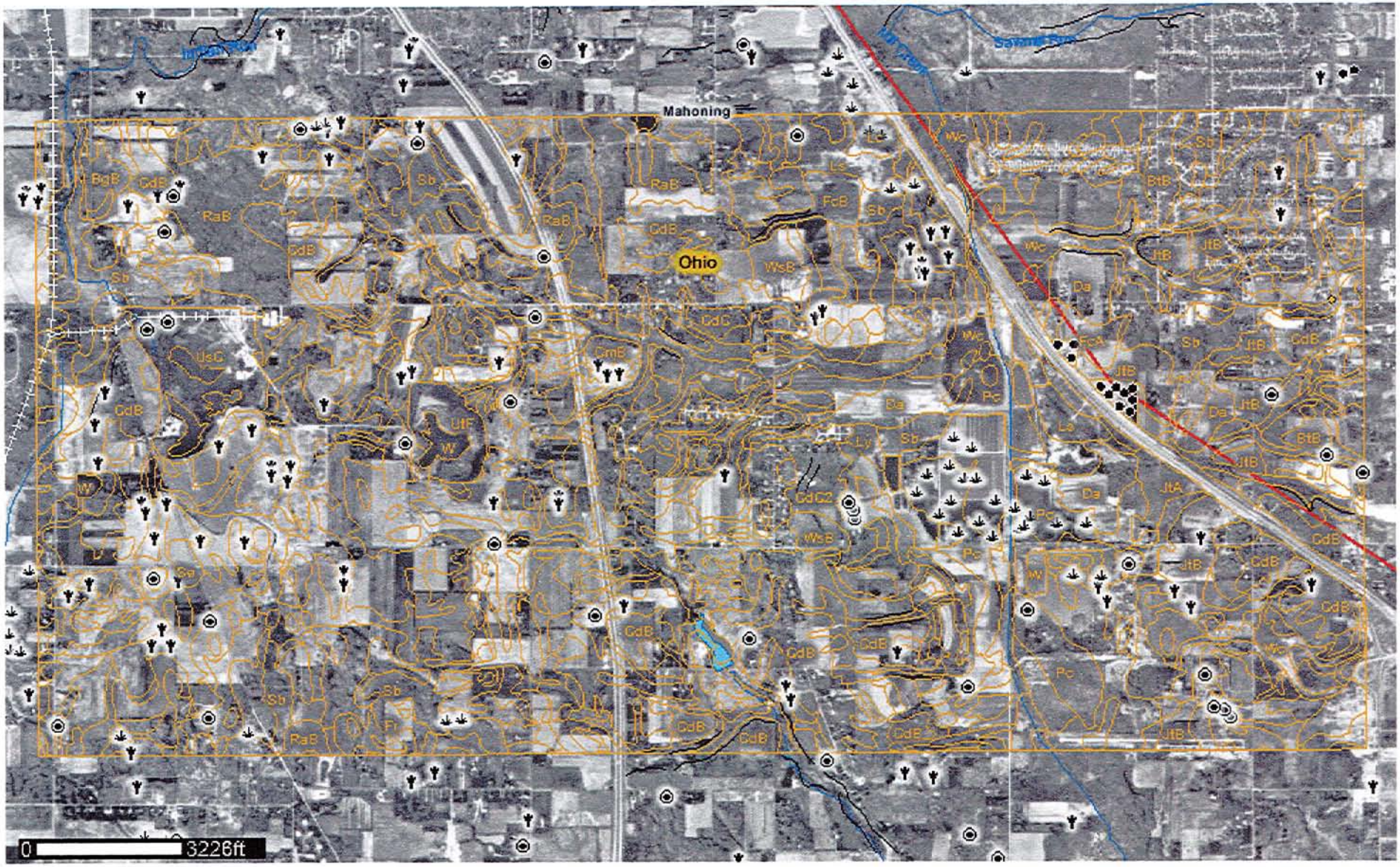
RuB
WbB
GdB
FcB
Fr
RsB
JtB
CoB
WaB
Sg
BgB
JwB
Da
Sb
FlB
Wc
Ls
LrC
ClB

Mahoning County, Ohio

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BgB	Bogart loam, 2 to 6 percent slopes	353.0	3.8
BgC	Bogart loam, 6 to 12 percent slopes	66.3	0.7
Ca	Canadice silty clay loam	7.4	0.1
CdB	Canfield silt loam, 2 to 6 percent slopes	235.8	2.5
CdC	Canfield silt loam, 6 to 12 percent slopes	7.8	0.1
CdC2	Canfield silt loam, 6 to 12 percent slopes, moderately eroded	67.3	0.7
CeB	Canfield-Urban land complex	9.5	0.1
Ch	Carlisle muck	9.5	0.1
Ck	Chagrin loam	73.6	0.8
ClB	Chili gravelly loam, 2 to 6 percent slopes	17.6	0.2
ClC	Chili gravelly loam, 6 to 12 percent slopes	15.9	0.2
ClD	Chili gravelly loam, 12 to 18 percent slopes	24.1	0.3
CmB	Chili loam, 2 to 6 percent slopes	78.3	0.8
CmC	Chili loam, 6 to 12 percent slopes	202.4	2.2
CnE	Chili and Conotton gravelly soils, 18 to 25 percent slopes	15.2	0.2
CnF	Chili and Conotton gravelly soils, 25 to 50 percent slopes	10.7	0.1
CoB	Chili-Urban land complex, undulating	611.6	6.6
CoC	Chili-Urban land complex, rolling	157.0	1.7
Da	Damascus loam	252.7	2.7
DkF	Dekalb very stony loam, 25 to 50 percent slopes	23.2	0.3
FcA	Fitchville silt loam, 0 to 2 percent slopes	6.3	0.1
FcB	Fitchville silt loam, 2 to 6 percent slopes	116.6	1.3
FlB	Fitchville-Urban land complex	91.9	1.0
Fr	Frenchtown silt loam	157.5	1.7
GbB	Geeburg silt loam, 2 to 6 percent slopes	8.1	0.1
GfB	Glenford silt loam, 2 to 6 percent slopes	3.5	0.0
GfC2	Glenford silt loam, 6 to 12 percent slopes, moderately eroded	6.2	0.1
JtA	Jimtown loam, 0 to 2 percent slopes	3.0	0.0
JtB	Jimtown loam, 2 to 6 percent slopes	365.9	3.9
JwB	Jimtown-Urban land complex	879.0	9.5
Lb	Lobdell loam	125.3	1.3
Lc	Lorain silty clay loam	60.5	0.7
LdB	Loudonville loam, 2 to 6 percent slopes	18.1	0.2
LdC2	Loudonville loam, 6 to 12 percent slopes, moderately eroded	102.9	1.1
LdD2	Loudonville loam, 12 to 18 percent slopes, moderately eroded	45.0	0.5
LdE2	Loudonville loam, 18 to 25 percent slopes, moderately eroded	25.6	0.3
LrB	Loudonville-Urban land complex, undulating	8.1	0.1
LrC	Loudonville-Urban land complex, rolling	53.9	0.6
Ls	Luray silt loam	42.7	0.5
Ly	Luray silty clay loam	76.1	0.8
Mn	Marengo silty clay loam	29.5	0.3
MsC2	Muskingum channery silt loam, 6 to 12 percent slopes, moderately eroded	2.6	0.0

Mahoning County, Ohio

Od	Olmsted loam	5.9	0.1
Ov	Orrville silt loam	23.7	0.3
Pa	Papakating silt loam	27.8	0.3
Pc	Papakating silty clay loam	59.0	0.6
RaB	Ravenna silt loam, 2 to 6 percent slopes	60.6	0.7
RsB	Rittman silt loam, 2 to 6 percent slopes	385.3	4.1
RsC	Rittman silt loam, 6 to 12 percent slopes	52.4	0.6
RsC2	Rittman silt loam, 6 to 12 percent slopes, moderately eroded	171.3	1.8
RsD2	Rittman silt loam, 12 to 18 percent slopes, moderately eroded	9.1	0.1
RuB	Rittman-Urban land complex	1,144.3	12.3
Sb	Sebring silt loam	452.3	4.9
Sg	Sebring-Urban land complex	189.8	2.0
TrA	Trumbull silt loam, 0 to 2 percent slopes	2.8	0.0
Ua	Udorthents, loamy, 2 to 25 percent slopes	36.6	0.4
UsC	Udorthents, shale and sandstone materials, rolling	1.3	0.0
UtB	Udorthents, loamy till materials, undulating	4.6	0.0
UtC	Udorthents, loamy till materials, rolling	5.0	0.1
W	Water	104.4	1.1
WaA	Wadsworth silt loam, 0 to 2 percent slopes	34.7	0.4
WaB	Wadsworth silt loam, 2 to 6 percent slopes	635.5	6.8
WbB	Wadsworth-Urban land complex	987.3	10.6
Wc	Wayland silt loam	305.8	3.3
WrF2	Wooster loam, 25 to 50 percent slopes, moderately eroded	7.0	0.1
WsB	Wooster silt loam, 2 to 6 percent slopes	29.3	0.3
WsC2	Wooster silt loam, 6 to 12 percent slopes, moderately eroded	87.1	0.9
WsD2	Wooster silt loam, 12 to 18 percent slopes, moderately eroded	3.6	0.0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	slopes, moderately eroded		
MsF2	Muskingum channery silt loam, 25 to 50 percent slopes, moderately eroded	2.1	0.0
Od	Olmsted loam	17.1	0.2
Ov	Orrville silt loam	159.9	1.7
Pa	Papakating silt loam	63.5	0.7
Pc	Papakating silty clay loam	69.8	0.8
RaB	Ravenna silt loam, 2 to 6 percent slopes	951.9	10.4
RsB	Rittman silt loam, 2 to 6 percent slopes	140.9	1.5
RsC	Rittman silt loam, 6 to 12 percent slopes	25.0	0.3
RsC2	Rittman silt loam, 6 to 12 percent slopes, moderately eroded	114.5	1.2
RsD2	Rittman silt loam, 12 to 18 percent slopes, moderately eroded	24.6	0.3
RuB	Rittman-Urban land complex	283.3	3.1
Sb	Sebring silt loam	544.9	5.9
Sg	Sebring-Urban land complex	104.0	1.1
Tu	Trumbull-Urban land complex	2.0	0.0
Ua	Udorthents, loamy, 2 to 25 percent slopes	102.3	1.1
UsC	Udorthents, shale and sandstone materials, rolling	4.8	0.1
UsF	Udorthents, shale and sandstone materials, steep	1.5	0.0
UtB	Udorthents, loamy till materials, undulating	29.7	0.3
UtC	Udorthents, loamy till materials, rolling	5.6	0.1
UtF	Udorthents, loamy till materials, steep	18.1	0.2
W	Water	27.8	0.3
WaA	Wadsworth silt loam, 0 to 2 percent slopes	39.5	0.4
WaB	Wadsworth silt loam, 2 to 6 percent slopes	297.5	3.2
WbB	Wadsworth-Urban land complex	634.4	6.9
Wc	Wayland silt loam	426.9	4.6
WrF2	Wooster loam, 25 to 50 percent slopes, moderately eroded	16.7	0.2
WsB	Wooster silt loam, 2 to 6 percent slopes	47.4	0.5
WsC2	Wooster silt loam, 6 to 12 percent slopes, moderately eroded	192.7	2.1
WsD2	Wooster silt loam, 12 to 18 percent slopes, moderately eroded	46.8	0.5
WsE2	Wooster silt loam, 18 to 25 percent slopes, moderately eroded	30.4	0.3

Mahoning County, Ohio

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BgB	Bogart loam, 2 to 6 percent slopes	447.1	4.9
BgC	Bogart loam, 6 to 12 percent slopes	123.3	1.3
BtB	Bogart loam, till substratum, 2 to 6 percent slopes	18.4	0.2
Ca	Canadice silty clay loam	3.4	0.0
CdB	Canfield silt loam, 2 to 6 percent slopes	1,102.2	12.0
CdC	Canfield silt loam, 6 to 12 percent slopes	89.9	1.0
CdC2	Canfield silt loam, 6 to 12 percent slopes, moderately eroded	155.8	1.7
CeB	Canfield-Urban land complex	200.1	2.2
Ch	Carlisle muck	23.3	0.3
Ck	Chagrin loam	85.3	0.9
ClB	Chili gravelly loam, 2 to 6 percent slopes	12.9	0.1
ClC	Chili gravelly loam, 6 to 12 percent slopes	11.9	0.1
ClD	Chili gravelly loam, 12 to 18 percent slopes	14.1	0.2
CmB	Chili loam, 2 to 6 percent slopes	148.9	1.6
CmC	Chili loam, 6 to 12 percent slopes	144.0	1.6
CnE	Chili and Conotton gravelly soils, 18 to 25 percent slopes	48.9	0.5
CnF	Chili and Conotton gravelly soils, 25 to 50 percent slopes	5.7	0.1
CoB	Chili-Urban land complex, undulating	32.2	0.4
Da	Damascus loam	485.3	5.3
Dc	Damascus loam, till substratum	38.0	0.4
DkF	Dekalb very stony loam, 25 to 50 percent slopes	9.3	0.1
FcA	Fitchville silt loam, 0 to 2 percent slopes	11.5	0.1
FcB	Fitchville silt loam, 2 to 6 percent slopes	95.7	1.0
FhB	Fitchville silt loam, till substratum, 2 to 6 percent slopes	56.7	0.6
FlB	Fitchville-Urban land complex	54.5	0.6
Fr	Frenchtown silt loam	168.0	1.8
GfB	Glenford silt loam, 2 to 6 percent slopes	19.3	0.2
GfC2	Glenford silt loam, 6 to 12 percent slopes, moderately eroded	22.7	0.2
JtA	Jimtown loam, 0 to 2 percent slopes	30.5	0.3
JtB	Jimtown loam, 2 to 6 percent slopes	358.6	3.9
JuB	Jimtown loam, till substratum, 2 to 6 percent slopes	26.9	0.3
JwB	Jimtown-Urban land complex	133.7	1.5
Lb	Lobdell loam	129.9	1.4
Lc	Lorain silty clay loam	151.3	1.6
LdB	Loudonville loam, 2 to 6 percent slopes	6.5	0.1
LdC2	Loudonville loam, 6 to 12 percent slopes, moderately eroded	15.7	0.2
LdE2	Loudonville loam, 18 to 25 percent slopes, moderately eroded	45.8	0.5
Ls	Luray silt loam	164.4	1.8
Ly	Luray silty clay loam	41.1	0.4
Mn	Marengo silty clay loam	24.5	0.3
MsD2	Muskingum channery silt loam, 12 to 18 percent	3.2	0.0

Ohio
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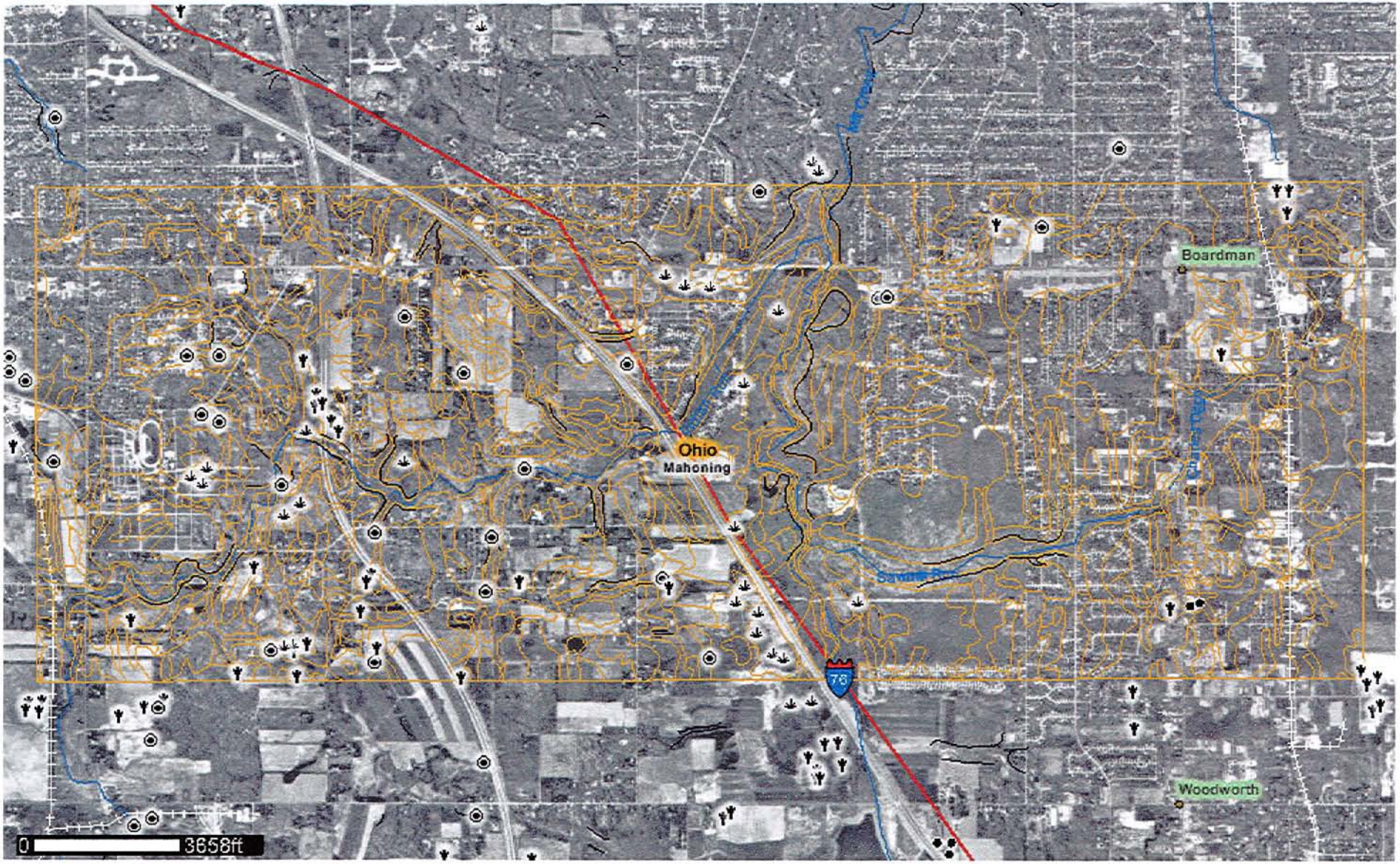
3257ft

Mahoning County, Ohio

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BeB	Bennington silt loam, 2 to 6 percent slopes	21.3	0.2
BgB	Bogart loam, 2 to 6 percent slopes	274.8	3.0
BgC	Bogart loam, 6 to 12 percent slopes	107.9	1.2
BtB	Bogart loam, till substratum, 2 to 6 percent slopes	75.4	0.8
BtC2	Bogart loam, till substratum, 6 to 12 percent slopes, moderately eroded	1.4	0.0
CdB	Canfield silt loam, 2 to 6 percent slopes	1,913.6	20.7
CdC	Canfield silt loam, 6 to 12 percent slopes	52.8	0.6
CdC2	Canfield silt loam, 6 to 12 percent slopes, moderately eroded	319.0	3.5
Ch	Carlisle muck	7.6	0.1
ClB	Chili gravelly loam, 2 to 6 percent slopes	3.0	0.0
ClC	Chili gravelly loam, 6 to 12 percent slopes	28.1	0.3
ClD	Chili gravelly loam, 12 to 18 percent slopes	15.7	0.2
CmB	Chili loam, 2 to 6 percent slopes	89.0	1.0
CmC	Chili loam, 6 to 12 percent slopes	231.0	2.5
CnE	Chili and Conotton gravelly soils, 18 to 25 percent slopes	7.6	0.1
CnF	Chili and Conotton gravelly soils, 25 to 50 percent slopes	5.6	0.1
CoC	Chili-Urban land complex, rolling	13.8	0.1
Da	Damascus loam	294.5	3.2
Dc	Damascus loam, till substratum	6.5	0.1
FcA	Fitchville silt loam, 0 to 2 percent slopes	74.8	0.8
FcB	Fitchville silt loam, 2 to 6 percent slopes	170.8	1.9
FhB	Fitchville silt loam, till substratum, 2 to 6 percent slopes	104.3	1.1
FlB	Fitchville-Urban land complex	9.8	0.1
Fr	Frenchtown silt loam	190.5	2.1
GfB	Glenford silt loam, 2 to 6 percent slopes	22.5	0.2
GfC2	Glenford silt loam, 6 to 12 percent slopes, moderately eroded	2.3	0.0
JtA	Jimtown loam, 0 to 2 percent slopes	57.9	0.6
JtB	Jimtown loam, 2 to 6 percent slopes	413.5	4.5
JuB	Jimtown loam, till substratum, 2 to 6 percent slopes	26.0	0.3
Lb	Lobdell loam	12.9	0.1
Lc	Lorain silty clay loam	113.5	1.2
LdB	Loudonville loam, 2 to 6 percent slopes	10.7	0.1
LdC2	Loudonville loam, 6 to 12 percent slopes, moderately eroded	69.2	0.7
LdD2	Loudonville loam, 12 to 18 percent slopes, moderately eroded	4.6	0.0
Ls	Luray silt loam	123.9	1.3
Ly	Luray silty clay loam	265.1	2.9
Mn	Marengo silty clay loam	73.2	0.8
Od	Olmsted loam	50.5	0.5
Ov	Orrville silt loam	129.4	1.4
Pa	Papakating silt loam	67.1	0.7

	Mahoning County, Ohio		
Pc	Papakating silty clay loam	297.3	3.2
RaA	Ravenna silt loam, 0 to 2 percent slopes	54.7	0.6
RaB	Ravenna silt loam, 2 to 6 percent slopes	1,391.9	15.1
Sb	Sebring silt loam	575.5	6.2
Se	Sebring silt loam, till substratum	36.9	0.4
Ua	Udorthents, loamy, 2 to 25 percent slopes	117.6	1.3
UsB	Udorthents, shale and sandstone materials, undulating	23.8	0.3
UsC	Udorthents, shale and sandstone materials, rolling	159.1	1.7
UsF	Udorthents, shale and sandstone materials, steep	5.3	0.1
UtB	Udorthents, loamy till materials, undulating	12.4	0.1
UtC	Udorthents, loamy till materials, rolling	14.7	0.2
UtF	Udorthents, loamy till materials, steep	56.0	0.6
W	Water	100.4	1.1
Wc	Wayland silt loam	561.6	6.1
WrF2	Wooster loam, 25 to 50 percent slopes, moderately eroded	6.9	0.1
WsB	Wooster silt loam, 2 to 6 percent slopes	66.5	0.7
WsC2	Wooster silt loam, 6 to 12 percent slopes, moderately eroded	209.5	2.3
WsD2	Wooster silt loam, 12 to 18 percent slopes, moderately eroded	74.4	0.8
WsE2	Wooster silt loam, 18 to 25 percent slopes, moderately eroded	4.3	0.0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Mahoning County, Ohio

