# Management Plan for the Little Beaver Creek Watershed

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**Little Beaver Creek Land Foundation**
**130 Maple Street**
**Lisbon, OH 44432**
**P: 330-420-9507**
**F: 330-424-0577**
**littlebeavercreek@gmail.com**
**www.littlebeavercreek.com**

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- Russ Gibson, DSW

Little Beaver Creek §319 Advisory Board members
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John Bralich, Youngstown State University, Department of Urban Studies
Columbiana County Department of Development
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## NOTE FROM THE AUTHOR

Portions of the information and data used for this management plan have been borrowed from the Ohio Environmental Protection Agency's *Total Maximum Daily Loads for the Little Beaver Creek Watershed* (2005) report. This is done for the purpose of maintaining congruity between these two documents which are both concerned with the same watershed.

The phrase "Watershed Action Plan" and "Watershed Management Plan" may be used interchangeably. Both refer to this document, which outlines non-point source pollution problems, problem areas and outlines strategies to manage and reduce the affects of said non-point source pollution.

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**Acronyms**

| | | |
|---|---|---|
| ARC | - | Appalachian Regional Commission |
| ARRA | - | American Recovery and Reinvestment Act |
| ARRI | - | Appalachian Regional Reforestation Initiative |
| AMD | - | acid mine drainage |
| BCSP | - | Beaver Creek State Park |
| CCDOD | - | Columbiana County Department of Development |
| CCEO | - | Columbiana County Engineer's Office |
| CCHD | - | Columbiana County Health Department |
| CDBG | - | Community Development Block Grant |
| CD&D | - | construction, demolition and debris |
| CFS | - | Cubic feet per second |
| CHIP | - | Community Housing Improvement Program |
| $CO_2$ | - | carbon dioxide *(gaseous)* |
| CSO | - | combined sewer overflow |
| CSWCD | - | Columbiana Soil & Water Conservation District |
| DO | - | dissolved oxygen |
| FSS | - | failed septic systems |
| GPP | - | groundwater pollution potential |
| HSTS | - | household sewage treatment system |
| HUC | - | Hydrologic Unit Code *(as established by the USGS)* |
| IBI | - | Index of Biologic Integrity |
| ICI | - | Invertebrate Community Index |
| LBC | - | Little Beaver Creek |
| LBCLF | - | Little Beaver Creek Land Foundation |
| LBCWSRAC | - | Little Beaver Creek Wild & Scenic River Advisory Council |
| MCBH | - | Mahoning County Board of Health |
| MF | - | Middle Fork watershed; sub-watershed of LBC watershed |
| MS | - | Main Stem of LBC |
| MSWCD | - | Mahoning Soil & Water Conservation District |
| NF | - | North Fork watershed; sub-watershed of LBC watershed |
| NPDES | - | National Pollution Discharge Elimination System |
| NPS | - | non-point source pollution |
| $O_2$ | - | oxygen *(molecular, gaseous)* |
| ODH | - | Ohio Department of Health |
| ODOD | - | Ohio Department of Development |
| Ohio EPA | - | Ohio Environmental Protection Agency |
| OGS | - | Ohio Geological Survey |
| Ohio DNR | - | Ohio Department of Natural Resources |
| DNAP | - | ODNR Division of Natural Areas and Preserves |
| SRP | - | Scenic Rivers Program |
| DOW | - | ODNR Division of Wildlife |
| DOWater | - | ODNR Division of Water |
| DSWR | - | ODNR Division of Soil & Water Resources |
| MRM | - | ODNR Division of Mineral Resources Management |
| OPW | - | Ohio Public Works |
| PS | - | point source pollution |
| RC&D | - | Resource Conservation & Development |

| | | |
|---|---|---|
| TMDL | - | Total Maximum Daily Load |
| TDS | - | total dissolved solids |
| TSS | - | total suspended solids *(a.k.a. turbidity)* |
| USDA | - | United States Department of Agriculture |
| NRCS | - | USDA Natural Resource Conservation Service |
| NRI | - | USDA-NRCS Natural Resource Inventory |
| SCS | - | Soil Conservation Service |
| USEPA | - | United States Environmental Protection Agency |
| USGS | - | United States Geological Survey |
| WAP | - | Watershed Action Plan |
| WAU | - | Watershed Assessment Unit |
| WF | - | West Fork watershed; sub-watershed of LBC watershed |
| WQ | - | water quality |
| WWTP | - | wastewater treatment plants |

# Executive Summary

It is the purpose of this document to propose methods for the management of the water and land resources of the Little Beaver Creek (LBC) watershed, located in Northeast Ohio. The plan was designed and developed by the local watershed community and guided by local expertise, and is outlined for the management of non-point pollution sources in the LBC watershed. The justification of the proposed management strategies is shown through discussion of the history of the LBC watershed, historical non-point source pollution sources and the current conditions of significant non-point source pollution sources as a result of recent analyses.

Major sources of non-point pollution that were identified in the development of this watershed plan include failed septic systems, illicit dumps, agriculture, soil/sediment loading, nutrient enrichment, acid mine drainage, and urbanization. The plan identifies 5 year implementation goals for non-point source pollution management activities for each of these major sources, the watershed partner organization best suited to take on the task, and if potential funding sources have been identified. Implementation actions include repairing or replacing 40 failed septic systems in the watershed, cleaning up 2 major dump sites and monitor them for future infractions, complete three stream bank stabilization projects, and place 150 acres of forested land under conservation easement. Additional measures include installing heavy use pads and exclusion fencing on 20 equine farms; increase conservation tillage practices by 50% (600 acres); and plan, design, and implement remediation at major acid mine drainage sites. Public education on the major sources of non-point source pollution will also be done by the various watershed organizations best suited to each issue with continuous help from the Little Beaver Creek Land Foundation.

This watershed plan also identifies the goals for the implementation of each non-point source reducing action, possible funding opportunities, and the time frame each one should be completed in. Additionally, quantifiable results that each implementation action should obtain based on average pollution loads and the methods for determining the actual reduction in pollution loading once the implementation action has been taken are discussed. This methodology varies slightly for actions like the cleanup of illicit dumps since the pollution issues vary so much site to site. The objectives of this LBC watershed plan are also prioritized, with factors such as potential levels of non-point source pollution reduction, funding

availability and project costs, landowner interest/participation, and public involvement. A series of tables with specific project activities based on the 14 digit hydrologic codes are then provided.

It is the hope that, in addition to the Little Beaver Creek Land Foundation and its watershed partners, many additional bodies, such as local governments, municipalities, and the general public will buy into and support the LBC watershed plan to help protect and conserve the health and beauty of the watershed for present and future generations.

# CHAPTER 1
# Introduction to the Little Beaver Creek Watershed

## I. Introduction

As it is commonly known, over seventy percent of the Earth's surface is covered by water; in both salt and freshwater forms. Water is arguably the most precious resource on this planet and it is believed by many scientists to be the most critical element for the existence of life on Earth as we know it. With such a high percentage of the Earth being comprised of water, it would seem intuitive that water is not a limited resource. However, this is not true. Water resources are, in fact, finite and precious. Needs and uses for water are many, and one of the most important factors for those uses and needs for water is that it must be clean. It is unfortunate that through the process of satisfying our needs and uses for water, we in turn pollute the same water we rely on, thereby making clean water an even more precious and rare resource.

In the United States, our water resources have an immeasurable value. However, in economic terms, clean water plays a key role in the nation's economy, although it may often be overlooked. Each year, clean water helps the agricultural industry produce over $200 billion in products. Clean water helps the manufacturing and industrial sectors generate $60 billion of business annually. And clean water, as an attraction in and of itself, helps the tourism industry to bring in over $40 billion per year.

The nation has improved the quality of its water resources in recent decades. A significant part of the recent improvements has been the change in water resource protection philosophy, from focusing on an individual waterbody to protecting a water resource by using the watershed-based approach. Watershed management addresses natural resource issues based on geologic boundaries, as opposed to political boundaries. It integrates concerns about WQ and water quantity and coordinates insights from the natural and social sciences. A successful watershed approach includes the support, participation and leadership of local stakeholders and land users. Their decisions and lifestyles profoundly impact the watersheds within which they live. In recent years, governments, non-profit organizations, businesses and private citizens have used a watershed approach to refocus their efforts to protect and restore the nation's waters. These refocused efforts have brought widespread positive results.

Although the nation has improved the quality of its water resources in recent decades, it has essentially failed at sufficiently protecting clean waters and restoring historically impaired waters. Despite the benefits of watershed management, more than half of the nation's major watersheds have WQ and aquatic-habitat-related problems. The problems are widespread and complex, and there is rarely a watershed which exhibits a single impairment. These impairments are both PS and NPS pollution. Long-term improvements and maintenance of clean waters can only be achieved through the comprehensive management of point and NPS pollution sources. Targeting the obvious PS culprits, such as large industrial complexes and waste-water treatment plants, will lead to improvements but, by itself, cannot lead to adequate, sustained WQ improvements. Existing programs and regulations have already greatly improved the techniques for industrial, commercial and residential consumption and release of water in order to return clean water back to the resource from which it came, although these improvements most often come at significant, yet necessary cost. These existing programs and regulations will continue to be critical for the continuation of improvement for WQ into the future.

It is the purpose of this document to propose methods for the management of the water and land resources of the LBC watershed. Through this plan, the protection strategy, designed by and developed by the local watershed community, and guided by local expertise, will be outlined for the management of non-point pollution sources in the LBC watershed. The justification of the proposed management strategies will be presented through discussion of the history of the LBC watershed, historical NPS pollution sources and the current conditions of significant NPS pollution sources as a result of recent analyses.

The WAP for the LBC watershed is subject to review and endorsement by the Ohio DNR and the Ohio EPA. Upon endorsement by the Ohio EPA and Ohio DNR, the WAP will be distributed to local government agencies and project partners for their subsequent review and adoption. A list of project partners is found in Table 1 below. Once these groups have agreed to support the WAP, the goals of this WAP can be more successfully realized.