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BeB	Bennington silt loam, 2 to 6 percent slopes	50.9	0.5
BgB	Bogart loam, 2 to 6 percent slopes	602.1	6.3
BgC	Bogart loam, 6 to 12 percent slopes	62.0	0.6
BtB	Bogart loam, till substratum, 2 to 6 percent slopes	122.8	1.3
BtC2	Bogart loam, till substratum, 6 to 12 percent slopes, moderately eroded	41.9	0.4
Ca	Canadice silty clay loam	45.4	0.5
CdB	Canfield silt loam, 2 to 6 percent slopes	2,321.7	24.3
CdC	Canfield silt loam, 6 to 12 percent slopes	17.6	0.2
CdC2	Canfield silt loam, 6 to 12 percent slopes, moderately eroded	267.0	2.8
CeB	Canfield-Urban land complex	239.3	2.5
CgC2	Cardington silt loam, 6 to 12 percent slopes, moderately eroded	7.6	0.1
Ch	Carlisle muck	2.9	0.0
ClC	Chili gravelly loam, 6 to 12 percent slopes	21.2	0.2
ClD	Chili gravelly loam, 12 to 18 percent slopes	107.5	1.1
CmB	Chili loam, 2 to 6 percent slopes	114.7	1.2
CmC	Chili loam, 6 to 12 percent slopes	266.8	2.8
CnE	Chili and Conotton gravelly soils, 18 to 25 percent slopes	20.6	0.2
Da	Damascus loam	30.9	0.3
FcA	Fitchville silt loam, 0 to 2 percent slopes	9.5	0.1
FcB	Fitchville silt loam, 2 to 6 percent slopes	271.4	2.8
FhB	Fitchville silt loam, till substratum, 2 to 6 percent slopes	139.4	1.5
Fr	Frenchtown silt loam	157.3	1.6
GfB	Glenford silt loam, 2 to 6 percent slopes	28.6	0.3
GfC2	Glenford silt loam, 6 to 12 percent slopes, moderately eroded	6.3	0.1
JtA	Jimtown loam, 0 to 2 percent slopes	4.1	0.0
JtB	Jimtown loam, 2 to 6 percent slopes	219.5	2.3
JuB	Jimtown loam, till substratum, 2 to 6 percent slopes	25.0	0.3
Lb	Lobdell loam	9.2	0.1
Lc	Lorain silty clay loam	145.8	1.5
LdB	Loudonville loam, 2 to 6 percent slopes	245.8	2.6
LdC2	Loudonville loam, 6 to 12 percent slopes, moderately eroded	97.2	1.0
LdD2	Loudonville loam, 12 to 18 percent slopes, moderately eroded	3.2	0.0
LdE2	Loudonville loam, 18 to 25 percent slopes, moderately eroded	0.6	0.0
Ly	Luray silty clay loam	64.7	0.7
Mn	Marengo silty clay loam	11.3	0.1
MsD2	Muskingum channery silt loam, 12 to 18 percent slopes, moderately eroded	1.1	0.0
MsE2	Muskingum channery silt loam, 18 to 25 percent slopes, moderately eroded	2.8	0.0

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Od	Olmsted loam	27.0	0.3
Ov	Orrville silt loam	227.6	2.4
Pa	Papakating silt loam	21.7	0.2
Pc	Papakating silty clay loam	58.7	0.6
Pg	Pits, gravel	2.3	0.0
RaA	Ravenna silt loam, 0 to 2 percent slopes	127.6	1.3
RaB	Ravenna silt loam, 2 to 6 percent slopes	860.1	9.0
Sb	Sebring silt loam	532.8	5.6
Se	Sebring silt loam, till substratum	42.5	0.4
Sg	Sebring-Urban land complex	20.1	0.2
Ua	Udorthents, loamy, 2 to 25 percent slopes	2.1	0.0
UsB	Udorthents, shale and sandstone materials, undulating	67.6	0.7
UsC	Udorthents, shale and sandstone materials, rolling	46.9	0.5
UsF	Udorthents, shale and sandstone materials, steep	47.6	0.5
UtB	Udorthents, loamy till materials, undulating	90.3	0.9
UtC	Udorthents, loamy till materials, rolling	124.9	1.3
UtF	Udorthents, loamy till materials, steep	93.8	1.0
W	Water	113.4	1.2
WbB	Wadsworth-Urban land complex	2.7	0.0
Wc	Wayland silt loam	522.7	5.5
WrF2	Wooster loam, 25 to 50 percent slopes, moderately eroded	3.1	0.0
WsB	Wooster silt loam, 2 to 6 percent slopes	202.6	2.1
WsC2	Wooster silt loam, 6 to 12 percent slopes, moderately eroded	469.1	4.9
WsD2	Wooster silt loam, 12 to 18 percent slopes, moderately eroded	50.7	0.5
WsE2	Wooster silt loam, 18 to 25 percent slopes, moderately eroded	0.3	0.0

Appendix G.

Demographics

DEMOGRAPHICS FOR SUB-WATERSHED 05030103080030		
Variable	**Total**	**Percent of Total**
Total Population	71,727	
Male:	33,741	47.0%
Under 1 year	391	1.2%
1 year	470	1.4%
2 years	361	1.1%
3 years	413	1.2%
4 years	478	1.4%
5 years	409	1.2%
6 years	373	1.1%
7 years	547	1.6%
8 years	584	1.7%
9 years	492	1.5%
10 years	458	1.4%
11 years	407	1.2%
12 years	476	1.4%
13 years	398	1.2%
14 years	460	1.4%
15 years	439	1.3%
16 years	395	1.2%
17 years	522	1.5%
18 years	460	1.4%
19 years	391	1.2%
20 years	471	1.4%
21 years	375	1.1%
22 to 24 years	1,128	3.3%
25 to 29 years	2,118	6.3%
30 to 34 years	2,190	6.5%
35 to 39 years	2,368	7.0%
40 to 44 years	2,885	8.6%
45 to 49 years	2,513	7.4%
50 to 54 years	2,214	6.6%
55 to 59 years	1,573	4.7%
60 and 61 years	567	1.7%
62 to 64 years	898	2.7%
65 and 66 years	584	1.7%
67 to 69 years	888	2.6%
70 to 74 years	1,363	4.0%
75 to 79 years	1,382	4.1%
80 to 84 years	842	2.5%
85 years and over	458	1.4%
Female:	37,986	53.0%
Under 1 year	521	1.4%
1 year	355	0.9%
2 years	436	1.1%
3 years	488	1.3%
4 years	411	1.1%
5 years	404	1.1%
6 years	429	1.1%
7 years	453	1.2%
8 years	428	1.1%
9 years	541	1.4%
10 years	389	1.0%
11 years	427	1.1%
12 years	459	1.2%

13 years	373	1.0%
14 years	336	0.9%
15 years	474	1.2%
16 years	415	1.1%
17 years	440	1.2%
18 years	401	1.1%
19 years	360	0.9%
20 years	379	1.0%
21 years	487	1.3%
22 to 24 years	1,373	3.6%
25 to 29 years	2,085	5.5%
30 to 34 years	2,161	5.7%
35 to 39 years	2,669	7.0%
40 to 44 years	2,941	7.7%
45 to 49 years	2,834	7.5%
50 to 54 years	2,432	6.4%
55 to 59 years	1,871	4.9%
60 and 61 years	821	2.2%
62 to 64 years	1,008	2.7%
65 and 66 years	677	1.8%
67 to 69 years	1,035	2.7%
70 to 74 years	2,200	5.8%
75 to 79 years	1,945	5.1%
80 to 84 years	1,470	3.9%
85 years and over	1,058	2.8%
Sex by Educational Attainment for the Population 25 years+		
Male:	22,845	
No schooling completed	83	0.4%
Nursery to 4th grade	46	0.2%
5th and 6th grade	125	0.5%
7th and 8th grade	367	1.6%
9th grade	477	2.1%
10th grade	650	2.8%
11th grade	741	3.2%
12th grade, no diploma	867	3.8%
High school graduate (includes equivalency)	8,321	36.4%
Some college, less than 1 year	1,594	7.0%
Some college, 1 or more years, no degree	3,834	16.8%
Associate degree	1,016	4.4%
Bachelor's degree	3,256	14.3%
Master's degree	920	4.0%
Professional school degree	390	1.7%
Doctorate degree	158	0.7%
Female:	27,206	
No schooling completed	127	0.5%
Nursery to 4th grade	24	0.1%
5th and 6th grade	131	0.5%
7th and 8th grade	587	2.2%
9th grade	498	1.8%
10th grade	892	3.3%
11th grade	913	3.4%
12th grade, no diploma	799	2.9%
High school graduate (includes equivalency)	11,362	41.8%
Some college, less than 1 year	2,211	8.1%
Some college, 1 or more years, no degree	3,516	12.9%
Associate degree	1,608	5.9%

Bachelor's degree	3,101	11.4%
Master's degree	1,111	4.1%
Professional school degree	289	1.1%
Doctorate degree	37	0.1%
Sex by Employment Status for the Population 16 years+		
Male:		
In labor force:	18,173	
In Armed Forces	41	
Civilian:	18,132	
Employed	17,197	
Unemployed	935	5.4%
Not in labor force	8,414	
Female:		
In labor force:	16,888	
In Armed Forces	5	
Civilian:	16,883	
Employed	16,025	
Unemployed	858	5.4%
Not in labor force	14,173	
Sex by Industry for the Employed Civilian Population 16 years+		
Male:	17,197	
Agriculture, forestry, fishing and hunting, and mining:	62	0.4%
Agriculture, forestry, fishing and hunting	36	58.1%
Mining	26	41.9%
Construction	1,285	7.5%
Manufacturing	4,634	26.9%
Wholesale trade	1,032	6.0%
Retail trade	2,251	13.1%
Transportation and warehousing, and utilities:	1,179	6.9%
Transportation and warehousing	992	84.1%
Utilities	187	15.9%
Information	425	2.5%
Finance, insurance, real estate and rental and leasing:	648	3.8%
Finance and insurance	394	60.8%
Real estate and rental and leasing	254	39.2%
Professional, scientific, management, administrative, and waste management services:	1,142	6.6%
Professional, scientific, and technical services	634	55.5%
Management of companies and enterprises	5	0.4%
Administrative and support and waste management services	503	44.0%
Educational, health and social services:	1,687	9.8%
Educational services	696	41.3%
Health care and social assistance	991	58.7%
Arts, entertainment, recreation, accommodation and food services:	1,232	7.2%
Arts, entertainment, and recreation	289	23.5%
Accommodation and food services	943	76.5%
Other services (except public administration)	773	4.5%
Public administration	847	4.9%
Female:	16,025	
Agriculture, forestry, fishing and hunting, and mining:	23	0.1%
Agriculture, forestry, fishing and hunting	11	47.8%
Mining	12	52.2%
Construction	240	1.5%
Manufacturing	1,341	8.4%
Wholesale trade	350	2.2%
Retail trade	2,401	15.0%
Transportation and warehousing, and utilities:	336	2.1%

Transportation and warehousing	284	84.5%
Utilities	52	15.5%
Information	369	2.3%
Finance, insurance, real estate and rental and leasing:	1,151	7.2%
Finance and insurance	940	81.7%
Real estate and rental and leasing	211	18.3%
Professional, scientific, management, administrative, and waste management services:	998	6.2%
Professional, scientific, and technical services	521	52.2%
Management of companies and enterprises	6	0.6%
Administrative and support and waste management services	471	47.2%
Educational, health and social services:	5,618	35.1%
Educational services	1,876	33.4%
Health care and social assistance	3,742	66.6%
Arts, entertainment, recreation, accommodation and food services:	1,501	9.4%
Arts, entertainment, and recreation	219	14.6%
Accommodation and food services	1,282	85.4%
Other services (except public administration)	970	6.1%
Public administration	727	4.5%
Total Households	30,633	
Average Household Income	$45,627	
Year Residential Structure Built		
Residential Structures	32,765	
Built 1999-2000	195	0.6%
Built 1995-1998	753	2.3%
Built 1990-1994	730	2.2%
Built 1980-1989	1,367	4.2%
Built 1970-1979	5,409	16.5%
Built 1960-1969	6,007	18.3%
Built 1950-1959	9,317	28.4%
Built 1940-1949	4,401	13.4%
Built 1939 or earlier	4,586	14.0%
Source: U.S. Census Bureau Census of Population and Housing, 2000		

DEMOGRAPHICS FOR SUB-WATERSHED 05030103080020		
Variable	**Total**	**Percent of Total**
Total Population	6,059	
Male:	2,959	48.8%
Under 1 year	34	1.1%
1 year	36	1.2%
2 years	36	1.2%
3 years	28	0.9%
4 years	31	1.0%
5 years	40	1.4%
6 years	41	1.4%
7 years	65	2.2%
8 years	33	1.1%
9 years	56	1.9%
10 years	44	1.5%
11 years	63	2.1%
12 years	47	1.6%
13 years	28	0.9%
14 years	41	1.4%
15 years	48	1.6%
16 years	41	1.4%
17 years	49	1.7%
18 years	54	1.8%
19 years	30	1.0%
20 years	24	0.8%
21 years	14	0.5%
22 to 24 years	107	3.6%
25 to 29 years	130	4.4%
30 to 34 years	162	5.5%
35 to 39 years	198	6.7%
40 to 44 years	285	9.6%
45 to 49 years	284	9.6%
50 to 54 years	277	9.4%
55 to 59 years	135	4.6%
60 and 61 years	34	1.1%
62 to 64 years	73	2.5%
65 and 66 years	60	2.0%
67 to 69 years	66	2.2%
70 to 74 years	87	2.9%
75 to 79 years	95	3.2%
80 to 84 years	64	2.2%
85 years and over	19	0.6%
Female:	3,100	51.2%
Under 1 year	36	1.2%
1 year	48	1.5%
2 years	13	0.4%
3 years	36	1.2%
4 years	23	0.7%
5 years	27	0.9%
6 years	48	1.5%
7 years	25	0.8%
8 years	48	1.5%
9 years	34	1.1%
10 years	57	1.8%
11 years	59	1.9%
12 years	43	1.4%
13 years	69	2.2%
14 years	40	1.3%

15 years	55	1.8%
16 years	32	1.0%
17 years	48	1.5%
18 years	42	1.4%
19 years	16	0.5%
20 years	30	1.0%
21 years	25	0.8%
22 to 24 years	101	3.3%
25 to 29 years	162	5.2%
30 to 34 years	157	5.1%
35 to 39 years	305	9.8%
40 to 44 years	278	9.0%
45 to 49 years	286	9.2%
50 to 54 years	203	6.5%
55 to 59 years	139	4.5%
60 and 61 years	61	2.0%
62 to 64 years	86	2.8%
65 and 66 years	58	1.9%
67 to 69 years	59	1.9%
70 to 74 years	144	4.6%
75 to 79 years	114	3.7%
80 to 84 years	58	1.9%
85 years and over	35	1.1%
Sex by Educational Attainment for the Population 25 years+		
Male:	1,970	
No schooling completed	2	0.1%
Nursery to 4th grade	0	0.0%
5th and 6th grade	12	0.6%
7th and 8th grade	9	0.5%
9th grade	15	0.8%
10th grade	5	0.3%
11th grade	28	1.4%
12th grade, no diploma	41	2.1%
High school graduate (includes equivalency)	443	22.5%
Some college, less than 1 year	123	6.2%
Some college, 1 or more years, no degree	325	16.5%
Associate degree	122	6.2%
Bachelor's degree	499	25.3%
Master's degree	141	7.2%
Professional school degree	156	7.9%
Doctorate degree	49	2.5%
Female:	2,144	
No schooling completed	3	0.1%
Nursery to 4th grade	0	0.0%
5th and 6th grade	7	0.3%
7th and 8th grade	21	1.0%
9th grade	20	0.9%
10th grade	36	1.7%
11th grade	44	2.1%
12th grade, no diploma	45	2.1%
High school graduate (includes equivalency)	695	32.4%
Some college, less than 1 year	156	7.3%
Some college, 1 or more years, no degree	265	12.4%
Associate degree	133	6.2%
Bachelor's degree	455	21.2%
Master's degree	182	8.5%
Professional school degree	68	3.2%
Doctorate degree	14	0.7%

Sex by Employment Status for the Population 16 years+		
Male:		
In labor force:	1,714	
In Armed Forces	0	
Civilian:	1,714	
Employed	1,663	
Unemployed	51	3.0%
Not in labor force	575	
Female:		
In labor force:	1,476	
In Armed Forces	0	
Civilian:	1,476	
Employed	1,433	
Unemployed	43	2.9%
Not in labor force	962	
Sex by Industry for the Employed Civilian Population 16 years+		
Male:	1,663	
Agriculture, forestry, fishing and hunting, and mining:	36	2.2%
Agriculture, forestry, fishing and hunting	22	61.1%
Mining	14	38.9%
Construction	153	9.2%
Manufacturing	370	22.2%
Wholesale trade	104	6.3%
Retail trade	222	13.3%
Transportation and warehousing, and utilities:	93	5.6%
Transportation and warehousing	75	80.6%
Utilities	18	19.4%
Information	29	1.7%
Finance, insurance, real estate and rental and leasing:	90	5.4%
Finance and insurance	58	64.4%
Real estate and rental and leasing	32	35.6%
Professional, scientific, management, administrative, and waste management services:	175	10.5%
Professional, scientific, and technical services	149	85.1%
Management of companies and enterprises	2	1.1%
Administrative and support and waste management services	24	13.7%
Educational, health and social services:	239	14.4%
Educational services	122	51.0%
Health care and social assistance	117	49.0%
Arts, entertainment, recreation, accommodation and food services:	80	4.8%
Arts, entertainment, and recreation	22	27.5%
Accommodation and food services	58	72.5%
Other services (except public administration)	34	2.0%
Public administration	38	2.3%
Female:	1,433	
Agriculture, forestry, fishing and hunting, and mining:	9	0.6%
Agriculture, forestry, fishing and hunting	3	33.3%
Mining	6	66.7%
Construction	15	1.0%
Manufacturing	93	6.5%
Wholesale trade	46	3.2%
Retail trade	200	14.0%
Transportation and warehousing, and utilities:	34	2.4%
Transportation and warehousing	34	100.0%
Utilities	0	0.0%
Information	10	0.7%
Finance, insurance, real estate and rental and leasing:	112	7.8%
Finance and insurance	74	66.1%
Real estate and rental and leasing	38	33.9%

Professional, scientific, management, administrative, and waste management services:	129	9.0%
Professional, scientific, and technical services	102	79.1%
Management of companies and enterprises	0	0.0%
Administrative and support and waste management services	27	20.9%
Educational, health and social services:	507	35.4%
Educational services	225	44.4%
Health care and social assistance	282	55.6%
Arts, entertainment, recreation, accommodation and food services:	151	10.5%
Arts, entertainment, and recreation	49	32.5%
Accommodation and food services	102	67.5%
Other services (except public administration)	77	5.4%
Public administration	44	3.1%
Total Households	2,432	
Average Household Income	$78,390	
Year Residential Structure Built		
Residential Structures	2,592	
Built 1999-2000	89	3.4%
Built 1995-1998	259	10.0%
Built 1990-1994	458	17.7%
Built 1980-1989	394	15.2%
Built 1970-1979	364	14.0%
Built 1960-1969	381	14.7%
Built 1950-1959	294	11.3%
Built 1940-1949	102	3.9%
Built 1939 or earlier	251	9.7%
Source: U.S. Census Bureau Census of Population and Housing, 2000		

DEMOGRAPHICS FOR SUB-WATERSHED 05030103080010		
Variable	**Total**	**Percent of Total**
Total Population	18,539	
Male:	8,727	47.1%
Under 1 year	98	1.1%
1 year	116	1.3%
2 years	76	0.9%
3 years	99	1.1%
4 years	93	1.1%
5 years	89	1.0%
6 years	102	1.2%
7 years	77	0.9%
8 years	111	1.3%
9 years	113	1.3%
10 years	105	1.2%
11 years	120	1.4%
12 years	120	1.4%
13 years	117	1.3%
14 years	119	1.4%
15 years	142	1.6%
16 years	116	1.3%
17 years	131	1.5%
18 years	168	1.9%
19 years	107	1.2%
20 years	159	1.8%
21 years	90	1.0%
22 to 24 years	312	3.6%
25 to 29 years	499	5.7%
30 to 34 years	512	5.9%
35 to 39 years	619	7.1%
40 to 44 years	730	8.4%
45 to 49 years	766	8.8%
50 to 54 years	671	7.7%
55 to 59 years	477	5.5%
60 and 61 years	136	1.6%
62 to 64 years	253	2.9%
65 and 66 years	139	1.6%
67 to 69 years	185	2.1%
70 to 74 years	358	4.1%
75 to 79 years	316	3.6%
80 to 84 years	166	1.9%
85 years and over	120	1.4%

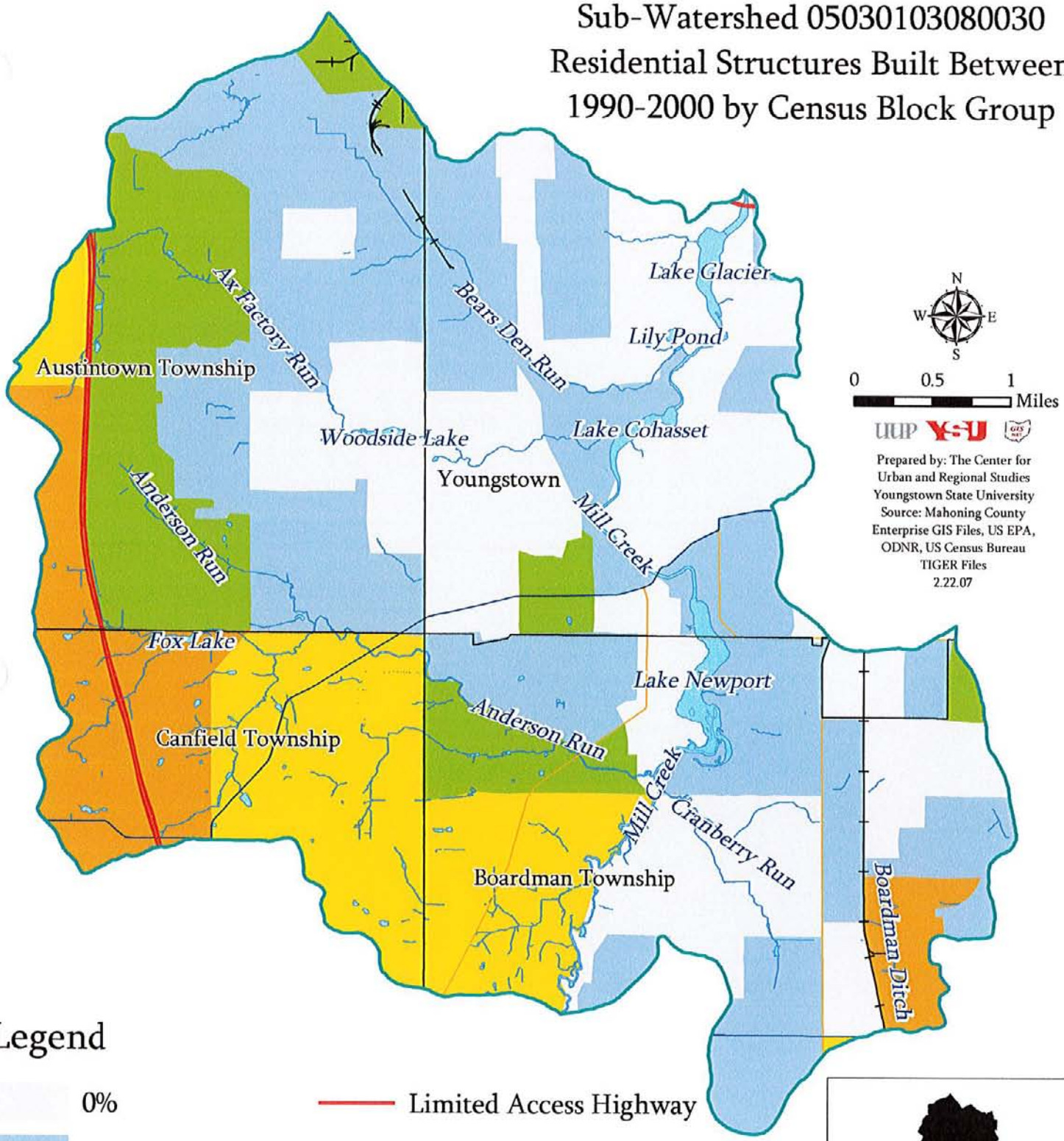
Sex by Educational Attainment for the Population 25 years+		
Male:	5,946	
No schooling completed	27	0.5%
Nursery to 4th grade	11	0.2%
5th and 6th grade	40	0.7%
7th and 8th grade	81	1.4%
9th grade	112	1.9%
10th grade	120	2.0%
11th grade	122	2.1%
12th grade, no diploma	175	2.9%
High school graduate (includes equivalency)	1,984	33.4%
Some college, less than 1 year	399	6.7%
Some college, 1 or more years, no degree	969	16.3%
Associate degree	263	4.4%
Bachelor's degree	1,092	18.4%
Master's degree	375	6.3%
Professional school degree	161	2.7%
Doctorate degree	15	0.3%
Female:	7,269	
No schooling completed	19	0.3%
Nursery to 4th grade	10	0.1%
5th and 6th grade	47	0.6%
7th and 8th grade	149	2.0%
9th grade	131	1.8%
10th grade	177	2.4%
11th grade	187	2.6%
12th grade, no diploma	203	2.8%
High school graduate (includes equivalency)	2,814	38.7%
Some college, less than 1 year	493	6.8%
Some college, 1 or more years, no degree	1,034	14.2%
Associate degree	481	6.6%
Bachelor's degree	984	13.5%
Master's degree	446	6.1%
Professional school degree	79	1.1%
Doctorate degree	15	0.2%
Sex by Employment Status for the Population 16 years+		
Male:		
In labor force:	5,013	
In Armed Forces	10	
Civilian:	5,003	
Employed	4,847	
Unemployed	156	3.1%
Not in labor force	2,017	
Female:		
In labor force:	4,570	
In Armed Forces	0	
Civilian:	4,570	
Employed	4,423	
Unemployed	147	3.2%
Not in labor force	3,582	

Sex by Industry for the Employed Civilian Population 16 years+		
Male:	4,847	
Agriculture, forestry, fishing and hunting, and mining:	24	0.5%
Agriculture, forestry, fishing and hunting	21	87.5%
Mining	3	12.5%
Construction	598	12.3%
Manufacturing	1,125	23.2%
Wholesale trade	229	4.7%
Retail trade	659	13.6%
Transportation and warehousing, and utilities:	245	5.1%
Transportation and warehousing	224	91.4%
Utilities	21	8.6%
Information	116	2.4%
Finance, insurance, real estate and rental and leasing:	226	4.7%
Finance and insurance	98	43.4%
Real estate and rental and leasing	128	56.6%
Professional, scientific, management, administrative, and waste management services:	332	6.8%
Professional, scientific, and technical services	170	51.2%
Management of companies and enterprises	0	0.0%
Administrative and support and waste management services	162	48.8%
Educational, health and social services:	476	9.8%
Educational services	278	58.4%
Health care and social assistance	198	41.6%
Arts, entertainment, recreation, accommodation and food services:	339	7.0%
Arts, entertainment, and recreation	49	14.5%
Accommodation and food services	290	85.5%
Other services (except public administration)	258	5.3%
Public administration	220	4.5%
Female:	4,423	
Agriculture, forestry, fishing and hunting, and mining:	55	1.2%
Agriculture, forestry, fishing and hunting	49	89.1%
Mining	6	10.9%
Construction	67	1.5%
Manufacturing	261	5.9%
Wholesale trade	81	1.8%
Retail trade	764	17.3%
Transportation and warehousing, and utilities:	59	1.3%
Transportation and warehousing	46	78.0%
Utilities	13	22.0%
Information	115	2.6%
Finance, insurance, real estate and rental and leasing:	295	6.7%
Finance and insurance	201	68.1%
Real estate and rental and leasing	94	31.9%
Professional, scientific, management, administrative, and waste management services:	318	7.2%
Professional, scientific, and technical services	213	67.0%
Management of companies and enterprises	3	0.9%
Administrative and support and waste management services	102	32.1%
Educational, health and social services:	1,569	35.5%
Educational services	610	38.9%
Health care and social assistance	959	61.1%
Arts, entertainment, recreation, accommodation and food services:	520	11.8%
Arts, entertainment, and recreation	62	11.9%
Accommodation and food services	458	88.1%
Other services (except public administration)	230	5.2%
Public administration	89	2.0%

Total Households	7,796	
Average Household Income	$51,537	
Year Residential Structure Built		
Residential Structures	8,213	
Built 1999-2000	169	2.1%
Built 1995-1998	580	7.1%
Built 1990-1994	667	8.1%
Built 1980-1989	1,005	12.2%
Built 1970-1979	2,275	27.7%
Built 1960-1969	1,140	13.9%
Built 1950-1959	977	11.9%
Built 1940-1949	482	5.9%
Built 1939 or earlier	918	11.2%

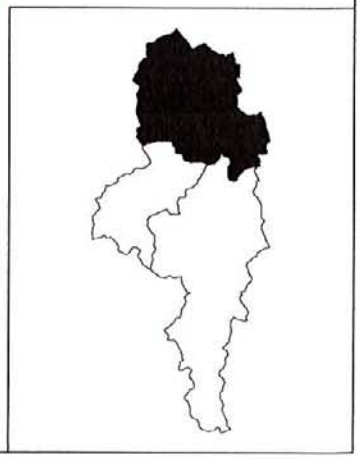
Source: U.S. Census Bureau Census of Population and Housing, 2000

Mill Creek Watershed
Sub-Watershed 05030103080030
Residential Structures Built Between 1990-2000 by Census Block Group

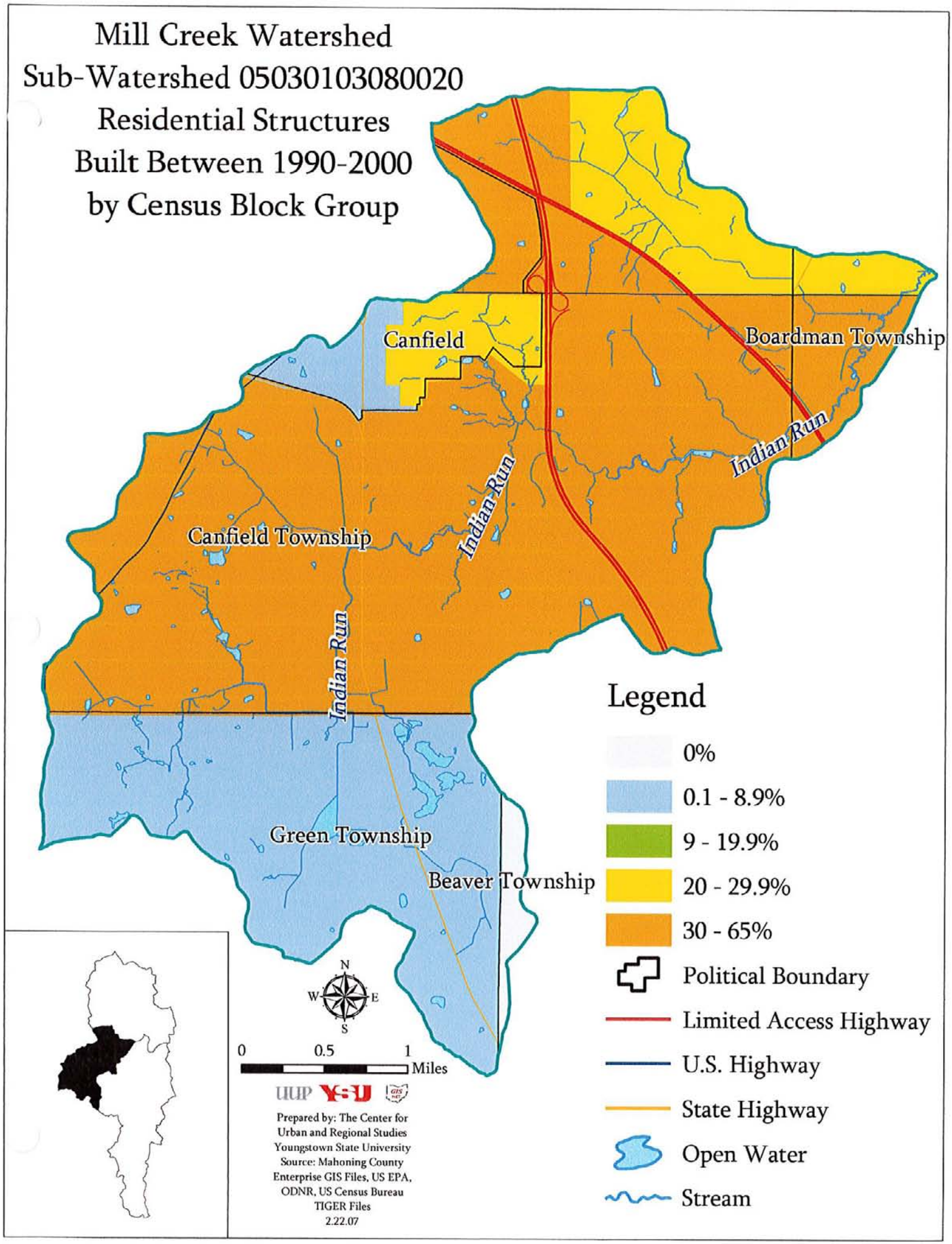


Legend

- 0%
- 0.1 - 8.9%
- 9 - 19.9%
- 20 - 29.9%
- 30 - 65%
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



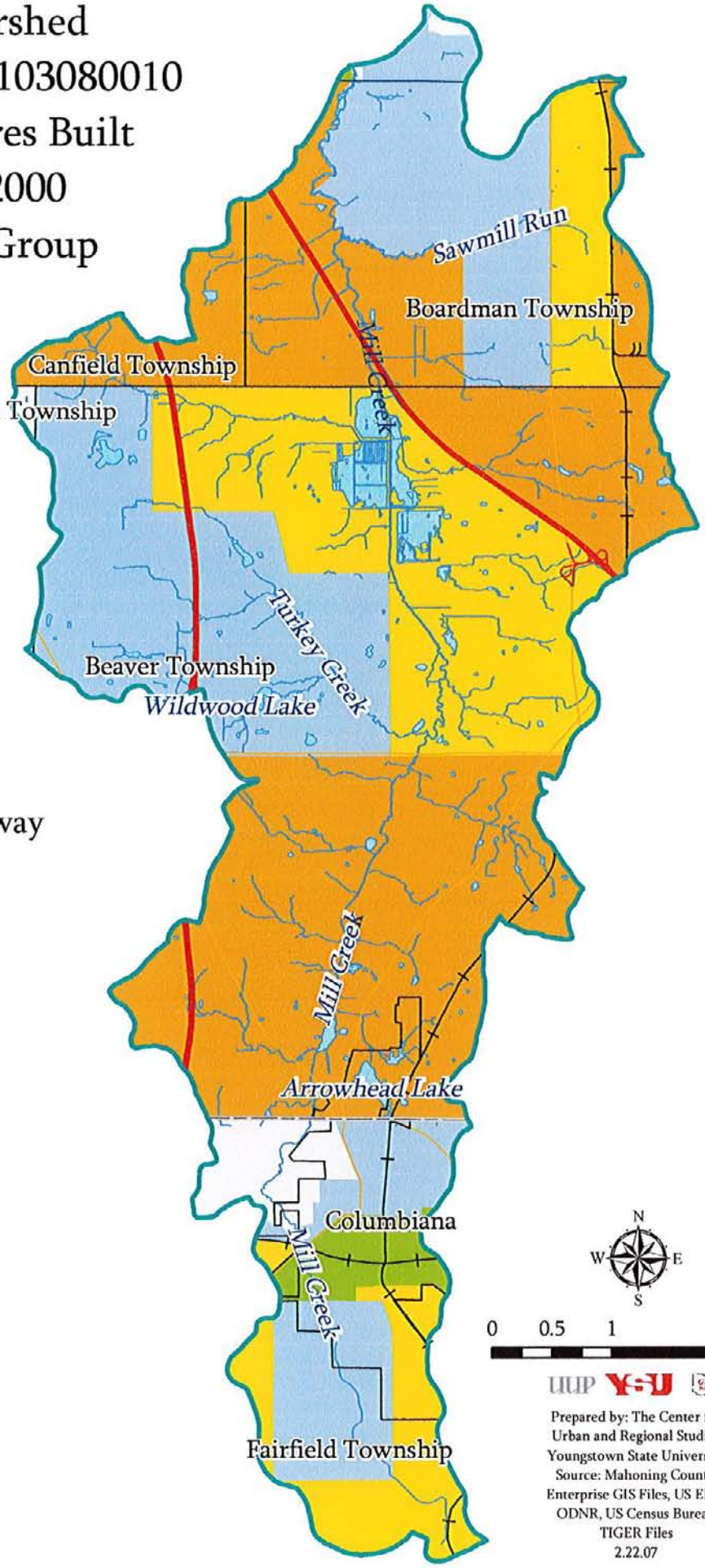
Mill Creek Watershed
Sub-Watershed 05030103080020
Residential Structures
Built Between 1990-2000
by Census Block Group



Mill Creek Watershed
Sub-Watershed 05030103080010
Residential Structures Built Between 1990-2000 by Census Block Group

Legend

- 0%
- 0.1 - 8.9%
- 9 - 19.9%
- 20 - 29.9%
- 30 - 65%
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



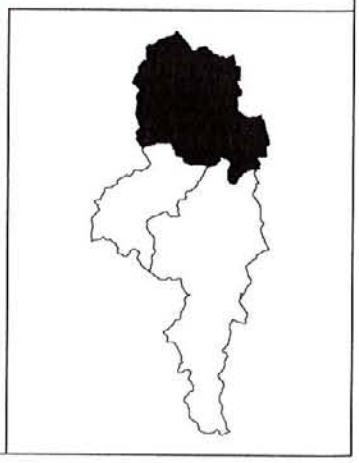
Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.22.07

Mill Creek Watershed
Sub-Watershed 05030103080030
Census Urbanized Areas

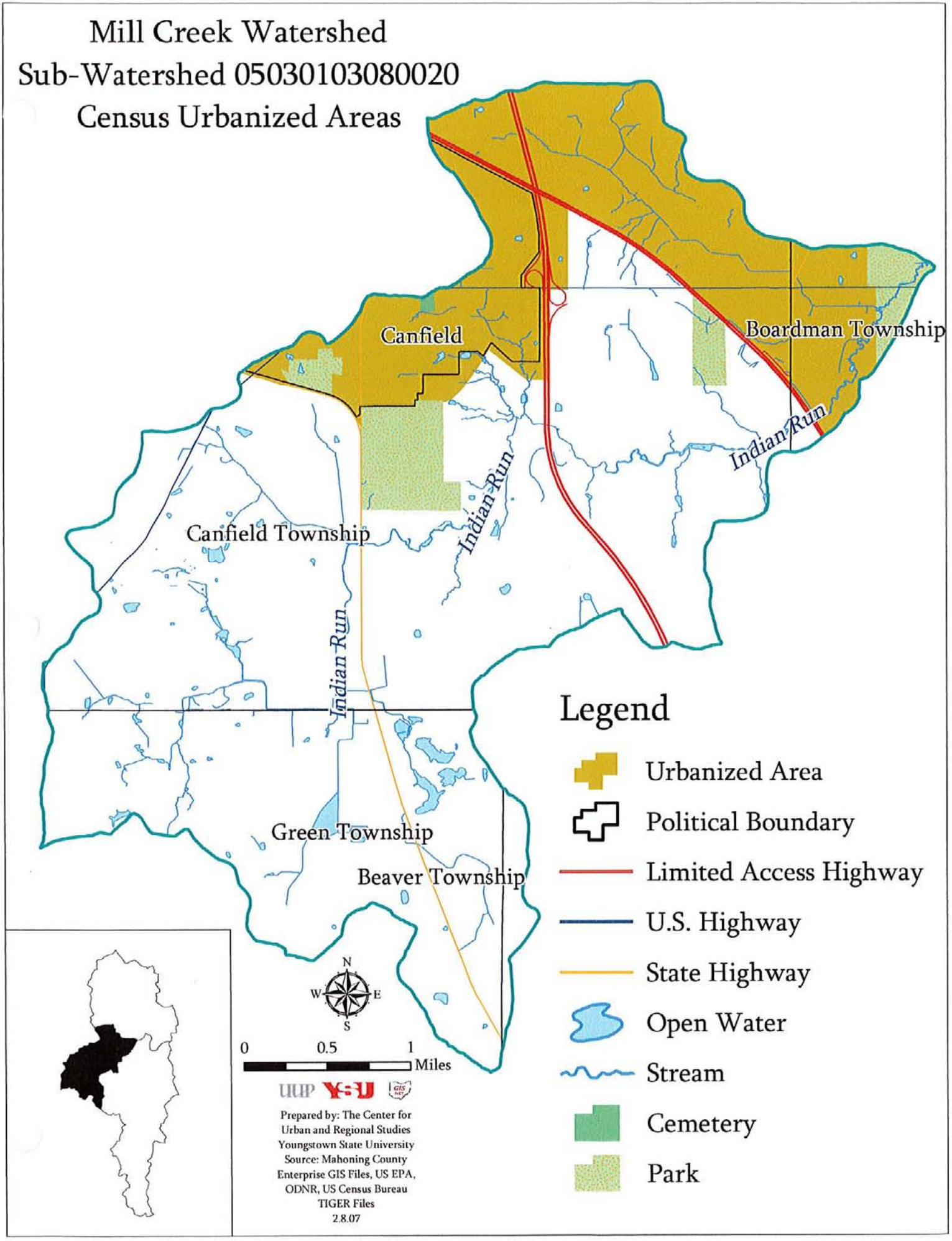
Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.12.07

Legend

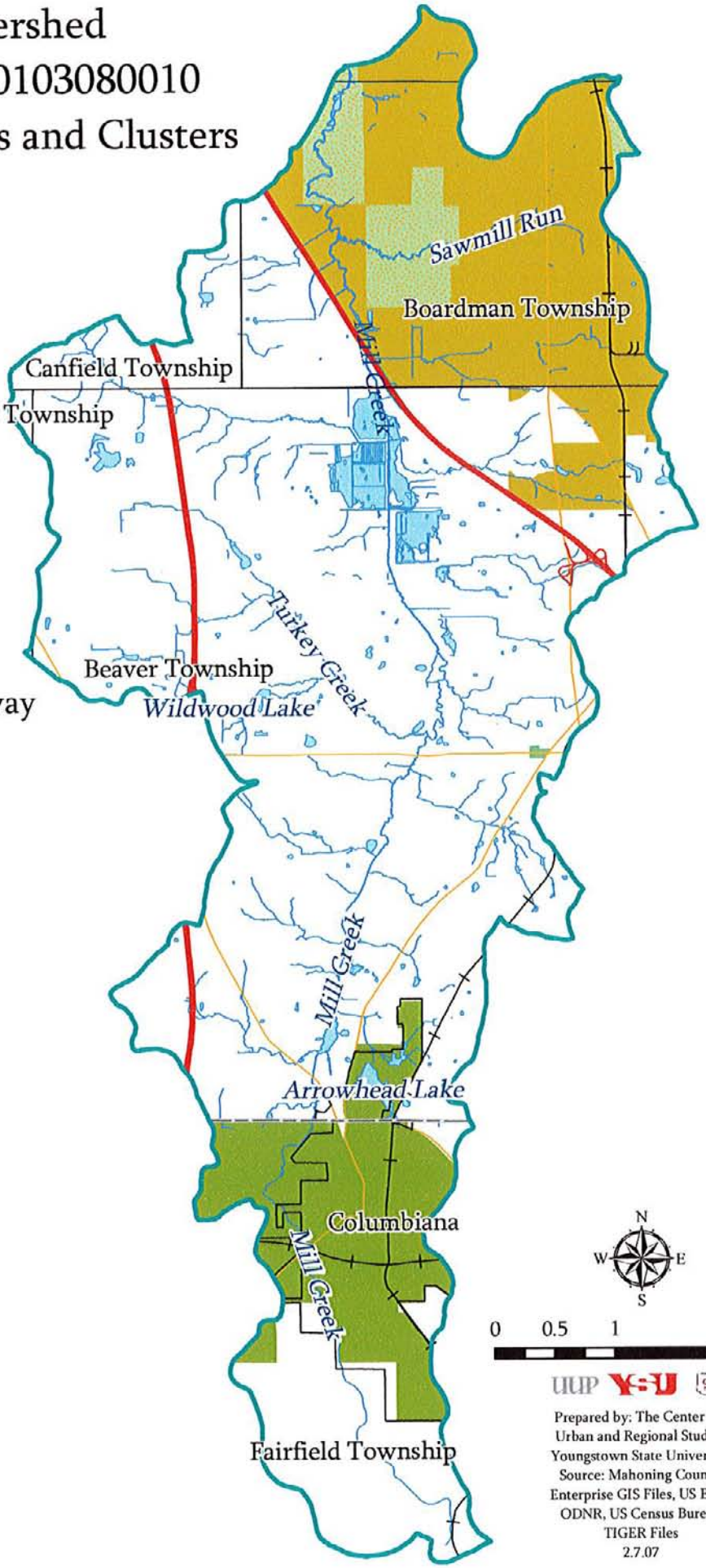
- Urbanized Area
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



Mill Creek Watershed
Sub-Watershed 05030103080020
Census Urbanized Areas

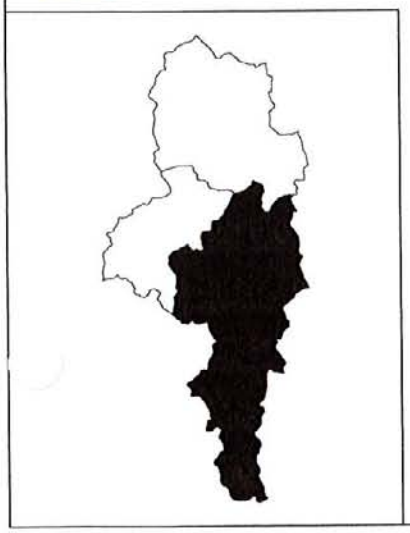


Mill Creek Watershed
Sub-Watershed 05030103080010
Census Urbanized Areas and Clusters



Legend

- Urbanized Area (UA)
- Urban Cluster (UC)
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream
- Cemetery
- Park



Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

Appendix H.