***Table 1:*** *Organizations that will primarily manage the WAP implementation.*

| |
|---|
| 1. LBCLF (*primary WAP manager*) |
| 2. LBCWSRAC |
| 3. CSWCD |
| 4. USDA-NRCS |
| 5. OHIO DNR-DNAP SRP |
| 6. OHIO DNR-DOW |
| 7. OHIO DNR-MRM |
| 8. CCHD |
| 9. MCBH |
| 10. MSWCD |

## II. Background of Watershed

### *A. Physical Characteristics*

The LBC watershed is located in northeast Ohio and in central western Pennsylvania. It is part of the Upper Ohio watershed, designated by the USGS with the 8-digit HUC of 05030101 (*Map 1, Map 2*). The LBC watershed is divided into three 11-digit HUC subwatersheds: WF (05030101-080), MF (05030101-070), and NF (05030101-090). The WF watershed contains four 14-digit HUC watersheds. The MF watershed contains seven 14-digit HUC watersheds. The NF watershed contains ten 14-digit HUC watersheds, including the portion of the NF watershed which lies in Pennsylvania (*Table 2, Map 3*). The vast majority of the LBC watershed within Ohio lies within Columbiana County, with portions of the watershed in Mahoning and Carroll Counties, and a large portion of the NF headwaters lying within Lawrence and Beaver Counties in Pennsylvania. The LBC watershed, in total size, covers an area of approximately 510 square miles, 408 square miles of which are in Ohio. Within the entire watershed is an estimated 808 linear miles of streams. Land in the Ohio-portion of the watershed is primarily used for agriculture and as forestland. The majority of land is under private ownership. The primary usage of the water resources within the LBC watershed are as a drinking water source, recreational, agricultural and commercial.

The LBC watershed is characterized by deep valleys, wooded slopes, and occasional rock outcroppings (*Figure 1*). The creek is boulder-strewn, consisting of fast-flowing rapids and riffles, quiet pools, and clear, swiftly flowing tributaries. In addition to a diverse macroinvertebrate population, the watershed supports 63 species of fish, 49 mammal species, 270 species of resident and migratory birds, and 46 species of reptiles and amphibians. Ohio's largest population of endangered hellbender salamanders (*Cryptobranchus alleganiensis*) resides in the LBC watershed (Ohio DNR, 2004).

The mainstem of LBC begins at the confluence of the MF and the WF in St. Clair Township at river mile (RM) 16.3. It then flows in a southeasterly direction into Pennsylvania, and joins the Ohio River near Smith's Ferry. The mainstem has a length of 14.8 miles in Ohio and 1.5 miles in Pennsylvania, with an average gradient of 10.5 feet per mile. The drainage area for the mainstem segment is 67.9 square miles.

***Table 2:*** *12-digit HUC designations for the LBC watershed.*

| West Fork | 12-digit HUC | Associated Stream |
|---|---|---|
| | 050301010501 | Cold Run |
| | 050301010502 | Headwaters West Fork |
| | 050301010503 | Brush Creek |
| | 050301010504 | Patterson Creek |
| | | |
| **Middle Fork** | **12-digit HUC** | **Associated Stream** |
| | 050301010401 | East Branch |
| | 050301010402 | Headwaters Middle Fork |
| | 050301010403 | Stone Mill Run |
| | 050301010404 | Lisbon Creek |
| | 050301010405 | Elk Run |
| | | |
| **North Fork/Main Stem** | **12-digit HUC** | **Associated Stream** |
| | 050301010601 | Longs Run |
| | 050301010602 | Honey Creek |
| | 050301010603 | Headwaters North Fork |
| | 050301010604 | Little Bull Creek |
| | 050301010605 | Bull Creek |
| | 050301010606 | Leslie Run |
| | 050301010607 | Dilworth Run |
| | 050301010608 | Brush Run |
| | 050301010609 | Rough Run |
| | 050301010610 | Bieler Run |

The NF rises in Springfield Township in Mahoning County and flows southeastwardly into Pennsylvania, then returns to Ohio at RM 7.75 near Negley. It empties into the mainstem of LBC in St. Clair Township about eight miles downstream from the confluence of the WF and the MF. The NF has a length of 34.2 miles and a gradient of approximately 13.9 feet per mile. It drains a total area of 183.1 square miles, with 76.1 square miles in Pennsylvania. According to the Ohio EPA's *2006 Integrated Report*, the

***Figure 1:*** *Typical topography of LBC and the watershed.*

NF and MS of LBC currently has WAU scores of 90% Full attainment, 3% Partial attainment, and 7% Non-attainment. High-magnitude causes of pollution are un-ionized ammonia, nutrient enrichment, siltation, organic enrichment/low DO, flow alteration, direct habitat alterations, pathogens, and the natural limits of wetlands and other features of the watershed to process pollutants (*Appendix A*).

The WF rises in the southern part of Butler Township of Columbiana County and flows southerly where it is impounded by Guilford Lake. Downstream from the lake it merges with Brush Creek east of Summitville, where it turns sharply and flows in a due easterly direction until it unites with the MF to form the mainstem of LBC within the boundary of the Little Beaver Creek State Park. The WF has a length of 25.2 miles and an average gradient of 21 feet per mile. The total drainage area is 111.7 square miles, all in Ohio. According to the Ohio EPA's *2006 Integrated Report*, the WF of LBC currently has WAU scores of 50% Full attainment, 39% Partial attainment, and 11% Non-attainment. High-magnitude causes of pollution are flow alteration, natural limits, nutrient enrichment, organic enrichment/ low DO, un-ionized ammonia, pathogens, and other unknown causes (*Appendix B*).