Bridge and Highway Projects

Appendix I.

Load Reduction Estimates from Original Proposed Projects

LR-MC1

Stream Restoration
Please fill in gray areas below

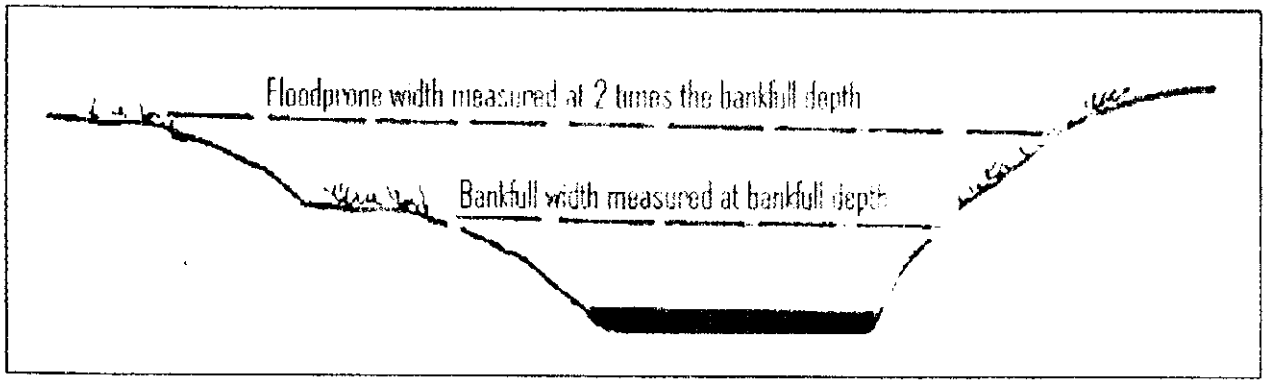
Project Information (complete all applicable fields)					
County	Mahoning	14 Digit HUC		05030103-080-020	
Owner / Operator	Canfield Township Trustees	Stream Segment Name		Little Indian Creek	
Semi-Annual Report Date		River Miles		0.3	
319 Project Name		BMP & Date Installed			
OEPA Project Number		Latitude		Longitude	

QHEI Score	
Pre-restoration	30
Post Restoration	65

Area of streambank restored (Ac)	4.5
Length of stream channel restored (ft)	1500

Sinuosity	Pre-restoration	Post Restoration	**Example**
Stream length (ft)	1570	1760	210
Valley length (ft)	1490	1490	100
Ratio	1.1 : 1	1.2 : 1	2.1 : 1

Entrenchment	Pre-restoration	Post Restoration	**Example**
Flood prone width (ft)	NA		70
Bankfull width (ft)	NA	17	25
Ratio	#VALUE!	: 1	2.8 : 1



No Pre-restoration BkF width available

No BkF indicators due to channel modification

Post-Restoration Width based on Bankful dimensions vs. Drainage Area for Eastern United States

LR-MC3

Stream Restoration
Please fill in gray areas below.

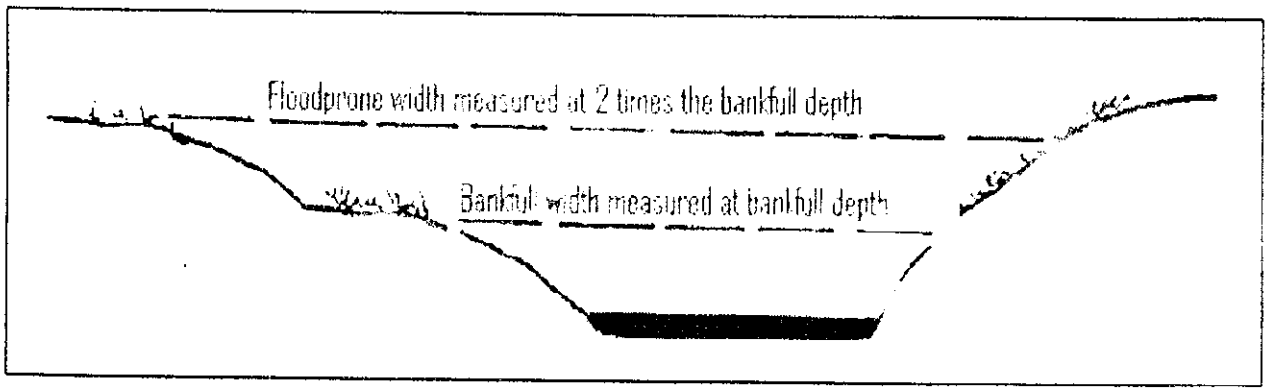
Project Information (complete all applicable fields)					
County	Mahoning	14 Digit HUC		05030103-080-030	
Owner / Operator	Private Landowners	Stream Segment Name		Ax Factory Run	
Semi-Annual Report Date		River Miles		0.9	
319 Project Name		BMP & Date Installed			
OEPA Project Number		Latitude		Longitude	

QHEI Score	
Pre-restoration	0-30
Post Restoration	65

Area of streambank restored (Ac)	20
Length of stream channel restored (ft)	15000

Sinuosity	Pre-restoration	Post Restoration	**Example**
Stream length (ft)	5700	6070	210
Valley length (ft)	5200	5200	100
Ratio	1.1 : 1	1.2 : 1	2.1 : 1

Entrenchment	Pre-restoration	Post Restoration	**Example**
Flood prone width (ft)	NA		70
Bankfull width (ft)	NA	20	25
Ratio	#VALUE!	: 1	2.8 : 1



No Pre-restoration BkF width available

No BkF indicators due to channel modification

Post-Restoration Width based on Bankful dimensions vs. Drainage Area for Eastern United States

Bank Stabilization

Please fill in the gray areas below.

Note:
If estimating for just one bank, enter "0" in areas for Bank #2.

Project Information (complete all applicable fields)			
County	Mahoning	14 Digit HUC	05030103-080-030
Owner / Operator		Stream Segment Name	Anderson Run
Semi-Annual Report Date		River Miles	
319 Project Name		BMP & Date Installed	
OEPA Project Number		Latitude	Longitude

Please select a soil textural class:

- ( ) Sands, loamy sands
- ( ) Sandy loam
- ( ) Fine sandy loam
- ( ) Loams, sandy clay loams, sandy clay
- (•) Silt loam
- ( ) Silty clay loam, silty clay
- ( ) Clay loam
- ( ) Clay
- ( ) Organic

Parameter	Bank #1	Bank #2	Example
Length (ft)	4400	4400	**500**
Height (ft)	8	9	**15**
Lateral Recession Rate (ft/yr)	0.2	0.2	**0.5**
Soil P Conc (lb/lb soil) DEFAULT	0.0005	0.0005	**0.0005**
Soil N Conc (lb/lb soil) DEFAULT	0.001	0.001	**0.001**

Note:
To insert custom N & P concentrations, highlight 'DEFAULT' in drop down box and type new concentration.

Note:
Lateral recession rate (LRR) is the rate at which bank deterioration has taken place and is measured in feet per year. This rate may not be easilly determined by direct measurement. Therefore, best professional judgement may be required to estimate the LRR. See Table 1.

Note:
'Default' assumes concentration values for Total P of 0.0005 (lb/lb soil) and Total N of 0.001 (lb/lb soil).

Table 1. Lateral recession rates narrative descriptions.

LRR (ft/yr)	Category	Description
0.01 - 0.05	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang
0.06 - 0.2	Moderate	Bank is predominantly bare with some rills and vegetative overhang
0.3 - 0.5	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped.
0.5+	Very Severe	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains and culverts eroding out and changes in cultural features as above. Massive slips or washouts common. Channel cross-section is U-shaped and streamcourse or gully may be meandering.

Source. Steffen, L.J. 1982. Channel Erosion (personal communication), as printed in "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual," June 1999 Revision; Michigan Department of Environmental Quality - Surface Water Quality Division - Nonpoint Source Unit. EQP 5841 (6/99).

Estimated Load Reductions:

	Bank #1	Bank #2	Example
Sediment Load Reduction (ton/year)	299	337	**150**
Phosphorus Load Reduction (lb/year)	299	337	**150**
Nitrogen Load Reduction (lb/yr)	598	673	**300**

Load reductions are based on completion of entire length of restoration. It is likely that the project would be completed in phases, yielding incremental reductions with each phase.

LR-MC5

Stream Restoration
Please fill in gray areas below.

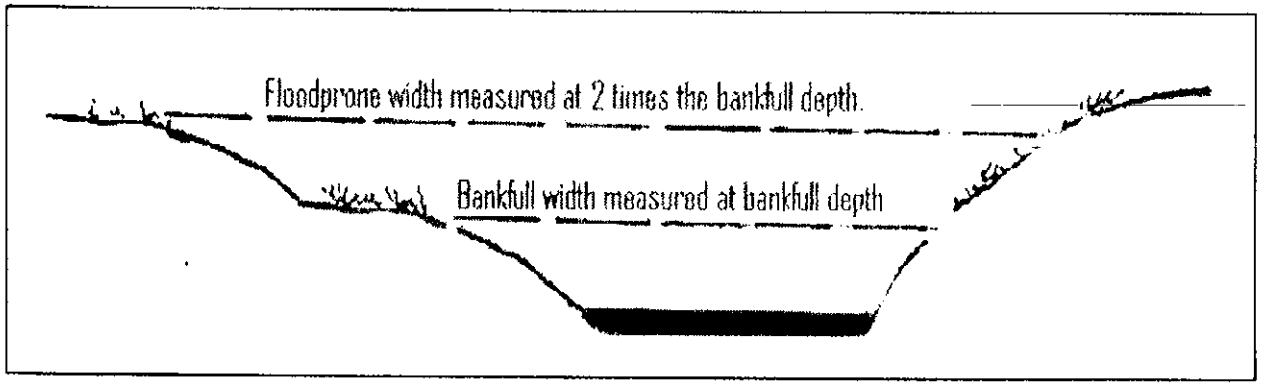
Project Information (complete all applicable fields)					
County	Mahoning	14 Digit HUC		05030103-080-010	
Owner / Operator	Private Landowners	Stream Segment Name		Mill Creek	
Semi-Annual Report Date		River Miles		1.8	
319 Project Name		BMP & Date Installed			
OEPA Project Number		Latitude		Longitude	

QHEI Score	
Pre-restoration	30
Post Restoration	65

Area of streambank restored (Ac)	44
Length of stream channel restored (ft)	5900

Sinuosity	Pre-restoration	Post Restoration	**Example**
Stream length (ft)	5900	8000	210
Valley length (ft)	5900	5900	100
Ratio	1. : 1	1.4 : 1	2.1 : 1

Entrenchment	Pre-restoration	Post Restoration	**Example**
Flood prone width (ft)	NA		70
Bankfull width (ft)	NA	52	25
Ratio	#VALUE!	. : 1	2.8 : 1



No Pre-restoration BkF width available

No BkF indicators due to channel modification

Post-Restoration Width based on Bankful dimensions vs. Drainage Area for Eastern United States

LR-MC7

Stream Restoration
Please fill in gray areas below.

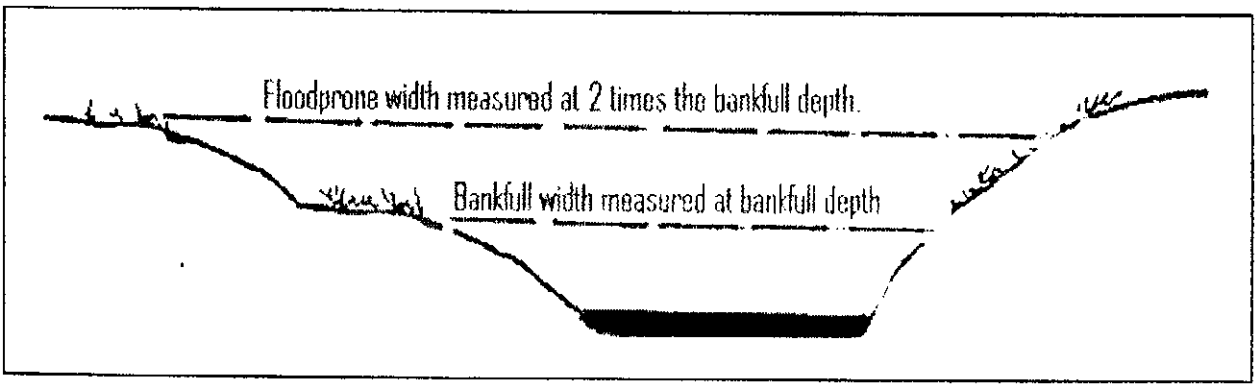
Project Information (complete all applicable fields)					
County	Mahoning	14 Digit HUC		05030103-080-010	
Owner / Operator	Private Landowners	Stream Segment Name		Mill Creek	
Semi-Annual Report Date		River Miles		0.5	
319 Project Name		BMP & Date Installed			
OEPA Project Number		Latitude		Longitude	

QHEI Score	
Pre-restoration	35
Post Restoration	70

Area of streambank restored (Ac)	20
Length of stream channel restored (ft)	2500

Sinuosity	Pre-restoration	Post Restoration	**Example**
Stream length (ft)	1600	2000	210
Valley length (ft)	1520	1520	100
Ratio	1.1 : 1	1.3 : 1	2.1 : 1

Entrenchment	Pre-restoration	Post Restoration	**Example**
Flood prone width (ft)	NA		70
Bankfull width (ft)	NA	14	25
Ratio	#VALUE!	. : 1	2.8 : 1



No Pre-restoration BkF width available

No BkF indicators due to channel modification

Post-Restoration Width based on Bankful dimensions vs. Drainage Area for Eastern United States

LR-MC10a

Urban Runoff BMP's
Please fill in the gray areas below.

Note:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Project Information (complete all applicable fields)			
County	Mahoning	14 Digit HUC	05030103-080-010
Owner / Operator	Private Landowner	Stream Segment Name	Charles Ditch/Sawmill Run
Semi-Annual Report Date		River Miles	
319 Project Name		BMP & Date Installed	
OEPA Project Number		Latitude	Longitude

Please select a best management practice:

- ○ Vegetated filter strips
- ○ Grass swales
- ○ Infiltration device
- ○ Extended wet detention
- ○ Wetland detention
- ○ Dry detention
- ○ Settling basin
- ○ Sand filters
- ○ WQ inlets
- ○ Weekly street sweeping
- ○ Infiltration basin
- ○ Infiltration trench
- ◉ Porous pavement
- ○ Concrete grid pavement
- ○ Sand filter / infiltration basin
- ○ WQ inlet w/ sand filter
- ○ Oil / grit separator
- ○ Wet pond

Please enter landuse (in acres) of contributing drainage area:

	Sewered	Unsewered
Commercial	84	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	21
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note:
Sewered and unsewered refers to storm sewers

Estimated Load Reductions:

	Pre-BMP Loading (lbs/yr)		Post-BMP Loading (lbs/yr)		Load Reduction (lbs/yr)
BOD	7,371		U		U
COD	50,967		10,193		40,774
TSS	102,354		10,235		92,119
LEAD	89		0		89
COPPER	17		U		U
ZINC	144		0		144
TDS	242,298		U		U
TN	1,829		274		1,555
TKN	613		U		U
DP	61		U		U
TP	118		41		76
CADMIUM	1		U		U

Note:
U = Removal efficiency for the particular BMP and constituent unavailable.

Based on removal of 1/3 of impervious surface and replacement with pervious pavers

LR-MC10b

Urban Runoff BMP's
Please fill in the gray areas below.

Note:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Project Information (complete all applicable fields)					
County	Mahoning	14 Digit HUC		05030103-080-010	
Owner / Operator	Private Landowner	Stream Segment Name		Charles Ditch/Sawmill Run	
Semi-Annual Report Date		River Miles			
319 Project Name		BMP & Date Installed			
OEPA Project Number		Latitude		Longitude	

Please select a best management practice:

- ○ Vegetated filter strips
- ○ Grass swales
- ○ Infiltration device
- ○ Extended wet detention
- ○ Wetland detention
- ○ Dry detention
- ○ Settling basin
- ○ Sand filters
- ○ WQ inlets
- ○ Weekly street sweeping
- ○ Infiltration basin
- ◉ Infiltration trench
- ○ Porous pavement
- ○ Concrete grid pavement
- ○ Sand filter / infiltration basin
- ○ WQ inlet w/ sand filter
- ○ Oil / grit separator
- ○ Wet pond

Please enter landuse (in acres) of contributing drainage area:

	Sewered	Unsewered
Commercial	84	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	21
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note:
Sewered and unsewered refers to storm sewers

Estimated Load Reductions:

	Pre-BMP Loading (lbs/yr)		Post-BMP Loading (lbs/yr)		Load Reduction (lbs/yr)
BOD	7,371		U		U
COD	50,967		17,838		33,129
TSS	102,354		25,589		76,766
LEAD	89		31		58
COPPER	17		U		U
ZINC	144		50		94
TDS	242,298		U		U
TN	1,829		823		1,006
TKN	613		U		U
OP	61		U		U
TP	118		47		71
CADMIUM	1		U		U

Note:
U = Removal efficiency for the particular BMP and constituent unavailable.

Based on creation of infiltration trenches in place of some parking area

Urban Runoff BMP's

Please fill in the gray areas below.

Note:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency

Project Information (complete all applicable fields)					
County	Mahoning	14 Digit HUC		05030103-080-010	
Owner / Operator	Private Landowner	Stream Segment Name		UNT21055	
Semi-Annual Report Date		River Miles			
319 Project Name		BMP & Date Installed			
OEPA Project Number		Latitude		Longitude	

Please select a best management practice:

- ○ Vegetated filter strips
- ○ Grass swales
- ○ Infiltration device
- ○ Extended wet detention
- ○ Wetland detention
- ○ Dry detention
- ○ Settling basin
- ○ Sand filters
- ○ WQ inlets
- ○ Weekly street sweeping
- ○ Infiltration basin
- ○ Infiltration trench
- ◉ Porous pavement
- ○ Concrete grid pavement
- ○ Sand filter / infiltration basin
- ○ WQ inlet w/ sand filter
- ○ Oil / grit separator
- ○ Wet pond

Please enter landuse (in acres) of contributing drainage area:

	Sewered	Unsewered
Commercial	25	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	21
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note:
Sewered and unsewered refers to storm sewers

Estimated Load Reductions:

	Pre-BMP Loading (lbs/yr)	Post-BMP Loading (lbs/yr)	Load Reduction (lbs/yr)
BOD	2,356	U	U
COD	16,216	3,243	12,973
TSS	32,734	3,273	29,461
LEAD	28	0	28
COPPER	6	U	U
ZINC	49	0	49
TDS	75,328	U	U
TN	590	89	502
TKN	206	U	U
DP	20	U	U
TP	41	14	27
CADMIUM	0	U	U

Note:
U = Removal efficiency for the particular BMP and constituent unavailable.

Based on removal of 1/3 of impervious surface and replacement with pervious pavers

LR-MC11b

Urban Runoff BMP's

Please fill in the gray areas below.

Note:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency

Project Information (complete all applicable fields)					
County	Mahoning	14 Digit HUC		05030103-080-010	
Owner / Operator	Private Landowner	Stream Segment Name		UNT21055	
Semi-Annual Report Date		River Miles			
319 Project Name		BMP & Date Installed			
OEPA Project Number		Latitude		Longitude	

Please select a best management practice:

- ○ Vegetated filter strips
- ○ Grass swales
- ○ Infiltration device
- ○ Extended wet detention
- ○ Wetland detention
- ○ Dry detention
- ○ Settling basin
- ○ Sand filters
- ○ WQ inlets
- ○ Weekly street sweeping
- ○ Infiltration basin
- ◉ Infiltration trench
- ○ Porous pavement
- ○ Concrete grid pavement
- ○ Sand filter / infiltration basin
- ○ WQ inlet w/ sand filter
- ○ Oil / grit separator
- ○ Wet pond

Please enter landuse (in acres) of contributing drainage area:

	Sewered	Unsewered
Commercial	25	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	21
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note:
Sewered and unsewered refers to storm sewers

Estimated Load Reductions:

	Pre-BMP Loading (lbs/yr)		Post-BMP Loading (lbs/yr)		Load Reduction (lbs/yr)
BOD	2,356		U		U
COD	16,216		5,676		10,540
TSS	32,734		8,184		24,551
LEAD	28		10		18
COPPER	6		U		U
ZINC	49		17		32
TDS	75,328		U		U
TN	590		266		325
TKN	206		U		U
DP	20		U		U
TP	41		16		25
CADMIUM	0		U		U

Note:
U = Removal efficiency for the particular BMP and constituent unavailable.

Based on creation of infiltration trenches in place of some parking area

LR-MC16

Agricultural Fields and Filter Strips
Please fill in the gray areas below.

Project Information (complete all applicable fields)					
County	Mahoning	14 Digit HUC		05030103-080-010	
Owner / Operator	Private Landowner	Stream Segment Name		UNT22080	
Semi-Annual Report Date		River Miles			
319 Project Name		BMP & Date Installed			
OEPA Project Number		Latitude		Longitude	

Note:
The project type may include:

Prescribed grazing
Residue management
Conservation crop rotation
Conservation cover
Cover and green manure crops
Critical area planting
Stripcropping
Contour farming
Field filter strips

Please check which type of BMP applies:
- ☐ Agricultural Field Practices
- ☑ Filter Strips

RUSLE	Before Treatment	After Treatment	Example Before Treatment	Example After Treatment
Rainfall-Runoff Erosivity Factor (R)	125.00	125.00	120	120
Soil Erodibility Factor (K)	0.37	0.37	0.35	0.35
Length-Slope Factor (LS)	0.59	0.59	0.44	0.44
Cover Management Factor (C)	0.20	0.20	0.7	0.5
Support Practice Factor (P)	0.99	0.97	0.775	0.11
Predicted Avg Annual Soil Loss (ton/acre/year)	5.30	5.30	10.03	1.02

		Example
Contributing area (acres)	150	14

Note:
The contributing area (watershed) is the portion of the treated field which contributes eroded soil to the waterbody. The contributing area (watershed) is defined by the runoff flowpath and by topography and may differ in size from the actual treated field

Please select a gross soil texture:
- ○ Clay (clay, clay loam, and silt clay)
- ○ Silt (silt, silty clay loam, loam, and silt loam)
- ○ Sand (sand, sandy clay, sandy clay loam, sandy loam, and loamy sand)
- ◉ Peat

Estimated load reductions for agricultural field practices

	Treated	Example
Sediment Load Reduction (ton/year)	0	85
Phosphorus Load Reduction (lb/year)	0	100
Nitrogen Load Reduction (lb/yr)	1	200

Estimated additional load reductions through filter strips

	Filter Strips	Example
Sediment Load Reduction (ton/year)	260	92
Phosphorus Load Reduction (lb/year)	591	114
Nitrogen Load Reduction (lb/yr)	1104	227

Total estimated load reductions

	Total	Example
Sediment Load Reduction (ton/year)	260	177
Phosphorus Load Reduction (lb/year)	592	214
Nitrogen Load Reduction (lb/yr)	1105	427

Based on exclusion fencing for approximately 40 cattle (hence creating a filter strip behind exclusion fencing)

Agricultural Fields and Filter Strips
Please fill in the gray areas below.

Project Information (complete all applicable fields)			
County	Mahoning	14 Digit HUC	05030103-080-010
Owner / Operator	Private Landowner	Stream Segment Name	Moff Run
Semi-Annual Report Date		River Miles	
319 Project Name		BMP & Date Installed	
OEPA Project Number		Latitude	Longitude

Note:
The project type may include:

Prescribed grazing
Residue management
Conservation crop rotation
Conservation cover
Cover and green manure crops
Critical area planting
Strip cropping
Contour farming
Field filter strips.

Please check which type of BMP applies:
- ☐ Agricultural Field Practices
- ☑ Filter Strips

RUSLE	Before Treatment	After Treatment	Example Before Treatment	Example After Treatment
Rainfall-Runoff Erosivity Factor (R)	125.00	125.00	**120**	**120**
Soil Erodibility Factor (K)	0.37	0.37	**0.35**	**0.35**
Length-Slope Factor (LS)	0.59	0.59	**0.44**	**0.44**
Cover Management Factor (C)	0.20	0.20	**0.7**	**0.5**
Support Practice Factor (P)	0.99	0.97	**0.775**	**0.11**
Predicted Avg Annual Soil Loss (ton/acre/year)	5.30	5.30	**10.03**	**1.02**

		Example
Contributing area (acres)	1500	14

Note:
The contributing area (watershed) is the portion of the treated field which contributes eroded soil to the waterbody. The contributing area (watershed) is defined by the runoff flowpath and by topography and may differ in size from the actual treated field.

Please select a gross soil texture:
- ○ Clay (clay, clay loam, and silt clay)
- ○ Silt (silt, silty clay loam, loam, and silt loam)
- ○ Sand (sand, sandy clay, sandy clay loam, sandy loam, and loamy sand)
- ◉ Peat

Estimated load reductions for agricultural field practices

	Treated	Example
Sediment Load Reduction (ton/year)	2	**85**
Phosphorus Load Reduction (lb/year)	3	**100**
Nitrogen Load Reduction (lb/yr)	6	**200**

Estimated additional load reductions through filter strips

	Filter Strips	Example
Sediment Load Reduction (ton/year)	1950	**92**
Phosphorus Load Reduction (lb/year)	4696	**114**
Nitrogen Load Reduction (lb/yr)	8771	**227**

Total estimated load reductions

	Total	Example
Sediment Load Reduction (ton/year)	1952	**177**
Phosphorus Load Reduction (lb/year)	4699	**214**
Nitrogen Load Reduction (lb/yr)	8776	**427**

Based on exclusion fencing for approximately 50 cattle (hence creating a filter strip behind exclusion fencing)

Agricultural Fields and Filter Strips
Please fill in the gray areas below.

Project Information (complete all applicable fields)					
County	Mahoning	14 Digit HUC		05030103-080-010	
Owner / Operator	Private Landowner	Stream Segment Name		Raccoon Run Headwaters	
Semi-Annual Report Date		River Miles			
319 Project Name		BMP & Date Installed			
OEPA Project Number		Latitude		Longitude	

Note:
The project type may include:

Prescribed grazing
Residue management
Conservation crop rotation
Conservation cover
Cover and green manure crops
Critical area planting
Stripcropping
Contour farming
Field filter strips

Please check which type of BMP applies:
- ☐ Agricultural Field Practices
- ☑ Filter Strips

RUSLE	Before Treatment	After Treatment	Example Before Treatment	Example After Treatment
Rainfall-Runoff Erosivity Factor (R)	125.00	125.00	120	120
Soil Erodibility Factor (K)	0.37	0.37	0.35	0.35
Length-Slope Factor (LS)	0.59	0.59	0.44	0.44
Cover Management Factor (C)	0.20	0.20	0.7	0.5
pport Practice Factor (P)	0.99	0.97	0.775	0.11
redicted Avg Annual Soil Loss (ton/acre/year)	5.30	5.30	10.03	1.02

		Example
Contributing area (acres)	113	14

Note:
The contributing area (watershed) is the portion of the treated field which contributes eroded soil to the waterbody. The contributing area (watershed) is defined by the runoff flowpath and by topography and may differ in size from the actual treated field

Please select a gross soil texture:
- ○ Clay (clay, clay loam, and silt clay)
- ○ Silt (silt, silty clay loam, loam, and silt loam)
- ○ Sand (sand, sandy clay, sandy clay loam, sandy loam, and loamy sand)
- ◉ Peat

Estimated load reductions for agricultural field practices

	Treated	Example
Sediment Load Reduction (ton/year)	0	85
Phosphorus Load Reduction (lb/year)	0	100
Nitrogen Load Reduction (lb/yr)	1	200

Estimated additional load reductions through filter strips

	Filter Strips	Example
Sediment Load Reduction (ton/year)	203	92
Phosphorus Load Reduction (lb/year)	458	114
Nitrogen Load Reduction (lb/yr)	856	227

Total estimated load reductions

	Total	Example
diment Load Reduction (ton/year)	203	177
osphorus Load Reduction (lb/year)	458	214
Nitrogen Load Reduction (lb/yr)	856	427

Based on exclusion fencing for approximately 20 cattle (hence creating a filter strip behind exclusion fencing)

LR-MC19

Septic Systems

Please fill in the gray areas below.

Project Information (complete all applicable fields)					
County	Mahoning	14 Digit HUC		05030103-080-030	
Owner Operator		Stream Segment Name		Anderson Run	
Semi-Annual Report Date		River Miles			
319 Project Name		BMP and Date Installed			
OEPA Project Number		Latitude		Longitude	

County	Landowner Initials	Final Inspection (mm/dd/yyyy)	Gallons per day adequately treated
Mahoning	PL*		400
Mahoning	PL*		400
Mahoning	PL*		400
Mahoning	PL*		400
Mahoning	PL*		400
Mahoning	PL*		400
Mahoning	PL*		400
Mahoning	PL*		400
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Mahoning	PL*		400
Mahoning	PL*		400
Mahoning	PL*		400
Mahoning	PL*		400
Mahoning	PL*		400
Mahoning	PL*		400

Estimated Load Reduction:

Gallons per day adequately treated: 14,000

Based on treatment of 34 homes, actual goal for area in question is 66 homes, so GPD treated will be higher.

Appendix J.

Original Mill Creek Watershed Ad Hoc Committee Identified Issues, Causes and Sources from Original Plan Submittal.

Mill Creek - Identified Issues, Causes, Sources						
Produced October-December 2003, AWARE Ad Hoc Committee						
Stream	**Segment**	**Location Details**	**Cause/Issue**	**Source(s)**	**General Recommendations**	**Reference Number**
Mill Creek	Headwaters	South of 165	**lack of data**	Biological	OEPA fish sampling demo	1MC-1 Research 1MC-1 Education
Mill Creek		South of Columbiana	**lack of data**	Biological	Volunteer monitor assignments	1MC-2 Research
Mill Creek	Headwaters	Near Columbiana	**lack of data**	Functional	Better identification of wetlands and easement potential in Columiana Co. portion of watershed. Include in Riparian Area Protection Plan update	1MC-3 Research
Mill Creek	All	Entire watershed	**lack of data**	Morphological	Determine miles of channelized stream using GIS	1MC-4 Research
Mill Creek	Middle Mainstem	North of OH 165	**Sediment**	Stream Bank ersosion	Acquisition of buffers to allow stream recovery in areas where stream has not been channelized	2MC-1 Project
Mill Creek		Bassinger Road - Western Reserve Road	**Sediment**	Stream Bank ersosion	Natural Channel Resoration	2MC-2 Project
Mill Creek		Bassinger Road Curve	**Sediment**	Storage of WWTP sludge in floodplain	improved handling of WWTP sludge	2MC-3 Project
Mill Creek	Middle to Lower Mainstem and tributaries	Western Reserve Road - US 224	**Sediment**	Stream Bank ersosion	Acquisition of buffers to allow stream recovery in areas where stream has not been channelized.	2MC-1 Project
Mill Creek	Middle to Lower Watershed	Western Reserve Road - US 224	**Sediment**	Stream Bank ersosion	Buffers for floodplain storage, Addition of Riaparian Setbacks in Zoning Ordinance to allow floodplain storage	2MC-4 Policy
Mill Creek	Middle to Lower Watershed	Western Reserve Road - US 224	**Sediment**	Stream Bank ersosion	Buffers for floodplain storage, Easements on tributaries and in headwater areas	2MC-4 Project
Mill Creek	Middle to Lower Mainstem	Western Reserve Road - US 224	**Sediment**	Stream Bank ersosion related to in channel debris	Selective removal of debris to avoid erosion points	2MC-5 Project
Indian Run	All	Calla Road - US 224	**Sediment**	Stream Bank ersosion	Buffers for floodplain storage, Easements on tributaries and in headwater areas	2MC-4 Project
Anderson Run	Near confluence with Mill Creek	Mill Creek MetroParks property	**Sediment**	Stream Bank ersosion	Channel Restoration	2MC-6 Project

Anderson Run	Headwaters - Middle Watershed	Canfield and Austintown Township west of US 62	**Sediment**	lack of flood plain storage leads to channel instability downstream	Buffers for floodplain storage, Addition of Riaparian Setbacks in Zoning Ordinance to allow floodplain storage	2MC-4 Policy
	Headwaters - Middle Watershed	Canfield and Austintown Township west of US 62	**Sediment**	lack of flood plain storage leads to channel instability downstream	Prioritize easements in headwaters area	2MC-4 Project
Anderson Run	Middle - Lower Watershed	East of US 62, West of Truesdale	**Sediment**	lack of flood plain storage leads to channel instability downstream	Buffers for floodplain storage, Addition of Riaparian Setbacks in Zoning Ordinance to allow floodplain storage	2MC-4 Policy
	Middle - Lower Watershed	East of US 62, West of Truesdale	**Sediment**	Channel instablity	Examination of retrofit stormwater retention for areas developed prior to Phase 1	2MC-7 Project
Ax Factory Run	Upper Watershed	West of Meridian	**Sediment**	Streambank erosion due to lack of access to floodplain and older development	Buffers for floodplain storage, Addition of Riaparian Setbacks in Zoning Ordinance to allow floodplain storage, Easements on existing corridors (Austintown Township trustees, Board of Ed, Maronite Center, Library)	2MC-4 Project
Mill Creek	Headwaters and Mid-watershed	South of 224	**Fecal coliform contamination**	Manure application	Catalogue manure application practices, identify producers spreading manure, education campaign	3MC-1 Research 3MC-1 Education
Mill Creek	Headwaters of Mainstem	Columbiana County/Fairfield Township	**Fecal coliform contamination**	Failing HSTS	Work with Columbiana County Health Department to gather data as it becomes available.	3MC-2 Research
Mill Creek	Lower Mill Creek and tribs	North of 224	**Fecal coliform contamination**	Combined Sewer Overflows	City of Youngstown, SE and MS consultants are planning to address this	3MC-3 Project
Sawmill Run	All	Near Hitchcock	**Fecal coliform contamination**	Presumed to be illicit discharges and cross connections	Phase II will adress illicit discharges and cross connections	3MC-4
Indian Run	All	Boardman and Canfield Township	**Fecal coliform contamination**	Failing HSTS	Summit Drive in Canfield is believed to be a major source for this area. Sewer is currently being planned for this area.	3MC-5 Project
Indian Run	Mid section	Canfield Township	**Fecal coliform contamination**	Manure application	Catalogue manure application practices, work with large applyers of manure in this watershed to improve practices	3MC-1 Project
Anderson Run	Headwaters of Anderson Run	Canfield Township	**Fecal coliform contamination**	Manure application	Catalogue manure application practices, identify producers spreading manure, education campaign	3MC-1 Research

Anderson Run	Mid section	Aladdin, Fox Haven, Edenrock, Alvacardo, etc. near US 62	**Fecal coliform contamination**	Failing HSTS	Form subcommittee to investigate options (including living machine type packet plants) for eliminating HSTS discharges	3MC-6 Project
Ax Factory Run	Ax Factory Run	Near Orkney and New Rd. ???	**Fecal coliform contamination**	Failing HSTS	After Anderson Run is addressed, possibly same approach as is taken there.	3MC-7 Project
Indian Run	Indian Run	Boy Scout Camp Stambaugh	**Inappropriate Recreational Use Designation**	NA	Recommend that OEPA redesignate Indian Run as PUBLIC BATHING WATER (currently it is designated as PRIMARY CONTACT RECREATION WATER)	4MC-1 Project
Mill Creek	Entire watershed		**Lack of Riaparian Cover/Buffer enhancement**	NA	Recommendation that a priority list be put together of areas with known existing buffers and areas targeted for easement. Riparian area protection plan update.	5MC-1 Project
	Mid section	Beaver Township	**Lack of Riaparian Cover/Buffer enhancement**	Development/ construction encroachment on riparain areas	Work with Beaver Township to provide technical support to their efforts to encorporate a Riparian Setback into their zoning ordinance.	5MC-2 Policy
	Entire watershed		**Lack of Riaparian Cover/Buffer enhancement**	Development/ construction encroachment on riparain areas	Work with Fairfield, Boardman and Canfield Township to provide technical support and encouragement for the inclusion of a Riparian Setback into their zoning ordinance.	5MC-2 Policy
	Entire watershed		**Lack of Riaparian Cover/Buffer enhancement**	Landowner management	Continue Riparian tree planting cost share. Prioritize areas listed in watershed priority document.	5MC-3 Project
Mill Creek	Western Reserve - US 224		**Excessive In-stream Debris**	Trees and large scale debris	Selective removal of large woody debris which is causing erosion and channel diversion.	6MC-1 Project
Ax Factory Run	Middle watershed	Trustees park to Meridian Lake	**Trash**	Urban NPS	Stream Cleanups	7MC-1 Project
Ax Factory Run	Lower Watershed	Meridian Lake-Mill Creek Park	**Trash**	Urban NPS	Stream Cleanups	7MC-2 Project
Mill Creek	Lake Newport		**Trash**	Urban NPS	Stream/Wetland Cleanups	7MC-3 Project
Mill Creek	Lake Glacier		**Trash**	Fishing refuse	Stream/Lake Cleanups	7MC-4 Project

Appendix K.

Mill Creek Watershed Ad Hoc Committee Recommendation for Projects, Policy, Research and Education from Original Plan Submission in 2004

Mill Creek Recommendations - Projects

Reference Number	Load Reduction Sheet Reference	14 Digit HUC	Location (Site Details)	Proposed Action	Cause / Source	Lead Parties	Critical Stakeholders	Cost Estimate	Other Resources	Feasibility (LOW, MODERATE, HIGH)	Project Timeline (approximate start and finish)	Performance Indicators
2MC-4 Project	LR-MC 1	05030103-080-020	Little Indian Creek, Canfield Township (from Andrews to Pebble Beach (Approximately 1500 stream feet)	2 stage channel design, re-establish floodplain storage for high flows, create in-stream habitat, replace cement channel	Habitat Alteration / Channelization	SWCD/Watershed Coordinator	Canfield Township Trustees, Private Landowners (2)	$200,000 Design and Construction	Time: Grant writing, project administration	MODERATE	To be determined locally	*Agreement to proceed from Landowners and Trustees *Project proposals received from contractors
NO REF	LR-MC 2	05030103-080-030	Bears Den Run Stambaugh Avenue- Mill Creek Park (approximately 15,000 stream feet)	Natural Channel Re-Design: Remove cement channel, restore floodplain access, improve habitat	Flow Alteration / Channelization	SWCD/Watershed Coordinator, Mahoning County Engineers (?)	Private Landowners, Austintown Township, City of Youngstown	$1,500,000 Design and Construction	Time: Grant writing, project administration	LOW	To be determined locally	
2MC-4 Project	LR-MC 3	05030103-080-030	Ax Factory Run Raccoon Rd. to New Rd. (approximately 5000 stream feet-100 for daylighting)	Daylight stream near Pembrook, Stabilize portion at New/Lancaster, restore channel (substrate) through apartments north of New Rd., Restore morphology at Fitch HS site (west of Raccoon Rd.)	Flow Alterations and other Habitat Alterations / Channelization and urban runoff	SWCD/ Watershed Coordinator	Private Landowners, Austintown Township	$600,000 Design and Construction	Time: Grant writing, project administration	MODERATE	To be determined locally	
2MC-6 Project	LR-MC 4	05030103-080-030	Anderson Run (from Hopkins Road to confluence with Mill Creek - approximately 4400 feet of stream)	Natural Channel Design, Stream stabilization, establishment of vegetated riparian buffer	Flow alterations and Other habitat alteration / Urban Runoff and removal of riparian vegetation	Mill Creek MetroParks	Private Landowners, Mill Creek MetroParks, Mahoning SWCD	$390,000* Design and Construction (based on estimates from MCMP proposal to restructure Anderson Run within the park boundaries)	Time: Grant writing, project administration	HIGH-MODERATE	To be determined locally	
2MC-2 Project	LR-MC 5	05030103-080-010	Mill Creek - Bassinger Rd. curve to Western Reserve Rd.	Natural Channel Design, Stream stabilization,	Flow alterations and Other habitat alteration / Channelization and irrigated crop production	Mill Creek MetroParks	Private Landowners, Mill Creek MetroParks			HIGH-MODERATE	To be determined locally, based on other project components	Designs for restoration submitted Funding for restoration secured Construction completed
NO REF	LR-MC 6	05030103-080-010	Mill Creek - Bassinger Rd. curve to Western Reserve Rd. (approximately 9500 stream feet)	Acquire wetlands (Paradise Fish Farm and Duck Club) re-establish floodplain connectivity to riparian wetlands	Flow alterations and Other habitat alteration / Channelization and irrigated crop production	Mill Creek MetroParks	Private Landowners, Mill Creek MetroParks	$1,140,000 design and construction	Time: Grant writing, project administration	HIGH	To be determined locally	Agreement reached with landowners Funding secured
NO REF	LR-MC 7	05030103-080-010	Mill Creek - Kelly Park Road to Metz Road (Approximately 2500 stream feet)	Natural Channel Design, re-establish sinuosity, flood plain connectivity, and channel stability	Other habitat Alterations / Channelization	Mill Creek MetroParks? Watershed Coordinator?	Private Landowners, Fairfield Township Trustees, Columbiana SWCD	$150,000 design and construction	Time: Grant writing, project administration	MODERATE-LOW	To be determined locally	

Reference Number	Load Reduction Sheet Reference	14 Digit HUC	Location (Site Details)	Proposed Action	Cause / Source	Lead Parties	Critical Stakeholders	Cost Estimate	Other Resources	Feasibility (LOW, MODERATE, HIGH)	Project Timeline (approximate start and finish)	Performance Indicators
2MC-5 Project	LR-MC 8	05030103-080-010 and 05030103-080-030	Mill Creek Western Reserve Road to Lake Newport	Selective removal of logjams to reduce erosive points and prevent further stream bank damage	Siltation / natural	Mahoning SWCD, Mill Creek MetroParks	Private landowners, ODNR–DSWC	Uncertain (Volunteers may be available to do the bulk of the work)	Labor, time to coordinate	HIGH	Summer 2004	Workforce secured Mill Creek MetroParks determines areas for removal
2MC-7 Project	LR-MC 9	05030103-080-030	Boardman Township- Tribs to Mill Creek, Cranberry Run	Retro-fitting stormwater detention, subsurface stormwater detention to manage flows to streams	Flow Alteration / Urban Runoff	Boardman Township	Boardman Township			MODERATE	To be determined locally	
2MC-7 Project	LR-MC 10	05030103-080-010	Southern Park Mall	Remove 1/3 impervious surface and replace with permeable pavers (approximately 600,000 sq ft) and bio retention areas (4 @ 2500 SqFt each)	Flow Alteration / Urban Runoff	Mahoning SWCD, Boardman Township	Private Landowners, Boardman Township Zoning, Boardman Township trustees	Grass Pavers (@ $2.00 per SqFt) $1,200,000 Bio Retention (@$20.00 perSqFt) $200,000	Time: Grant writing, project administration	?	To be determined locally	Agreement reached with landowners Funding secured
2MC-7 Project	LR-MC 11	05030103-080-010	Old Plaza (224 between St. Charles and West Blvd.), Boardman OH	Remove 1/3 impervious surface and replace with permeable pavers (approximately 160,000 sq ft) and bio retention areas (4@ 625 sq ft each)	Flow Alteration / Urban Runoff	Mahoning SWCD, Boardman Township	Private Landowners, Boardman Township Zoning, Boardman Township trustees	Grass Pavers (@ $2.00 per SqFt) $320,000 Bio Retention (@$20.00 perSqFt) $50,000	Time: Grant writing, project administration	?	To be determined locally	Agreement reached with landowners Funding secured
2MC-7 Project	LR-MC 12	05030103-080-010	Sparkle and Oakmont Plazas (near OH 14 and OH 46), Columbiana, OH	Retrofit bioretention in storm water systems. Retrofit trash containment/strainer systems	Flow alteration / Urban Runoff	Mahoning SWCD	Private Landowners, City of Columbiana			?	To be determined locally	Agreement reached with landowners Funding secured
2MC-7 Project	LR-MC 13	05030103-080-010	Giant Eagle Plaza, North Lima, OH	Retrofit bioretention in storm water systems. Retrofit trash containment/strainer systems	Flow alteration / Urban Runoff	Mahoning SWCD	Private Landowners, Beaver Township trustees			?	To be determined locally	Agreement reached with landowners Funding secured
2MC-4 Project 2MC-1 Project	LR-MC-14	05030103-080-010 05030103-080-020, 05030103-080-030	Mill Creek Watershed- see riparian area protection plan for details	Acquisition of Easements (BJ allen Site, Turkey Creek corridor, Indian Run corridor, see RAP for more details) Acquisition of Critical parcels (Paradise Fish Farm, Mahoning County Duck Club, see RAP for more details)	Loss of Riparian Buffer, Stream Encroachment	See Riparian Area Protection Plan	See Riparian Area Protection Plan	Average Costs: Easements $2500 + legal work Acquisition $5000 + legal work	Time: Grant writing, project administration	HIGH	Ongoing	Acres of easment obtained
3MC-1 Project	LR-MC 15	05030103-080-020	Indian Run	Manure management	Nutrient Enrichment / Agriculture	Natural Resource Conservation Service / Mahoning SWCD	Canfield Fair Board			HIGH	Summer 2004	