The MF rises southwest of Salem and flows in a northerly direction into Mahoning County, then turns sharply and flows in a southeasterly direction to Lisbon, then southeast to St. Clair Township where it joins the WF to form the LBC mainstem. The East Branch of the MF empties into the MF near Leetonia. The MF has a length of 40.6 miles and an average slope of 11.8 feet per mile. It drains a total area of 147.4 square miles, all in Ohio. According to the Ohio EPA's *2006 Integrated Report*, the MF of LBC currently has WAU scores of 46% Full attainment, 34% Partial attainment, and 20% Non-attainment. High-magnitude causes of pollution are oil and grease, pesticides, natural limits, un-ionized ammonia, nutrient enrichment, siltation, organic enrichment/low DO, salinity/TDS/chlorides, direct habitat alterations, and other unknown causes (*Appendix C*).

Also, according to the *2006 Integrated Report* (Ohio EPA), the WF watershed has been re-categorized under Section 303(d) of the Clean Water Act. Prior to September, 2005, it was a Category 5 watershed, meaning that the waters were impaired and a TMDL needed to be developed. Due to the plan's approval, the WF watershed is now a Category 4a watershed, meaning that the waters are impaired but a TMDL has been developed. Although the NF and MF watershed TMDLs are complete and have been approved, they remain listed as Category 5 watersheds.

As with similar watersheds, physical characteristics of individual streams within the LBC watershed vary greatly. The patchwork of land uses which most of the streams are exposed to result in successive stream reaches which can display drastically different morphologies. Streams in forested areas have wide riparian buffers and maintain healthy stream conditions, such as stable banks, low entrenchment, and proper connectivity to floodplain areas. However, these streams may have reaches which flow through urbanized or agricultural areas. These reaches typically have very narrow-to-no riparian buffer, highly eroded and unstable banks, high entrenchment, and limited access to proper floodplain areas. The vast majority of total stream mileage within the LBC watershed has not been surveyed or assessed for physical characteristics (e.g. entrenchment, floodplains, sinuosity, flow). This is primarily results from large percentage of stream reaches that flow through privately owned lands. Data for physical characteristics of streams in the LBC watershed is, at best, fragmented, with most of the information being focused in the state and federally-designated areas of the NF, MF, WF, and MS of LBC (*see part D of Chapter 1, Section 2 for further details)*. Anecdotal information is also available for stream reaches which are frequently utilized for angling and canoeing. However, consistent data on stream conditions is currently not available for most of the LBC watershed. As will be discussed in Chapter 4 of this WAP, a unified, comprehensive survey for the physical characteristics of streams within the LBC watershed will be conducted in order to locate priority areas for Best Management Practice (BMP) implementation.

***B. Climate***

The LBC watershed is situated at approximately 40° North latitude in the temperate, deciduous forest biome. As is typical with temperate forests at this latitude world-wide, the LBC is subjected to a wide temperature range. Average high temperatures in the summer months (June to mid-September) range from 75° to 85° F. Temperatures frequently exceed 90° for short periods or during periodic droughts. Average high temperatures in the winter months (mid-December to March) generally range from 25° to 35° F. Low temperatures during winter months can fall to 0° F and below.

The LBC watershed receives approximately 38 inches of precipitation each year, accounting for both rainfall and snowfall. July is typically the wettest month of the year, averaging 4.2 inches or precipitation as rain for a 30-year period from 1961 to 1990. January and February are typically the driest months of the year, averaging 2.3 inches or precipitation for the same 30-year period from 1961 to 1991. Average precipitation per month in the LBC watershed is 3.2 inches. There are often drastic variations from these averages. Since 2000, the LBC watershed has experienced several major floods, including an incident in September, 2004, where the Village of Lisbon was declared a “Federal Disaster Area” due to an extreme flooding event.

### *C. Land Use*

The LBC watershed encompasses approximately 65% of the total land area of Columbiana County, 12% of Mahoning County and less than 2% of Carroll County. The dominant land use throughout the watershed has historically been and continues to be agriculture in the form of pasture, hay fields and row crops, which occupies 46.9% (about 152,000 acres) of land within the LBC watershed in Ohio (*Table 3*, *Map 4*). Following agriculture as the primary land use is forest woodland, which occupies 44.7% (142,200 acres) of the LBC watershed land area. Because of the topography of the watershed, the largest portion of forested land is found in the eastern and southeastern portion of the watershed in Ohio. The LBC and its tributaries have created steep valleys and gorges due to the lack of recent glaciation, and these areas cannot easily or inexpensively be modified for use as agricultural land or for urban development. This fact will, to a certain degree, help to protect this portion of the watershed. The central, northwestern and western portions of the watershed have fewer steep valleys and hills, which allow the land to be more easily utilized for agriculture. These portions of the watershed are more susceptible to significant changes in land use if urbanization continues. According to the 1992 USDA-NRCS NRI data, from 1982 to 1992 there had been a net loss of cropland by 1.5% and a net loss of forestland by 1.3%. From 1980 to 2003, acreage in agriculture in Columbiana County, despite an increase of 5,000 acres in the middle of that period, has decreased by a net figure of 14,000 acres, from 156,000 acres in 1980 to 142,000 acres in 2003.

Although the LBC watershed is not in any immediate danger of becoming an urban or even a suburban watershed in the immediate future, rapid urbanization is occurring at several locations. The primary area of concern is along the full length of the Columbiana County/Mahoning County border. Land formerly in agriculture is being purchased by land developers and converted into low-, medium- and high-density housing developments and subdivisions. In particular, urban expansion around the Village of Columbiana and City of Salem has resulted in a significant loss of agricultural land. As this urban expansion continues, it is encroaching upon undeveloped, forested land.

***Table 3:*** *Land use within the LBC watershed.*

| Land Use | Acres | % of Total |
|---|---|---|
| Open Water | 3,795 | 1.2 |
| Low Intensity Residential | 9,732 | 3.0 |
| High Intensity Residential | 599 | 0.2 |
| Commercial/industrial/transportation | 2,496 | 0.8 |
| Quarries/strip Mines/gravel Pits | 1,508 | 0.5 |
| Transitional | 263 | 0.1 |
| Deciduous Forest | 137,189 | 42.5 |
| Evergreen Forest | 7,077 | 2.2 |
| Mixed Forest | 7,271 | 2.3 |
| Pasture/hay | 108,768 | 33.7 |
| Row Crops | 42,792 | 13.2 |
| Urban/recreational Grasses | 110 | 0.0 |
| Woody Wetlands | 806 | 0.3 |
| Herbaceous Wetlands | 754 | 0.2 |
| **Total** | **323,160** | **100** |

In 2006, Carroll County finalized and enacted a county-wide land use, development, and natural resource management plan. The Carroll County Comprehensive Plan will provide guidance for smart growth and development in the County, and this plan will provide a method of oversight for governments and public interest groups in Carroll County to prevent damaging land use practices which can degrade the county's natural resources.

Currently, neither Columbiana nor Mahoning Counties have an endorsed land use plan to manage growth within the county. Land management has historically been left to the individual townships and municipalities to oversee. The prevailing point of view in county and township governments has been that land management, typically in the form of zoning regulations, would act as a deterrent to businesses that might be interested in relocating to the county which would provide needed jobs and tax revenues. In Columbiana County, recent attempts to pass zoning ordinances have been soundly defeated in general elections. In Columbiana County, only Perry and Fairfield Townships have zoning ordinances in place, and within the LBC watershed in Mahoning County, only Beaver Township has zoning ordinances (*Map 5*). As previously mentioned, these are the primary areas of growth within the watershed. With no land use regulations in place for the majority of the LBC watershed, it is likely that the existing proportions of land use could potentially change significantly in a relatively short period of time.

### *D. History of the Watershed*

The LBC watershed has been settled for well over 200 years. Thus, there are numberous historic locations within the watershed. Many relict buildings can be found and there are many locations where significant historical events have occurred. For instance, a historic marker now identifies the point where Thomas Hutchins began the first U.S. Public Land Survey in 1785. At the time, this was the greatest subdivision of land in America and represented the first time land was actually surveyed prior to being sold. Perhaps the most well-known historic event in the LBC watershed was the construction of the Sandy and Beaver Canal. In 1848, the canal was completed to link the Ohio River with the Ohio-Erie Canal system. The project involved the construction of 30 dams, 90 locks and 2 tunnels (*Figure 2*). Remnants of the short-lived canal system are well preserved throughout the region. A significant piece of the history of the LBC watershed is found in the regional folklore, which includes, amongst other things, stories of haunted locks and hotels. With such a storied and diverse past, the human history of the LBC watershed is as important as its geologic past.

The significant wilderness areas of the LBC watershed provided great opportunities for development and exploitation of natural resources. Forests provided ample timber, which was cut and used for local construction as well as being sold and shipped to other locations. Despite the significant topographical relief found throughout most of the watershed, cleared land was quickly converted into farmlands, being used for crop production and for livestock pastures. The northern third of the LBC watershed is more flat than that of the lower two-thirds of the watershed. Therefore, towns and villages in the northern third of the watershed have, in general, developed more quickly and to a greater extent than communities in the lower two-thirds of the watershed, where the topography often limits development potential. These facts have allowed a significant portion of the LBC watershed to remain somewhat unchanged and have allowed large tracts of undeveloped land to remain as such.

The larger urbanized areas within the LBC watershed, such as the City of Salem, the City of Columbiana, the City of East Palestine, and Village of Lisbon, as well the smaller, so-called “crossroads communities”, have attempted to maintain their historical integrity through preservation of historic structures and by maintaining downtown areas and historic streetscapes. Funding remains a challenge to these endeavors. These cities, villages, and communities are attractions to tourists who are attracted to these historic areas for shopping and sight-seeing.

## *E. Geology*

### i. Glacial history

The surficial geology of the LBC basin has been greatly influenced by the advance of two continental glaciers, the first formed by the Illinoian ice sheet, and more recently the Wisconsin advance. The Wisconsin stage began its retreat from Ohio about 14,000 years ago. The melt waters formed the present drainage patterns of the MF and NF of the LBC. The northern region of the LBC basin was covered by ice which blanketed the area with layers of till, sand, clay, and gravel. The glacial action abraded once rugged hills and filled valleys, resulting in a relatively flat plain that is today covered with fertile soils. The middle section of the basin was crossed by end moraine of the Illinoian glacier 7 advance. This narrow area displays greater and more varied relief than the northern region, and soils are moderately fertile on higher lands.