Reference Number	Load Reduction Sheet Reference	14 Digit HUC	Location (Site Details)	Proposed Action	Cause / Source	Lead Parties	Critical Stakeholders	Cost Estimate	Other Resources	Feasibility (LOW, MODERATE, HIGH)	Project Timeline (approximate start and finish)	Performance Indicators
NO REF	LR-MC 16	05030103-080-010	Unnamed tributaries to Mill Creek- OH 164 and Blosser Road	Livestock exclusion for approximately 40 head of cattle	Nutrient Enrichment / Pasture Land	Natural Resource Conservation Service / Mahoning SWCD	Private Landowners			MODERATE	To be determined locally	Discussions held with landowners
NO REF	LR-MC 17	05030103-080-010	Moff Run	Livestock exclusion for approximately 50 head of cattle	Nutrient Enrichment / Pasture Land	Natural Resource Conservation Service / Mahoning SWCD	Private Landowners			MODERATE	To be determined locally	Discussions held with landowners
NO REF	LR-MC 18	05030103-080-010	Raccoon Run-headwaters	Livestock exclusion for approximately 20 head of cattle	Nutrient Enrichment / Pasture Land	Natural Resource Conservation Service / Mahoning SWCD	Private Landowners			MODERATE	To be determined locally	Discussions held with landowners
3MC-6 Project	LR-MC 19	05030103-080-030	Anderson Run (streets include- Alvacardo, Edenrock, Foxhaven, Clearview, Aladdin)	Elimination of approximately 66 failing HSTS (projected effluent of 225,000GPD), partial replacement with Living Machine Package Plant, balance replaced with upgraded septic or other treatment options	Nutrient Enrichment / Onsite Wastewater Systems	Mahoning County District Board of Health	Mahoning County Sanitary Engineer, Canfield Township Trustees, Private Landowners	ESTIMATE $990,000 construction, setup $10,000/year annual operation		MODERATE	To be determined locally	agreement reached with MCSE funding secured Bids obtained for project
	LR-MC 20	05030103-080-030	Mill Creek, Cranberry Run, Bears Den Run	Elimination of CSO's	Nutrient Enrichment / Combined Sewer Overflows	Mahoning County Sanitary Engineer	City of Youngstown, Mahoning Valley Sanitary District			MODERATE	Ongoing	85% of CSO loading eliminated
NO REF	LR-MC 29	05030103-080-010	Mill Creek UNT21076, near the former Ohio Valley Mushroom Farm on OH 164	Remediate mine drainage from surface and deep mines	Metals / Other (Mine Drainage)	Mahoning SWCD / ODNR –Division of Mineral Resource Management	Beaver Township trustees	Uncertain- monitoring wells currently in-place	Time for grant writing and project coordination	HIGH	To be determined locally	Design completed for site funding secured Bids obtained for project Construction completed
5MC-3 Project		05030103-080-010, 05030103-080-020, 05030103-080-030	Many locations throughout watershed (target all streamside parcels identified in the Riparian Parcels document)	Establish and enhance riparian buffers through landowner incentives (cost share)		Mahoning SWCD	Private Landowners	$185 (mailings for 500 landowners) $6250 (if 125 landowners take Advantage of 50-75% cost share receiving $50 on cost of plants purchased) for a first year total of $6435- budget to be re-examined in subsequent years		HIGH	Spring 2004, Spring 2005, ongoing	Landowners enrolled, plants established
7MC-1 Project	No load reduction models available	05030103-080-030	Ax Factory Run, Trustees Park to Meridian Lake	Neighborhood stream clean ups	Trash	Mahoning SWCD/ Austintown Township	Private Streamside landowners	$100 for miscellaneous items (gloves, bags)	Time to coordinate volunteers, seek donations of refreshments	HIGH	To be determined locally	Trash removed from stream
7MC-2 Project	No load reduction models available	05030103-080-030	Ax Factory Run, Meridian Lake - Mill Creek Park	Neighborhood stream clean ups	Trash / Urban NPS	Mahoning SWCD/ Austintown Township	Maronite Center, Other private streamside landowners	$100 for miscellaneous items (gloves, bags)	Time to coordinate volunteers, seek donations of refreshments	HIGH	To be determined locally	Trash removed from stream
7MC-3 Project	No load reduction models available	05030103-080-030	Lake Newport	Wetlands area cleanup	Trash / Urban NPS	Mill Creek MetroParks	Park visitors / Volunteers	$100 for miscellaneous items (gloves, bags)	Time to coordinate volunteers, seek donations of refreshments	HIGH	To be determined locally	Trash removed from stream
7MC-4 Project	No load reduction models available	05030103-080-030	Lake Glacier	Lake shore cleanup	Trash / Urban NPS	Mill Creek MetroParks	Park visitors / Volunteers	$100 for miscellaneous items (gloves, bags)	Time to coordinate volunteers, seek donations of refreshments	HIGH	To be determined locally	Trash removed from stream

Mill Creek Recommendations - Policy

Reference Number	Level of Government and Targeted areas	Proposed Action	Related to: Cause or Source	Lead Parties	Critical Stakeholders	Product required	Other Steps Required	Cost Estimate	Other Resources	Feasibility (LOW, MODERATE, HIGH)	Project Timeline (approximate start and finish)	Performance Indicators
2MC-4 Policy	Townships: Boardman, Canfield, Beaver, Austintown, Fairfield	Zoning ordinances revised to include riparian setbacks	Channelization, Stream Bank modification	SWCD / Eastgate RCOG	Township trustees and zoning boards	Model Ordinance	Presentation to local zoning boards, outreach campaign	$200 (based on 4 hours of consultant review at $50 per hour)	Time: development/collection of model ordinance	HIGH	July 2004-June 2005	Models developed, Presented to relevant agencies.
2MC-4 Policy	Cities: Columbiana, Canfield, Youngstown	Zoning ordinances revised to include riparian setbacks	Channelization, Stream Bank modification	SWCD / Eastgate RCOG	City Councils and zoning departments	Model Ordinance	Presentation to local zoning boards, outreach campaign	$200 (based on 4 hours of consultant review at $50 per hour)	Time: development/collection of model ordinance	HIGH	July 2004-June 2005	Models developed, Presented to relevant agencies.
NO REF	Townships: Boardman, Canfield, Beaver, Austintown, Fairfield	Zoning Ordinance revised to allow for lower number of parking spaces or require permiable parking for some percentage of overflow spaces	Flow alteration / Urban Runoff	SWCD / Eastgate RCOG	Township trustees and zoning boards	Model Ordinance	Presentation to local zoning boards, outreach campaign	$200 (based on 4 hours of consultant review at $50 per hour)	Time: development/collection of model ordinance	MODERATE	July 2004-June 2005	Models developed, Presented to relevant agencies.
NO REF	Cities: Columbiana, Canfield, Youngstown	Zoning Ordinance revised to allow for lower number of parking spaces or require permiable parking for some percentage of overflow spaces	Flow alteration / Urban Runoff	SWCD / Eastgate RCOG	City Councils and zoning departments	Model Ordinance	Presentation to local zoning boards, outreach campaign	$200 (based on 4 hours of consultant review at $50 per hour)	Time: development/collection of model ordinance	MODERATE	July 2004-June 2005	Models developed, Presented to relevant agencies.
NO REF	Townships: Boardman, Canfield, Beaver, Austintown, Fairfield	Zoning Ordinance revised to require some permiable parking (or bio-retention)at auto dealers and lots	Flow alteration / Urban Runoff	SWCD / Eastgate RCOG	Township trustees and zoning boards	Model Ordinance	Presentation to local zoning boards, outreach campaign	$200 (based on 4 hours of consultant review at $50 per hour)	Time: development/collection of model ordinance	MODERATE-LOW	July 2005-June 2006	Models developed, Presented to relevant agencies.

Reference Number	Level of Government and Targeted areas	Proposed Action	Related to: Cause or Source	Lead Parties	Critical Stakeholders	Product required	Other Steps Required	Cost Estimate	Other Resources	Feasibility (LOW, MODERATE, HIGH)	Project Timeline (approximate start and finish)	Performance Indicators
NO REF	Cities: Columbiana, Canfield, Youngstown	Zoning Ordinance revised to require some permiable parking (or bio-retention)at auto dealers and lots	Flow alteration / Urban Runoff	SWCD / Eastgate RCOG	City Councils and zoning departments	Model Ordinance	Presentation to local zoning boards, outreach campaign	$200 (based on 4 hours of consultant review at $50 per hour)	Time: development/collection of model ordinance	MODERATE-LOW	July 2005-June 2006	Models developed. Presented to relevant agencies.
NO REF	Townships: Boardman, Canfield, Beaver, Austintown, Fairfield	Zoning Ordinances revised to require trash containment and bio-retention/bio filtration for commercial areas	Oil and Grease / Urban Runoff	SWCD / Eastgate RCOG	Township trustees and zoning boards	Model Ordinance	Presentation to local zoning boards, outreach campaign	$200 (based on 4 hours of consultant review at $50 per hour)	Time: development/collection of model ordinance	MODERATE	July 2005-June 2006	Models developed. Presented to relevant agencies.
NO REF	Cities: Columbiana, Canfield, Youngstown	Zoning Ordinances revised to require trash containment and bio-retention/bio filtration for commercial areas	Oil and Grease / Urban Runoff	SWCD / Eastgate RCOG	City Councils and zoning departments	Model Ordinance	Presentation to local zoning boards, outreach campaign	$200 (based on 4 hours of consultant review at $50 per hour)	Time: development/collection of model ordinance	MDERATE	July 2005-June 2006	Models developed. Presented to relevant agencies.
2MC-4 Policy	Counties: Mahoning and Columbiana	Subdivision Regulations amended to include riparian setbacks	Siltation and Other Habitat Alterations / Streambank Modification and Channelization	SWCD / Eastgate RCOG	County Commissioners and Planning Commissions	Model Ordinance	Presentations to Commissioners and Planning Commissions	$200 (based on 4 hours of consultant review at $50 per hour)	Time: development/collection of model ordinance	HIGH-MODERATE	July 2004-June 2005	Models developed. Presented to relevant agencies.
4MC-1 Policy	State Agency: Ohio EPA	Recreational Use designation of Indian Run revised to PUBLIC BATHING WATER	Fecal Contamination / Onsite Wastewater Systems	SWCD, Mill Creek MetroPark	Boy Scouts of America	Letter to OEPA requesting revision of Designation	Follow up contacts with OEPA	None	Time: Drafting of letter	HIGH		

Mill Creek Recommendations - Research

Refrence Number	Location (Site Details)	Target or Scope of Study	Researchers / Data collectors	Coordinating Parties	Strong Partners	Cost Estimate	Other Resources	Use of Data	Project Timeline (approximate start and finish)	Performance Indicators
IMC-1 Research	Headwaters and Lower Middle Watershed (near Mill Creek/OH165 and near Mill Creek/Lisbon St.)	Baseline Fish Population data, one day sampling event	Ohio EPA	Mahoning SWCD	Columbiana HS, South Range HS, City of Columbiana, Beaver Township, Kent Salem, YSU		time to coordinate event	Better assessment of biological comunities for future planning	August 2004-October 2004	Field day completed, data obtained from OEPA
IMC-2 research	Headwaters and Lower Middle Watershed (OH165, Lisbon St., Southern Avenue, Kelly Park Road)	Macroinvertebrate populations	Volunteer Monitors	Mahoning SWCD	Mill Creek MetroParks	$100 per training date. (one training date annually)	time to manage volunteers, enter data, and coordinate training and field visits	Better assessment of biological comunities for future planning	ONGOING	3 Volunteer teams assigned in Mill Creek headwaters
3MC-1 Research	Mill Creek headwaters	Cataloging manure applicators (producers known to spread manure)	YSU or Kent Salem students	Mahoning SWCD and/or Columbiana SWCD	NRCS	8 hours intern time @ $10 per hour	time to coordinate data collection	Develop list of producers to target for education campaign	January-May 2005	Inventory developed, contacts made with producers
3MC-2 Research	Mill Creek headwaters	Gathering data on HSTS failure rates as it becomes available, incorporate into GIS layer (see below)	Columbiana District Board of Health	Mahoning SWCD and/or Columbiana SWCD	YSU- Center of Urban Studies		Data collection and entry (CDBOH is already collecting this data on homes being sold)	Determine septic failure rates for Upper Mill Creek watershed.	January 2005, then ongoing (time will be needed to develop a body of data in order to come to meaningful conclusions)	Data obtained from CDBOH GIS layer developed
NO REF	Mill Creek watershed	Stream entrenchment ratios on Mill Creek and tributary streams	YSU students or interns	YSU, Department of Civil and Environmental Engineering/ Mahoning SWCD	ODNR	$2000 intern pay (based on $10.00/hour with 16 protocol development- 2 people, 40 hours field data collection-3 people, 20 hours data analysis-2 people)	coordinating agency time, GIS resources, field equipment	Refine and expand list of streams to consider for restoration	Fall 2004- Fall 2005	Protocols developed for data collection Funding mechanism for interns determined Interns hired Data collected
NO REF	Mill Creek watershed	Comprehensive water quality data collected on Lakes in the watershed	Students (YSU, Kent, high schools?)	Mahoning SWCD, YSU	Ohio EPA, private landowners, Ohio Lake Management Society (OLMS)			Better assessment of lake water quality for future planning	To be determined	Contacts made with OLMS
NO REF	Mill Creek watershed	Comprehensive water quality data collected on Wetlands in the watershed	Students (YSU, Kent, high schools?)	Mahoning SWCD, YSU	Ohio EPA	$2000 intern pay (based on $10.00/hour with 16 protocol development- 2 people, 40 hours field data collection-3 people, 20 hours data analysis-2 people)	coordinating agency time, GIS resources, field equipment	Better tools to use in comments on wetland impacts in watershed, development of list of high quality wetlands	To be determined	Protocols developed for data collection Funding mechanism for interns determined Interns hired Data collected
NO REF	Mill Creek watershed	Create GIS layer (shp file) of all septic systems in Mill Creek Watershed	Mahoning County District Board of Health	YSU Center for Urban Studies		$800 -based on 80 hours of GIS time (YSU CUS) interns at $10 00 per hour	MCDBH- Time to pull HSTS records	Better means to pin point areas of high septice failure	Fall 2004	Data for septic sytems retrieved by MCDBOH Data entered by YSU CURS

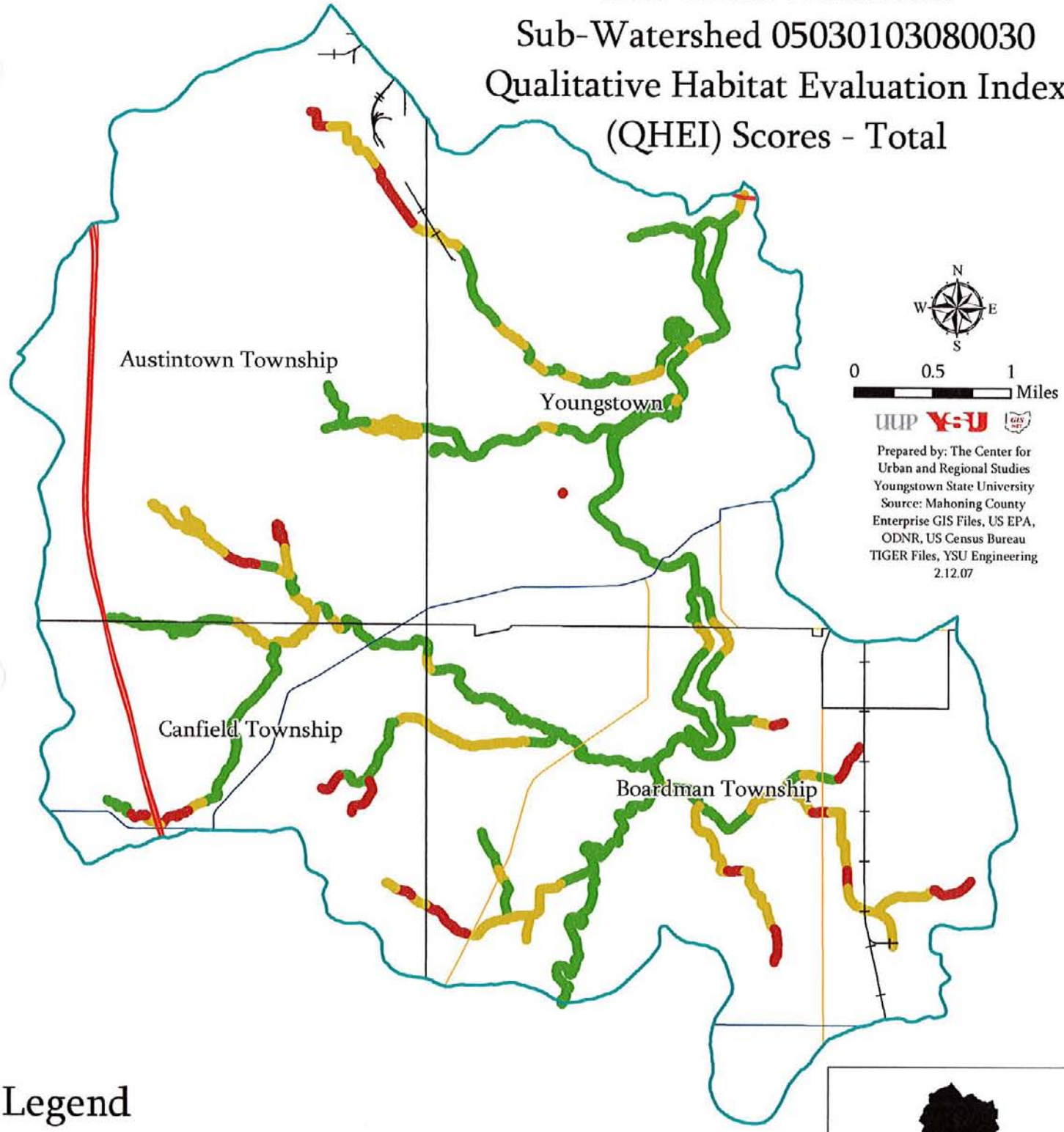
Mill Creek Recommendations - Education and Outreach

Reference Number	Stream	Segment or Area	Site details	Issue/Cause	Audience	Message/ Recommendations	Forum/Tools	Lead Parties	Contacts/Partners	Funding	First Steps
NO REF	All	Entire watershed		Floodplain access	Engineers and Contractors	Preservation of floodplain function	Urban Workshops	SWCD-Urban		NA	Presentation on floodplain funtion and stream morphology given at 2004 Urban workshop
NO REF	All	Entire watershed		Floodplain access	Trustees, Zoning and Planning	Public value ($$$) of preservation of floodplain function		SWCD-Urban and Watershed Coordinator		NA	Watershed coordinator speaks to trustees and zoning boards in watershed
NO REF	All	Entire watershed		Manure Management practices	Streamside landowners	Preservation of floodplain function/ value of riparian buffers	One-on-one discussions, distribution of Life At the Waters Edge,	SWCD, Watershed Coordinator, Mill Creek MetroParks		NA	
NO REF	All	Entire watershed		Riparian Buffers	Streamside landowners	Preservation of floodplain function/ value of riparian buffers	Life at the Waters Edge	Mahoning SWCD, Mill Creek MetroParks		NA	
NO REF	Selected Tributaries (suburban)		Axe Factory Run Anderson Run Cranberry Run Sawmill Run	Buffers, floodplain access, stakeholder involvement	Streamside landowners	Ownership of streams, good stream stewardship	Neighbor hood level meetings, formation of "Friends of"Groups	SWCD (WC)	Applicable trustees, AWARE members	NA	Article in Splash! encouraging neighborhood stream groups
NO REF	Mill Creek	Selected sites	*Lake Front GC 14550 South Ave. Columbiana *Mill Creek Metro Park Golf Dr. Boardman *Tippecanoe CC 5870 Tippecanoe Rd. Canfield	Riparian Buffers, Floodplain access, Pesticide and fertilizer runoff	Golf course owners and managers	Riparian Buffers and IPM and low imput management practices		Mill Creek MetroParks	Audubon		Calls to area golf course, meetings with managers
NO REF	Mill Creek	headwaters-mid section		Failing HSTS	Homeowners with HSTS	Regular pumping, maintance and upkeep issues	Pumping reminder cards	Mahoning County Health Department/ Columbiana County			Cards sent annually (ongoing)
NO REF	Mill Creek	Entire watershed		General NPS and watershed science education for homeowners	watershed residents	Current state of stream health, Homeowner BMP's	TV weather programing	SWCD, MCMP, local TV stations,		US EPA grant	Discussion with local TV weather anchors
3MC-1 Education	Mill Creek	Headwaters	Agricultural areas (fairfield and Beaver Township)	Manure Management practices	Agricultural Producers applying manure	Proper spreading practices	Newsletter articles, one-on one discussions with producers	Columbiana SWCD, Mahoning SWCD, NRCS			
1MC-1 Education	Mill Creek	Headwaters	South of Columbiana	Fish populations, habitat and fish populations	High School Students	Basic Aquatic ecology, stream health	OEPA field sampling day	Mahoning SWCD	Columbiana High School, Crestview High School, Heartland School, South Range High School	NA	Calls to OEPA, and teachers

Appendix L.