***Figure 2:*** *Remnant of a lock from the Sandy & Beaver Canal.*

The southern portions of the LBC basin are unglaciated, and the topography is hilly and rugged. Most of the WF of the LBC watershed is located within this unglaciated region of Ohio. The bedrock geology in this portion of the watershed consists of alternating layers of sandstone, shale, limestone, clay and coal which were deposited during the Pennsylvanian period. These strata have been classified into four rock formations: the Pottsville, Allegheny, Conemaugh, and Monogahela. Coal beds are prevalent in all of these formations. The highest elevation is found in Madison Township at 1,447 feet above sea level.

Portions of the LBC basin were designated State Wild and Scenic River under Section 1,501 of the Ohio Revised Code (effective on January 15, 1974). In 1975, select river sections were also designated National Scenic River, thus making LBC the only major river in Ohio to have dual State Wild and Scenic and National Scenic River designations. A total of 36 river miles are designated under the State and Federal Wild and Scenic River rules as shown in *Table 4* (Ohio DNR, 1979).

***Table 4:*** *State and Federal Wild and Scenic River designated areas for the Little Beaver Creek watershed.*

| | |
|---|---|
| State Designation | ***Wild segments –*** West Fork from 1/4 mile downstream from Twp. Rd. 914 to confluence with Middle Fork. North Fork from Twp-. Rd. 952 to confluence with Little Beaver Creek. Little Beaver Creek from confluence of West and Middle Forks downstream to 3/4 mile north of Grimm's Bridge. Effective: January 15, 1974.<br><br>***Scenic segments -*** North Fork from Ohio-Pennsylvania line downstream to Jackman Road. Middle Fork from Elkton Rd. (Twp. Rd. 901) downstream to confluence with West Fork. Little Beaver Creek from 3/4 mile north of Grimm's Bridge downstream to the Ohio-Pennsylvania line. Effective: January 15, 1974.<br><br>Miles with State designation is approximately: Wild-20 miles, Scenic-16 miles |
| National Designation | In October, 1975, Little Beaver Creek was designated a National Scenic River.<br>Designated sections include the Little Beaver Creek main stem, from confluence of West Fork with Middle Fork near Williamsport to mouth; North Fork from confluence of Brush Run and North Fork to confluence of North Fork with main stem at Fredericktown; Middle Fork from vicinity of Co. Rd. 901 (Elkton Road) bridge crossing to confluence of Middle Fork with West Fork near Williamsport; West Fork from vicinity of Co. Rd. 914 (Y-Camp Road) bridge crossing east to confluence of West Fork with Middle Fork near Williamsport.<br><br>Miles with National designation is approximately: Scenic-33 miles. |

### ii. Surface Water

The LBC watershed in Ohio has a total of 808 miles of streams, as estimated from Ohio DNR-DOWater basin maps. This stream mileage total accounts for streams which have been mapped or surveyed. Many lower order streams (e.g.1$^{st}$ and some 2$^{nd}$ order streams) are known by watershed residents but have not been surveyed or mapped. Estimating conservatively, if these unmapped streams were accounted for, the total stream mileage in the watershed would likely increase by 20% to 970 miles.

Specific flow data for individual streams or sub-watersheds within the LBC watershed are not available. The USGS established a gaging station on the MS of LBC, four (4) miles upstream from LBC's confluence with the Ohio River. The gaging station (USGS 03109500) has been used to record flow discharge volume and gage height since May, 1915. Data from the gaging station provides data in many forms. To simplify the data, daily flow volumes are generally averaged for a particular period of time. For the purpose of this WAP, the daily flow data has been averaged for each month of each year from 1970 to 2006. Then the monthly average of daily flows were again averaged for each year to develop an average annual daily flow. Finally, to summarize the daily flow regime in the LBC watershed, the average annual daily flows from 1970 to 2006 were averaged a final time. As a result of this averaging of flow data, a single value for average daily discharge, in CFS was determined. The daily discharge of water averages 563 CFS. In this same time frame, the lowest daily discharge average for a one-year period was 284 CFS in 2001. Since 1970, the highest daily discharge average for a one-year period was 1,047 CFS in 2004. The discharge volumes measured by the gaging station on LBC accounts for the entire LBC watershed, in both Ohio and Pennsylvania.

The watershed also contains several lakes, some of which are of significant size or importance. Guilford Lake is a 396-acre lake on the WF. It is also a State Park and is significant as a recreation area. Salem Reservoir (97 acres) is on a tributary of Cold Run, which is a tributary to the WF. It is the drinking water source for the city of Salem. Lake Tomahawk (115 acres) is on Rough Run, a tributary to the MS. This sizable lake is surrounded by resort type housing and is used for recreation. The county as a whole has approximately 55 smaller lakes ranging in size from 5 acres to 41 acres. The majority of the lakes and ponds within the LBC are artificial water bodies. Due to the steep gradients present throughout the watershed, there are very few locations where natural lakes, ponds and wetlands can form. In addition to the lakes and ponds which are accounted for, there are an unknown number of ponds and impoundments on farms and private properties. These unknown ponds are usually small and shallow and likely do not account for a significant portion of surface waters in the LBC watershed. Lakes and ponds in the LBC watershed in general are of good quality. However, the number of pollution sources throughout the watershed have influenced most lakes and ponds in some negative way.