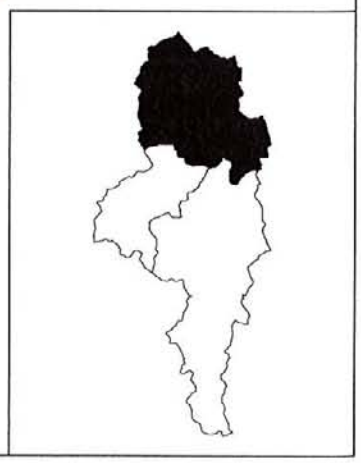
Macroinvertebrate Monitoring Data

Mill Creek Watershed
Sub-Watershed 05030103080030
Qualitative Habitat Evaluation Index (QHEI) Scores - Total

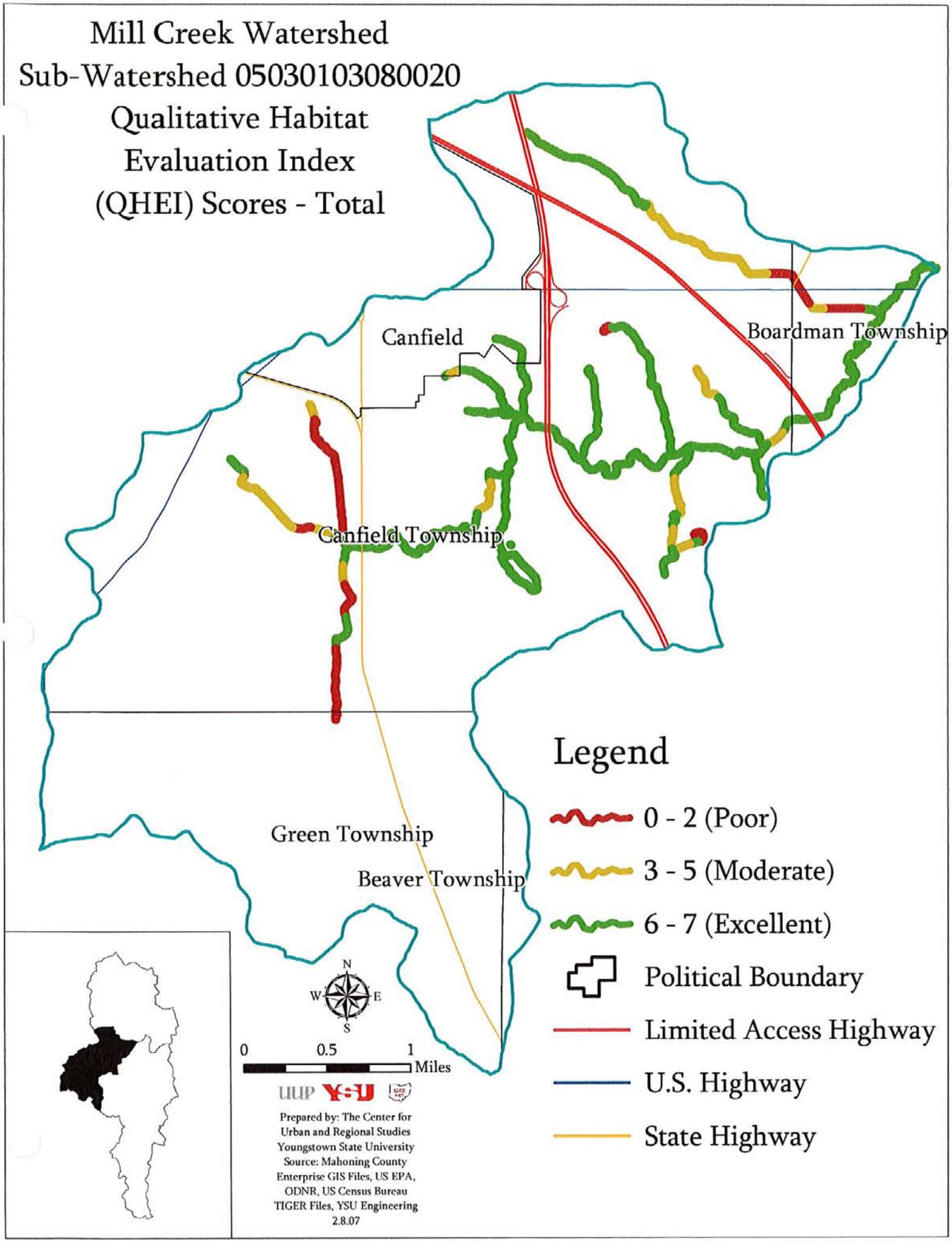


Legend

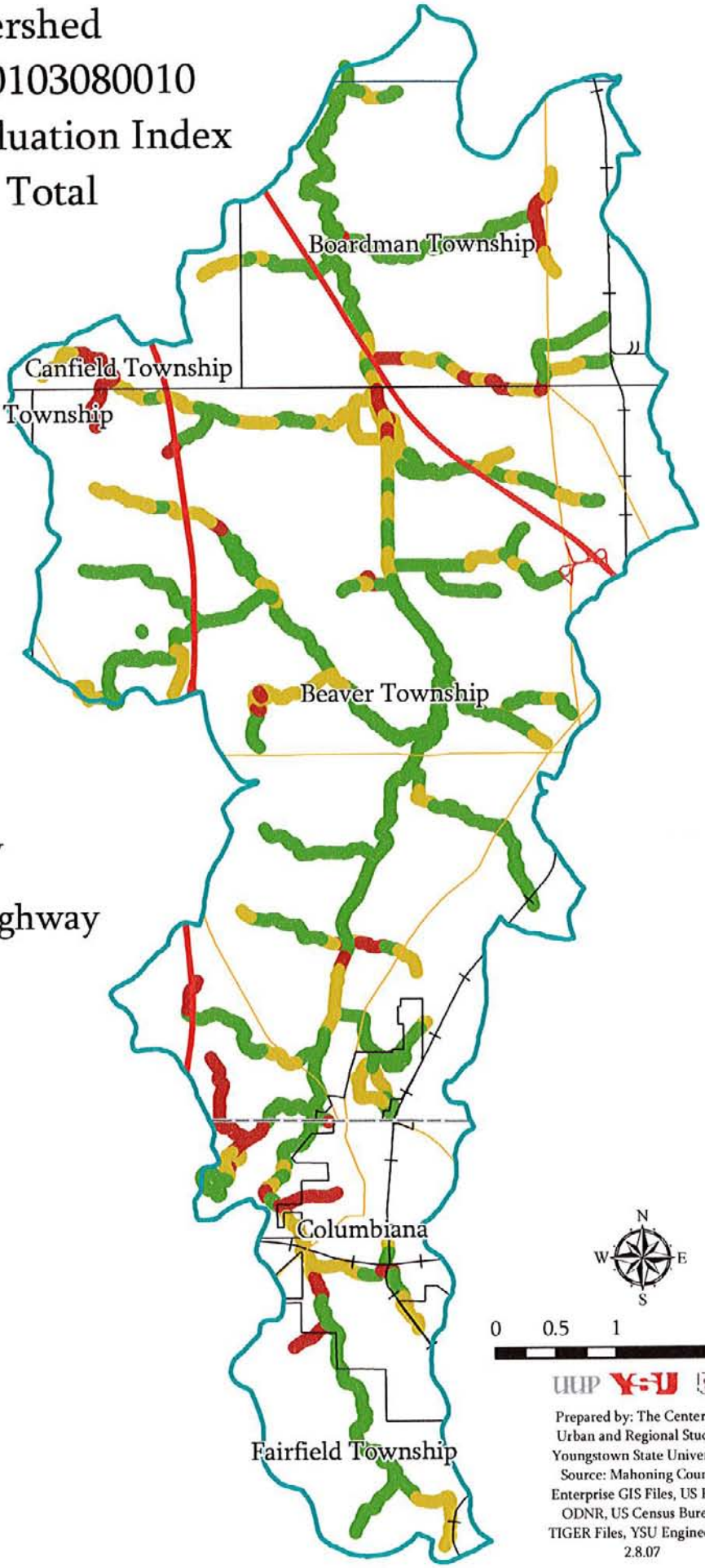
- 0 - 2 (Poor)
- 3 - 5 (Moderate)
- 6 - 7 (Excellent)
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad



Mill Creek Watershed
Sub-Watershed 05030103080020
Qualitative Habitat Evaluation Index (QHEI) Scores - Total

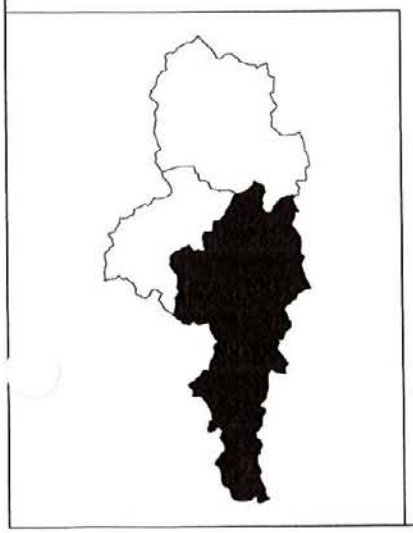


Mill Creek Watershed
Sub-Watershed 05030103080010
Qualitative Habitat Evaluation Index (QHEI) Scores - Total



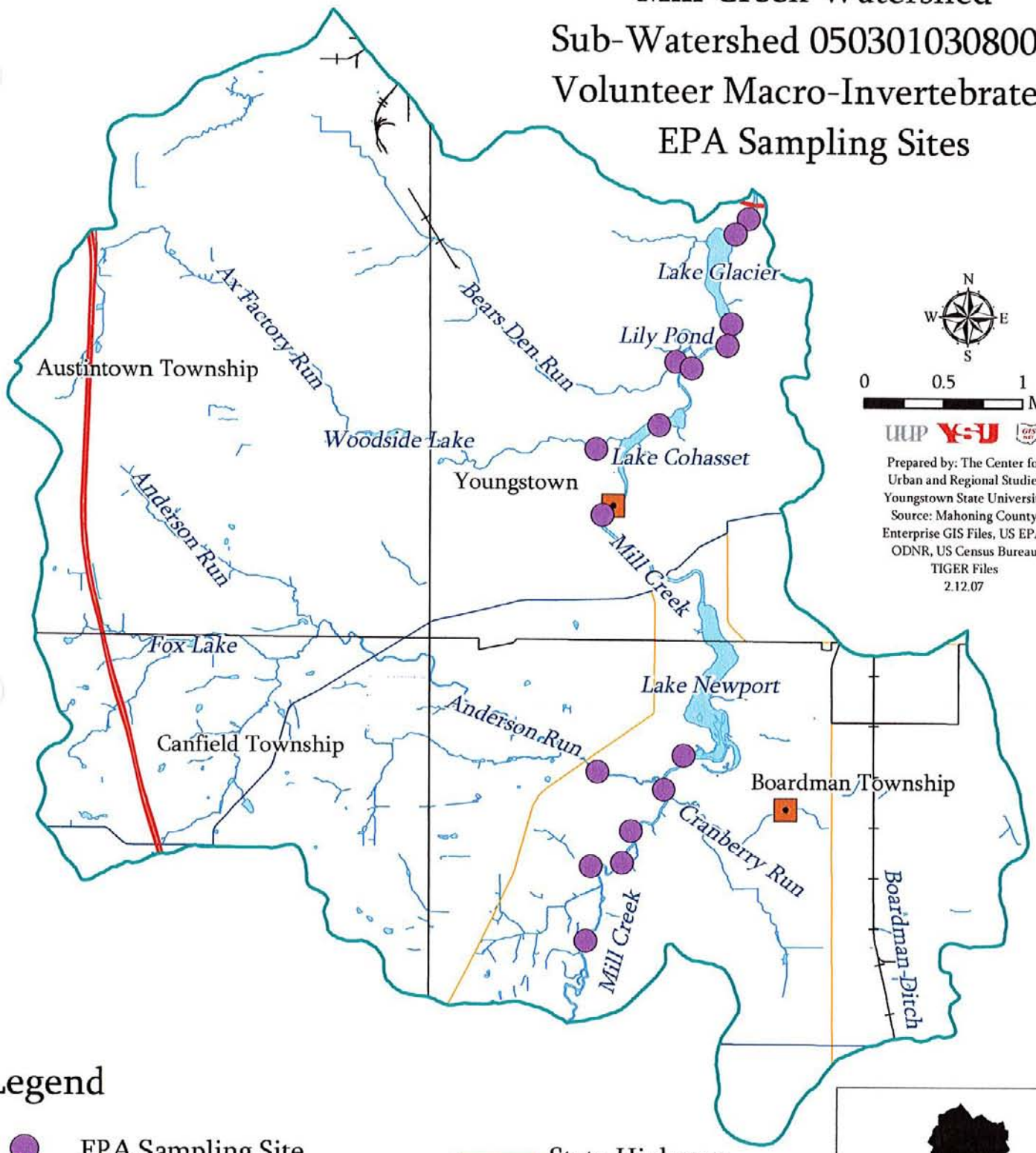
Legend

- 0 - 2 (Poor)
- 3 - 5 (Moderate)
- 6 - 7 (Excellent)
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad



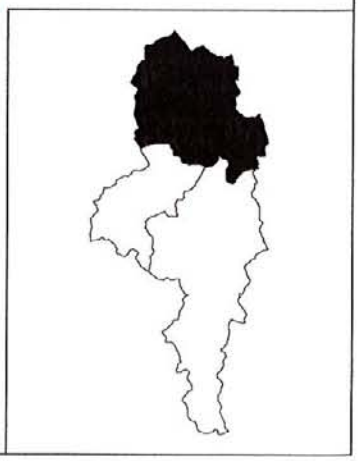
Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files, YSU Engineering
2.8.07

Mill Creek Watershed
Sub-Watershed 05030103080030
Volunteer Macro-Invertebrate & EPA Sampling Sites

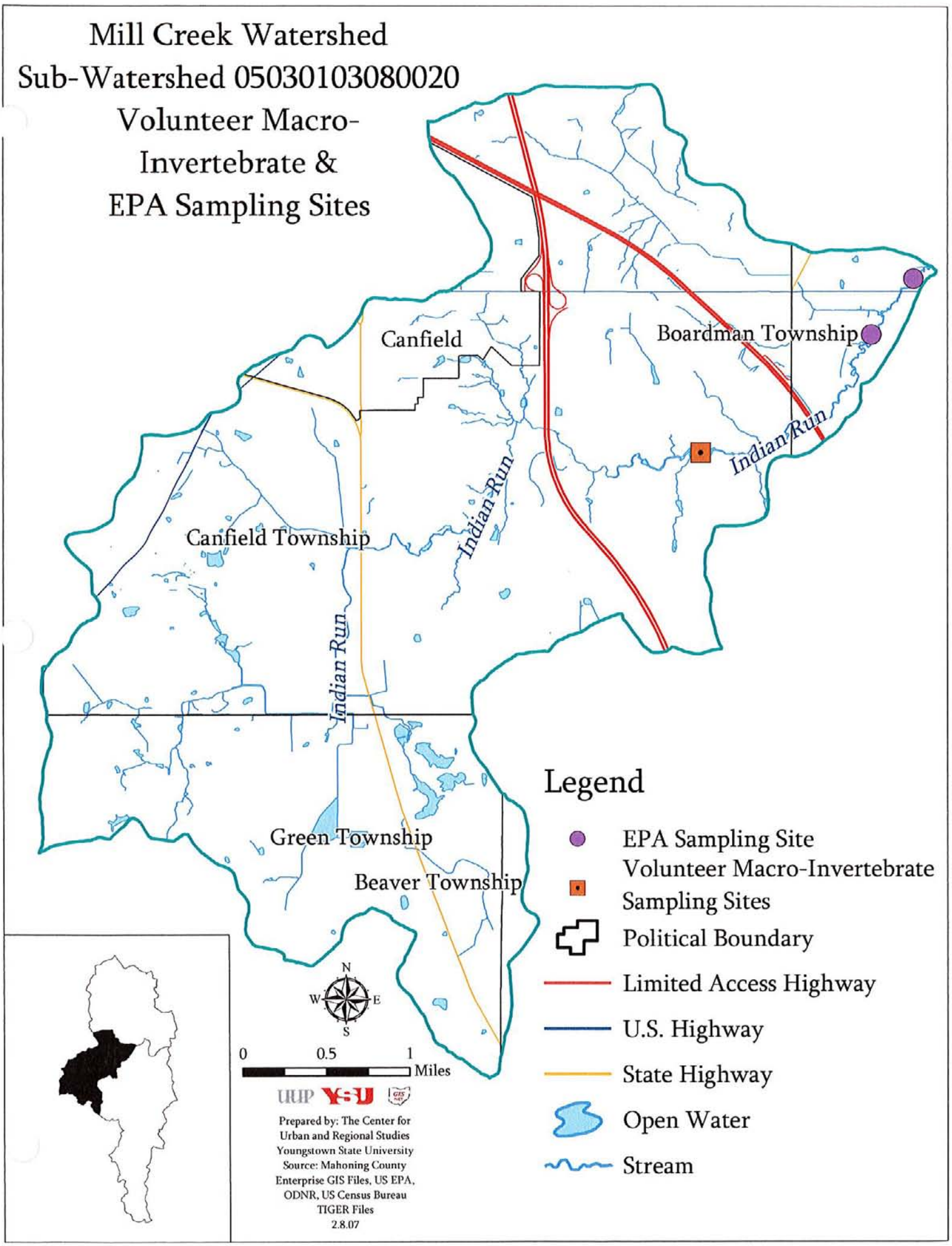


Legend

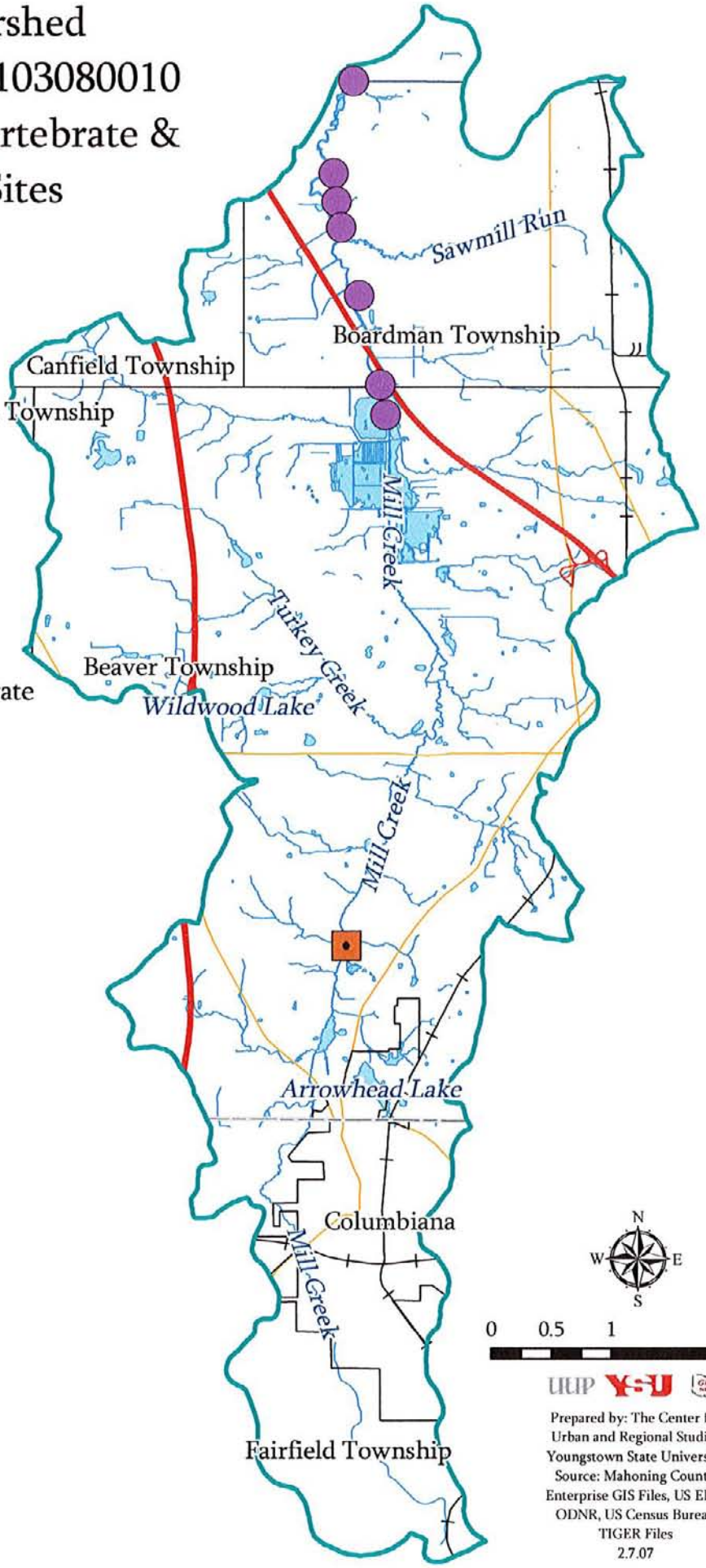
- EPA Sampling Site
- Volunteer Macro-Invertebrate Sampling Sites
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



Mill Creek Watershed
Sub-Watershed 05030103080020
Volunteer Macro-Invertebrate & EPA Sampling Sites

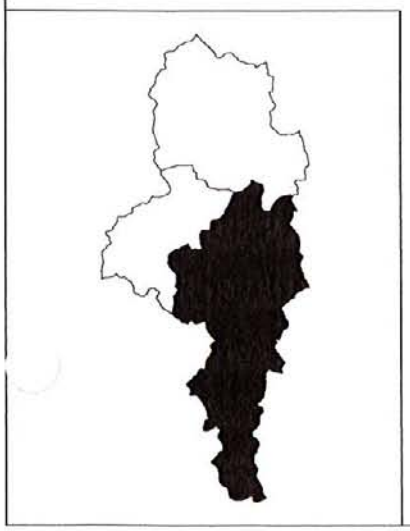


Mill Creek Watershed
Sub-Watershed 05030103080010
Volunteer Macro-Invertebrate & EPA Sampling Sites



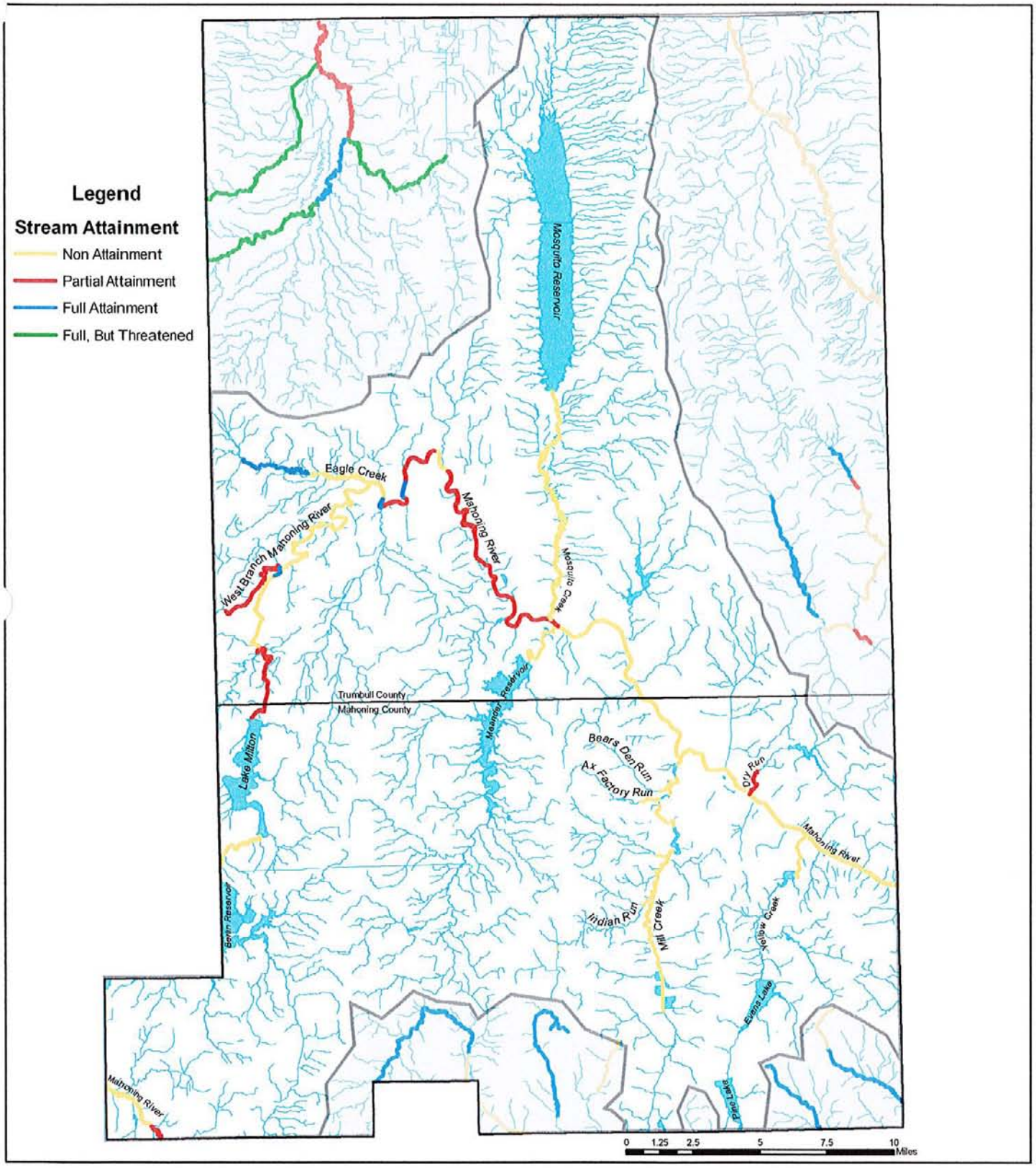
Legend

- EPA Sampling Site
- Volunteer Macro-Invertebrate Sampling Sites
- County Boundary
- Political Boundary
- Limited Access Highway
- U.S. Highway
- State Highway
- Railroad
- Open Water
- Stream