Large wetland complexes are more common in the LBC watershed, as opposed to smaller wetland units *(Map 6, Map 7).* The watershed's topography provides few locations where wetlands can form. However, large wetlands form in low-gradient areas of stream valleys. Large wetland complexes are located on the MF headwaters west of the City of Salem, along North Egypt Road north of the Columbiana-Mahoning County line east of the City of Salem, and along the MF in Franklin Square. The WF sub-watershed does not have as many large wetland complexes similar to the MF. However, wetland complexes are located throughout the watershed, typically within preserved floodplains of streams and often in livestock pastures. The NF/MS sub-watershed has few wetlands because the NF/MS has steeper gradients with fewer areas for wetlands to form. The most common form of wetlands in the NF/MS sub-watershed are associated with groundwater seeps. In general, wetlands in the LBC watershed are higher quality wetlands. The most common wetland type is palustrine emergent (PEM) wetlands. Palustine open water wetlands typically develop around ponds and impoundments. Palustrine forested (PFO) wetlands are more common in the NF/MS sub-watershed where large areas of undisturbed mature forests remain.

*Dams & Impoundments*

The topography of the LBC watershed provides few places where surface water naturally pools and forms lakes or ponds. Practically all of the ponds and lakes in the LBC watershed result from the construction of dams. The most notable impoundments resulting from the construction of dams are Guilford Lake, Salem Reservoir, Lake Tomahawk, and Copeland Lake. Many smaller lakes and ponds have been created by the placement of dams, such as Spruce Lake, Al's Lake, Dickey's Lake, Cherry Valley Pond, Lake Cha-Vel, Lake Bibbee, and Lake Samary. The Columbiana County Engineer's Office identifies seventeen (17) dams within the LBC watershed. In the Mahoning County portion of the LBC watershed, there are no identified dams that create ponds or lakes. However, there are many farm ponds and ponds on private residences which result from the placement of small dams. In addition, many impoundments are formed by the placement of culverts under roadways, which constrict flow and result in ponding of water.

The Ohio DNR-DOWater maintains records of low-head dams in throughout the state. According to the Ohio DNR-DOWater, only two (2) low-head dams exist within the LBC watershed. The state's database indicates that both of these low-head dams are located on the MF of LBC in Lisbon, with the two dams being only a few hundred feet apart. Of the two identified dams, the upper dam creates an impoundment at Willow Grove Park in Lisbon, just above the US Route 30 bridge. Although the state's database indicates a second, lower dam, a visual inspection of the site in 2005 did not confirm the existence of the lower dam. A fragmented line of carved sandstone blocks were present at the supposed location of the lower dam. However, these sandstone blocks did not create any impounding of water because the blocks have been shifted and relocated, most likely by the force of the flowing water, but possibly by man.

No other low-head dams or man-made impounding structures are identified along any of the NF, MF, WF, or MS of LBC. Historically, the locks along LBC created flow diversions and temporary impoundments for the upstream and downstream movement of watercraft. Although remnants of several locks are present along LBC, the structures no longer function to create impoundments of water.

### iii. Soils

According to the USDA SCS, Mahoning County has a total of 147 soil mapping units *(Map 8, Appendix D).* Soils in the Canfield, Mahoning, Ravenna, Sebring, Trumbull, and Wadsworth soil groups make up the largest percentage of soil types in Mahoning County. The Canfield series is described as being gently sloping to steep, very deep, moderately well-drained soils, being moderately slow to slowly permeable. Canfield soils are not hydric. The Mahoning series is described as being nearly level to gently sloping, very deep, somewhat poorly drained soils, having very slow permeability. Mahoning soils are not hydric. The Ravenna series is described as being nearly level to gently sloping, very deep, somewhat poorly drained soils, having moderately slow permeability. Ravenna soils are not hydric. The Sebring series is described as being nearly level, very deep, poorly drained soils, having moderately slow permeability. Sebring soils are hydric. The Trumbull series is described as being nearly level to gently sloping, very deep, poorly drained soils, having very slow permeability. Trumbull soils are hydric. The Wadsworth series is described as being nearly level to gently sloping, very deep, somewhat poorly drained soils, having slow permeability. Wadsworth soils are not hydric.

The USDA SCS lists 127 soil mapping units in Columbiana County *(Map 9, Appendix D).* Soils in the Canfield series comprise 23% of the soil types in Columbiana County. Along with the Canfield series, soils in the Berks and Fairpoint series make up the majority of soils in Columbiana County. The Berks series is described as being moderately steep to strongly sloping, moderately deep, well drained soils, having moderate permeability. Berks soils are not hydric. The Fairpoint series is described as being nearly level to strongly sloping, very deep, well drained soil, having moderately slow permeability. Fairpoint soils are not hydric.

The USDA SCS lists 111 soil mapping units in Carroll County *(Map 10, Appendix D).* Soils in the Westmoreland-Coshocton series comprise 34% of the soil types in Carroll County. The Westmoreland and Westmoreland-Coshocton series account for 41% of soil types in Carroll County. The Westmoreland-Coshocton series is described as being moderately steep to strongly sloping, deep to very deep, well drained soil, having moderate permeability. Westmoreland-Coshocton soils are not hydric. The Westmoreland series is described as being moderately steep to strongly sloping, deep to very deep, well drained soil, having moderate permeability. Westmoreland soils are not hydric.

Most of the hydric soils mapping units are found within Mahoning County and northern Columbiana County in the glaciated region. However, the majority of the soils found within the LBC watershed and the three counties which house the watershed are non-hydric soils which are permeable to moderately permeable, which allows for sufficient water infiltration that can recharge groundwater supplies or serve as adequate substrates for septic system leach beds.