Prepared by: The Center for Urban and Regional Studies
Youngstown State University
Source: Mahoning County Enterprise GIS Files, US EPA, ODNR, US Census Bureau TIGER Files
2.7.07

Figure 2-5: Mahoning River Watershed Stream Attainment Status



Eastgate Regional Council of Governments 208 Water Quality Management Plan

Source: Ohio Environmental Protection Agency

EASTGATE
Regional Council of Governments

October 2004

Volunteer Macro-Invertebrate Monitoring Data Summaries- Mill Creek Watershed

Stream: Mill Creek
Station: Flats/Silver Bridge- Mill Creek Park
Riffle Width: 15' Riffle Depth: 9'-14"

Date	Temp	Sample #	Group I Index Value	Group II Index Value	Group III Index Value	Cummulative Index Value	Assessment Rating	Average of Turbidity Readings	Group I Pollution Sensitive: Water Penny Larva	Mayfly Nymphs	Stonefly Nymphs	Dobsonfly Larva	Caddisfly Larva	Riffle Beetle Adult	Gilled Snails	Group II Pollution Intermediate: Damselfly Nymph	Dragonfly Nymph	Cranefly Larva	Beetle Larva	Crayfish	Scuds	Calms	Sow Bugs	Group III Pollution Tolerant: Blackfly Larva	Aquatic Worms	Midge Larva	Pouch Sands	Leeches	TEAM
27-Jun-02	80F	1	6	10	4	20	Good*	36	-	-	-	-	B	A	-	A	-	-	-	A	A	B	A	A	A	A	-	B	Bummer Fund
13-Oct-02	68F	1	6	6	2	14	Fair	36	-	A	-	-	-	A	-	-	-	-	B	-	A	A	-	-	B	-	-	A	Bummer Fund
20-Jul-03	77F	1	9	6	1	16	Fair	28	-	A	B	-	-	A	-	-	-	-	B	A	-	A	-	-	A	-	-	-	Bummer Fund

* assessment conducted with SWCD staff

Stream: Indian Run
Station: Camp Stambaugh Boy Scout Camp
Riffle Width: 15' Riffle Depth: 6'

Date	Temp	Sample #	Group I Index Value	Group II Index Value	Group III Index Value	Cummulative Index Value	Assessment Rating	Average of Turbidity Readings	Group I Pollution Sensitive: Water Penny Larva	Mayfly Nymphs	Stonefly Nymphs	Dobsonfly Larva	Caddisfly Larva	Riffle Beetle Adult	Gilled Snails	Group II Pollution Intermediate: Damselfly Nymph	Dragonfly Nymph	Cranefly Larva	Beetle Larva	Crayfish	Scuds	Calms	Sow Bugs	Group III Pollution Tolerant: Blackfly Larva	Aquatic Worms	Midge Larva	Pouch Sands	Leeches	
14-Jun-02	68F	1	21	4	2	27	Excellent*	5	B	A	B	A	A	A	A	-	-	A	-	-	-	B	-	-	-	B	-	A	Cursora
7-Oct-03	-	1							Assessment Form Not Turned In																				Canfield

* assessment conducted with SWCD staff

Stream: Cranberry Run
Station: Forest Lawn Memorial Park
Riffle Width: 15 Riffle Depth: 9"-14"

Date	Temp	Sample #	Group I Index Value	Group II Index Value	Group III Index Value	Cummulative Index Value	Assessment Rating	Average of Turbidity Readings	Group I Pollution Sensitive: Water Penny Larva	Mayfly Nymphs	Stonefly Nymphs	Dobsonfly Larva	Caddisfly Larva	Riffle Beetle Adult	Gilled Snails	Group II Pollution Intermediate: Damselfly Nymph	Dragonfly Nymph	Cranefly Larva	Beetle Larva	Crayfish	Scuds	Calms	Sow Bugs	Group III Pollution Tolerant: Blackfly Larva	Aquatic Worms	Midge Larva	Pouch Sands	Leeches	
29-Jul-03	76C	1	3	4	4	11	Poor*	36	-	-	-	B	-	-	-	-	-	A	-	-	-	A	-	-	-	A	-	A	T. Cash/Kids
18-Oct-03	12C	1	0	2	3	5	Poor	36	-	-	-	-	-	-	-	-	-	-	-	-	-	A	-	-	A	A	-	A	T.Cash/Kids

* assessment conducted with SWCD staff

Stream: Mill Creek
Station: Renkenberger Road
Riffle Width: Riffle Depth:

Date	Temp	Sample #	Group I Index Value	Group II Index Value	Group III Index Value	Cummulative Index Value	Assessment Rating	Average of Turbidity Readings	Group I Pollution Sensitive: Water Penny Larva	Mayfly Nymphs	Stonefly Nymphs	Dobsonfly Larva	Caddisfly Larva	Riffle Beetle Adult	Gilled Snails	Group II Pollution Intermediate: Damselfly Nymph	Dragonfly Nymph	Cranefly Larva	Beetle Larva	Crayfish	Scuds	Calms	Sow Bugs	Group III Pollution Tolerant: Blackfly Larva	Aquatic Worms	Midge Larva	Pouch Sands	Leeches	
-Aug-03							Poor*		Assessment Form Not Turned In																				Weir

* assessment conducted with SWCD staff

Ohio EPA Water Quality Monitoring and Assessment Section
Macroinvertebrate Collection Summary for Mill Creek Watershed

Sample Dates Range: 09/13/94 – 09/14/94 **Sample Sites:** Mill Creek (8)

Macroinvertebrate Collection:

Ablabesmyia sp
Ancyronyx variegate
Argia sp
Baetis flavistriga
Baetis intercalaris
Belostoma sp
Brillia flavifrons group
Caecidotea sp
Caenis sp
Calopteryx sp
Ceratopogonidae
Chauliodes rastricornis
Cheumatopsyche sp
Chironomus (C.) decorus group
Chironomus (C.) riparius group
Coenagriondae
Conchapelopia sp
Corynoneura lobata
Crangony sp
Cricopopus (C.) tremulus group
Cricotopus (C.) bicinctus
Cryptochironomus sp
Cryptotendipes sp
Dicrotendipes Lucifer
Dicrotendipes neomodestus
Dicrotendipes simpsoni
Dubiraphia vittata group
Enochironomus nigricans
Erpobdella punctata punctata
Eunapius fragilis
Ferrissia sp
Glyptotendipes (Phytotendipes) sp
Menetus (Micromenetus) dilatatus
Microtendipes pedellus group
Namocladius (N.) crassicornus or N. (n.) rectinervus
Nanocladius (N.) crassicornus or N. (N.) rectinervus
Nanocladius (N.) distinctus
Nanocladius (N.) spiniplenus
Nigronia serricornis
Notonecta sp
Odontomyia (O.) sp
Oligochaeta
Oligochaete
Orconectes (Crokerinus) obscurus
Parachironomus frequens
Parakiefferiella n.sp 1
Parametricotopus sp
Parametriocnemus sp
Paranytarsus sp
Paratanytarsus exiguus group
Paratanytarsus sp
Paratendipes albimanus or P. duplicatus
Paratrichocladius sp
Peltodytes sexmaculatus
Phaenopsectra obdiens group
Physella sp
Plumatella sp
Polypedilum (P.) albicorne
Polypedilum (P.) contictum
Polypedilum (P.) convictum
Polypedilum (P.) fallax group
Polypedilum (P.) illinoense
Polypedilum (Tripodura) scalaenum group
Ptilostomis sp

Harnichia curtilamellata
Hayesomyia senata or Thienemannimyia norena
Helichus sp
Helopelopia sp
Helophorus sp
Hemerodromia sp
Heyesomyia senta
Hydra sp
Hydracarina
Hydrobiidae
Hydropsyche (Ceratopsyche) morose group
Hydropsyche (H.) depravata group
Hydropsyche (H.) dicantha
Hydropsyche (H.) valanis
Hydropsyche (H.)dicantha
Leptoceridae
Limonia sp
Limonia sp
Macronychus glabratus
Ranatra sp
Rheocricotopus (Psilocricotopus) robacki
Rheocricotopus sp
Rheotanytarsus exiguous group
Sialis sp
Simulium sp
Sphaerium sp
Spongilla sp
Spongillidae
Stenacron sp
Stenacron sp
Stictochironomus sp
Tanytarsus glabrescens group
Tanytarsus guerlus group
Tanytarsus sp
Thienemanniella xena
Tribelos fuscicorne
Turbellaria
Urnatella gracilis

Narrative:
-Macroinvertebrate communities were evaluated at eight locations on Mill Creek from RMs 11.2-0.1. Community performance ranged from poor to good with the lowest ICI scores recorded in the section of creek affected by the Boardman WWTP effluent.
-The 2 sites upstream from the Boardman WWTP scored ICI values of 28(fair) at RM 11.2, and 30 (marginally good) at RM 9.7 Quantitative samples were very similar in the numbers of tanytarsini midges and caddisflies of the genus *Cheumatopsyche* collected. The major difference was an increased number of other dipterans and non-insects and tolerant species at RM11.2. Very few mayflies were collected at either site (<1% of total organisms), but they were present in the quantitative and qualitative samples.
-ICI scores dropped abruptly downstream from the Boardman WWTP to 14 (fair) at RM 9.5 and 12 (poor) at 7.8. Densities of tolerant taxa (oligochaeta, *Dicrotendipes simpsoni*, *Polypedilum (P.) fallax* group and *Polypodilum (P.) illinoense* were predominant (58.3%at RM 9.5 and 55.4% at RM7.8) on the artificial substrates. No mayflies were collected with either sampling protocol downstream from the Boardman WWTP between RM 9.5 and RM 5.4.
-Community performance in Mill Creek began to recover from the effect of the Boardman WWTP effluent at RM 5.4. Percentage of tolerant organisms declined (6.9%) and tanytarsini midge density increased resulting in an ICI score of 24. The communities improved from fair at RM5.4 to good at RMs 2.7 and 1.6 (ICI's 40 and 38 respectively). There was higher species richness and higher percentages of caddisflies on the artificial substrates at the lower sites.
-Near the mouth, the ICI score dropped to 24. Densities of tolerant organisms (oligochaeta and the midges *Nanocladius (N.) distinctus* and other dipterans and non-insects increased while densities of tanytarsini midges were reduced on artificial substrates.

Appendix M.

Original Agency Comments to Plan Submission in 2004 for Full Endorsement

April 12, 2004

AWARE
C/o Mahoning SWCD
490 South Board Street
Canfield, OH 44406

Dear Ms. Moser and the AWARE watershed partners,

Thank you for submitting a copy of the *Watershed Management Plan for Mill Creek* dated April 2004 for review. We sincerely appreciate the efforts the local watershed partners undertook to complete this important task. We recognize that water resource restoration and protection cannot happen without the solid commitment of local groups such as the Alliance for Watershed Awareness and Riparian Easements with their strong local partners. Comments from ODNR central office staff are compiled and enclosed.

Please share our comments with the watershed group leadership as appropriate. Adequately addressing the enclosed comments will allow for state endorsement of the plan. Future 319 implementation grants will continue to focus on watersheds implementing endorsed watershed action plans in priority TMDL watersheds or in advance of TMDLs. Therefore, with a state endorsed watershed action plan, the one of the partners in AWARE will be ideally positioned to compete for the limited 319 grant dollars that are available and potentially other funding sources as well.

The comments provided are intended to assist the local partners to make plan revisions that: a) solidly link water quality problems in critical areas to recommended actions, b) maximize opportunities for future state funding assistance to implement those actions, and, c) insure the long-term sustainability of the local watershed partnership. We believe that the recommended steps outlined will further strengthen your organization and plan.

Please let us know by Friday, April 16 how your organization plans to address the attached comments provided by John Kessler. After each comment, please detail a strategy as to how this comment will be met, along with a timeline. If the response can immediately be incorporated in the watershed plan, please consider this. If not, please include the necessary tasks (what, who, how) and timelines (when) under each comment to fully address it.

It is the State's intention to continue to be a very strong stakeholder and supporter of your efforts to improve water resource quality in the Mill Creek, Mahoning River watershed. As you add new technical information, incorporate other methods, and commence implementation, your planning will be an ongoing process. Ohio truly appreciates your efforts thus far, and we look forward to working with you in the future. If you have any questions, please contact Rosida at 614 265-6647 or John Kessler at 614-265-6621.

Mill Creek Watershed Management Plan Comments
April 14, 2004

Written review comments on your plan were provided by John Kessler, ODNR - DSWC, Columbus and Tim Gerber, ODNR – DSWC, Columbus. Verbal review comments on your plan were provided by Mark Bergman of Ohio EPA on April 13, 2004. These comments will need to be addressed by the project as well.

Mr. Kessler's Comments:

I believe the plan, while needing some improvements for full endorsement, is a great start for an Action plan in a very challenging watershed. The urbanization and channelization present serious problems but my compliments to the community and AWARE for stepping up as key stakeholders and stewards.

Below are specific comments and I have noted if I believe the issue needs addressed and/or developed into a condition for endorsement.

1. The plan did not distinguish between incorporated and unincorporated areas. This may be a moot point if all of the area is incorporated.

2. An expansion on the discussion of economic patterns, housing growth, trends, areas threatened, etc. is warranted. This may help steer prioritization by the group.

3. I did not see local private businesses and industry on the watershed partners list. What is the status of this or past efforts?

4. Over the years, AWARE has existed as a loose knit coalition. Please consider a more formal structure and seriously discuss the pros and cons of organizing with a board, procedures, by-laws, etc.

5. Please set a timeline to secure all practicable local endorsements based on information in appendix B.

6. Low flow information for mainstem and tribs is needed or evidence that procedures (i.e., watershed yield based on gage readings, instream measurements, etc.) are available to obtain info.

7. Enhance the groundwater section to include aquifers, SWAP, drinking water protection plans, etc. Technical assistance is available from the Ohio EPA DDAGW.

8. A better sub-basin description of the HSTS sources is warranted given the bacteria loading in the system although there are specific action items related to this.

9. Please include information on grazing and chemical use patterns in the landscape, or spell out why this information is not pertinent in this watershed.

10. There was no discussion of land protected by private foundations or local governmental entities. A GIS map showing these areas would be a valuable addition to the plan.

11. There was no listing of miles of stream with forested riparian areas. Again a GIS map by subwatershed would be helpful.

12. Please include in your inventory information on permitted discharges (NPDES). I did see action items related to CSOs. Perhaps request that this be discussed in the inventory and relate to prioritization in the action plan.

13. Petition ditches or maintained ditches were not discussed. Are they an issue in the watershed.

14. I thought the pollutant load discussion was excellent.

15. There were no problem statements as we are used to seeing them. However, it appeared much thought went into this area and was described in the action steps in the appendices. I suggest that we request a discussion on how or what priorities have been identified and manifested themselves in the appendices. (condition with timeline)

16. After priorities and goals have been established, indicators and evaluation should be enhanced. For example, what biological and chemical indicators will be used in-stream (IBI,ICI, TSS, BOD, pathogens, etc.) And, what load reductions are we looking for to achieve the biological response (this may have to be an estimate)? Then, how will this be evaluated and monitored? And, how will the plan be modified after the evaluation and lessons learned are known? What is the overall monitoring plan? (condition w/timeline)

17. What is the groups funding strategy? Please spell out a strategy with a timeline as to how one will be created.

18. This plan should detail when the other basin plans (Yellow, Meander) will be developed.

19. Is the Mill Cr plan impacted by the Mahoning TMDL (USEPA study on bacteria)? If so, please include in your plan how the findings of the TMDO will be incorporated.

Mr. Gerber's comments (should be included immediately in the watershed plan, as they are more text upgrades):

SSURGO digital soils information has become available from NRCS within the past month. Although it was not available while the plan was being developed, it should be included in the resource materials available to the plan implementers.

Section 3.1, Soils subsection

Soils in most of this region were formed in glacial deposits from the Wisconsin glacier (14,000 to 24,000 years ago.)
Soils on floodplains ~~Floodplains~~ formed in alluvium deposited more recently. The most common soils on floodplains along the main trunk of Mill Creek are ~~in the upper watershed are~~

~~comprised mainly of~~ Wayland and Orrville Soils ~~Soils~~. These are nearly level, poorly to somewhat poorly drained soils.
The most common soils on stream ~~Stream~~ terraces and near uplands for most of the length of the watershed are Bogart, Chili, and Jimtown soils ~~association~~. They are sloping ~~Sloping~~ to gently sloping, well drained to somewhat poorly drained soils with a gravely subsoil.
In the lower watershed (near the confluence of Mill Creek with the Mahoning River) the most common soils in the riparian and near uplands are ~~made up largely of~~ Loudonville, -~~Muskingham~~ Muskingum, and Dekalb soils ~~association~~, which are gently sloping to steep and well drained. These soils are ~~This association is mostly~~ moderately deep over sandstone or siltstone[3].
The most common soils in the uplands formed in glacial till. Rittman, Wadsworth, and Frenchtown are the most common soils on uplands that drain into the watershed downstream of the confluence of Indian Run and Mill Creek and in the western part of the Indian Run watershed. These soils are finer-textured than the Canfield, Ravenna, and Wooster soils, which are more common on uplands in the rest of the Mill Creek watershed. All six of these upland soils have a fragipan that restricts water movement through the lower part of the subsoil. Well or moderately well drained soils are more common in the uplands upstream from the confluence of Indian Run and Mill Creek than in uplands in the Indian Run watershed and in uplands that drain downstream from the confluence of Indian Run and Mill Creek.
Pockets of Sebring and Fitchville soils are recognized in parts of the watershed. They are poorly to nearly level to gently sloping, somewhat poorly drained soils that formed in glacial lakebeds.

Please consider adding the following paragraph after the first paragraph under Home Septic Treatment System (HSTS) locations heading on page 26:

Among the soils identified as common in Section 3.1, all except the Wooster soil are rated with a severe limitation for septic tank absorption fields, according to the *Soil Survey of Mahoning County, Ohio.* The gravely layers in Bogart, Chili, and Jimtown soils are a poor filter for effluent. Rittman, Wadsworth, Frenchtown, Canfield, Ravenna, Sebring, and Fitchville soils have restricted permeability in the subsoil. A seasonal high water table is a limitation for all of the soils except Wooster, Chili, Loudonvillle, Muskingum, and Dekalb. Bedrock within 40 inches of the surface is a limitation for septic tank absorption fields in Loudonville, Muskingum, and Dekalb soils.

The State's review of this plan took place over the course of one week, due to the plan's late submission. Therefore, one can reasonably assume that there could be omissions to these endorsement conditions. As the project works towards satisfying the conditions listed below, these omissions will become more apparent. Please note that in addition to the conditions listed below, there will be other future updates to the plan required. These will be agreed upon with the agencies working in collaboration with the watershed project.

The following conditions for endorsement must be addressed over the next six months for the state's endorsement to remain in effect:

1. Include a large scale color version of critical maps, or maps that break the watershed down into subbasins. The maps contained in the plan are color coded, however, the copy that most people can print out will be in black and white. Many of the maps are small and difficult to read, therefore, they lose their usefulness.

2. Many of the Appendix 8 Update sections would be more complete with a map to show specific locations. Mark Bergman, working with Heather Moser on April 13, discussed which sections would benefit, if maps were included.

3. The Mahoning County Health Department has compiled solid data on HSTS sources, it could be more specifically developed so critical areas could be prioritized. Addressing these areas by sub-basins may be the best approach. The U.S. EPA funded Bacteriological TMDL will only be concentrating on the Mahoning River mainstem.

4. Please update the partners list. Local private businesses and industry, as well as ODNR, appear to have been omitted from the watershed partners list.

5. AWARE operates more as a task force organization. They have some structure and rules of procedure, however, prefer **not** to become more formalized. Heather agreed to expand on the basic contact information. We also need to know how and when discussions to not formally organized took place, and who was involved in those decisions.

6. AWARE prefers to wait for endorsement from key watershed partners and local units of government until this plan is approved by Ohio EPA and ODNR. Please set a strategy to secure all practicable local endorsements based on information in appendix B of the watershed plan.

7. The TMDL for Mill Creek is currently scheduled for 2013 and the existing level 3 monitoring data is almost ten years old. This will make projections of waste load reduction estimates toward attainment difficult, however, best judgement will be necessary. Perhaps YSU could provide some modeling assistance.

8. There were no problem statements as we are used to seeing them. However, it appeared much thought went into this area and was described in the action steps in the appendices.

The State will work with the project on how some of the 54 items on the action table can be Mill Creek Recommendation Projects Table in the plan can be turned into problem statements. Please note that AWARE, working with Mark Bergman of Ohio EPA, can prioritize which items (four to six of the existing 54) will be fleshed out into problem statement detail.

9. The plan did not distinguish between incorporated and unincorporated areas. Please designate these, as they can show where Phase 2 Stormwater can come into play.

10. An expansion on the discussion of economic patterns, housing growth, trends, areas threatened, etc. is warranted. This may help steer prioritization by the group.

11. Low flow information for mainstem and tribs is needed or evidence that procedures (i.e., watershed yield based on gage readings, instream measurements, etc.) are available to obtain info.

12. Enhance the groundwater section to include aquifers, SWAP, drinking water protection plans, etc. Technical assistance is available from the Ohio EPA DDAGW.

13. Please include information on grazing and chemical use patterns in the landscape, or spell out why this information is not pertinent in this watershed.

14. There was no discussion of land protected by private foundations or local governmental entities. A GIS map showing these areas would be a valuable addition to the plan.

15. There was no listing of miles of stream with forested riparian areas. Again a GIS map by subwatershed would be helpful.

16. Please include in your inventory information on permitted discharges (NPDES). I did see action items related to CSOs. Perhaps request that this be discussed in the inventory and relate to prioritization in the action plan.

17. Petitioned and maintained ditches were not discussed. Please elaborate if they are an issue in the watershed.

18. After priorities and goals have been established, indicators and evaluation should be enhanced. For example, what biological and chemical indicators will be used in-stream (IBI,ICI, TSS, BOD, pathogens, etc.) Attempt to quantify load reductions to achieve the biological response (this may have to be an estimate). Determine how these will be evaluated and monitored. Determine how the plan will be modified after the evaluation and lessons learned are known. Spell out the overall monitoring plan.

19. Spell out a strategy with a timeline as to how a funding strategy will be created, or provide information of the existing funding strategy.

20. This plan should detail when and/or if the other basin plans (Yellow, Meander) will be developed. Priority should be given to completing the Mill Creek plan before concentrating on the others.