**iv. Groundwater**

LBC watershed aquifers are greatly influenced by the glacial deposits of the area. The thick sand and gravel deposits from streams carrying glacial meltwater form the highest yielding aquifers in the watershed. Deposits as much as 100-feet thick are found in valley areas near East Palestine and along the Ohio River. These deposits can produce sustained yields of as much as several hundred gallons per minute (gpm) –sufficient for municipal and industrial use. Wells in smaller deposits of sand, gravel, silt and clay range in yield from 25 to 100 gpm in valleys from Leetonia to Columbiana, and in areas near Salem, and Lisbon.

*Groundwater Potential*

In much of the northern portion of the watershed, the thick glacial deposits overlie sandstone and shale bedrock. Wells in these areas average 10 to 25 gpm, appropriate for domestic and farm supplies. Where the glacial deposits include sand and gravel lenses, yields as high as 100 gpm may occur. Well depth ranges in this area are commonly 25 to 300 feet. In the central portion of the watershed, a transitional zone between the glaciated and unglaciated portions of Columbiana County forms a latitudinal band which follows along the WF of LBC through the central, southern portion of Columbiana County and into Carroll County. In this region where the glacial cover was thinner, wells yield lesser volumes. Wells in this region typically yield between 3 gpm and 10 gpm, which is only adequate for domestic use. Well depths are commonly 25 to 100 feet, but some may exceed 300 feet deep. In the southernmost portion of the watershed, demarcated along the southern bank of the MS of LBC in the lowest reaches of the watershed, no glacial cover occurred. The unglaciated sandstones and shales provide poor ground water supplies. Ground water production in this region is much lower with wells typically yielding less than 3 gpm, and additional water storage is required to provide adequate domestic supplies. Well depths are commonly 60 to 150 feet, but some may exceed 250 feet. Map 11 provides details of the ground water resources of Columbiana County.

The LBC watershed in Mahoning County, which comprises the northernmost reaches of the MF and NF sub-watersheds, is comprised primarily of sandstones which produce yields of 10 gpm to 25 gpm. This yield is sufficient for domestic and farm uses. Well depths in this area are typically 50 to 100 feet, with some wells exceeding 250 feet. Areas within larger stream valleys have higher groundwater yields, as high as 100 gpm or more. However, these high volume discharge areas are scattered and can be difficult to locate. Map 12 provides details of the ground water resources of Mahoning County.

Along the border between Mahoning and Columbiana Counties, areas of low ground water production are found scattered between the City of Salem and the Village of Columbiana. These isolated low-yield areas produce between 3 gpm and 10 gpm. Their position in the watershed is likely due to the lack of uniform boundaries during consecutive glacial periods.

The Salem public water system is the only system within the LBC watershed that uses surface water as well as ground water. According to the Ohio EPA 1996 information, this system serves both Salem and Washingtonville with a water usage capacity of 2,169,000 gallons per day. All other public water supplies in the watershed are from ground water sources. The US EPA maintains information on all drinking water systems in the country in its Safe Drinking Water Information System. This database lists detailed violation and enforcement histories on each water system, whether its source is surface or ground water. This information can be accessed on the US EPA's website or by calling the Safe Drinking Water hotline at 1-800-426-4791. The City of Salem system also derives water from a ground water source. The Ohio EPA has endorsed a wellhead protection area for the City of Salem, but the city does not yet have an endorsed SWAP plan for its surface water drinking water sources.

*Groundwater Pollution Potential*

The DRASTIC mapping system (*Depth* to Water, Net *Recharge*, *Aquifer* Media, *Soil* Media, *Topography*, *Impact* of the Vadose Zone Media, *Conductivity* of the Aquifer), as developed by the Ohio DNR-DOWater, utilizes a weighted system of scoring to numerically categorize a test location's GPP according to a set scale. For a more detailed description of the DRASTIC system, refer to the GPP reports for Mahoning and Columbiana Counties. The

DRASTIC mapping system rates a location's GPP from 65 through 223, with 65 being the lowest score and 223 being the highest score. Using the DRASTIC mapping system, pollution potential has been mapped for these two counties (*Map 13, Map 14).* According to the Groundwater Pollution Potential Reports for Mahoning and Columbiana Counties, the majority of the LBC watershed has moderate to low potential for groundwater pollution.

Countywide, 235 site tests were conducted for Mahoning County. Computed indexes for GPP ranged from 76 to 168. One hundred and ten (110) of these test sites (46%) were found to have a hydrogeologic setting of glacial till over bedded sedimentary rock. The vast majority of Mahoning County test sites within the LBC watershed were placed in this class. Approximately 90% of the LBC watershed in Mahoning County has been given a GPP index of 139 or less, indicating moderate to low GPP. Of this 90%, the majority of this area has a GPP index of 119 or less. Two (2) areas in the LBC watershed in Mahoning County have been determined to have high GPP. These locations are in the primary stream valley of the MF of LBC in Green Township, and in the primary stream valley of the East Branch of the MF of LBC in Beaver Township. These high risk areas have GPPs of 163 or higher. These high risk areas extend south into Salem and Fairfield Townships in Columbiana County for both the MF of LBC and the East Branch of the MF of LBC. However, these high risk areas only extend a few miles into Columbiana County. These high risk areas are in the buried valley hydrogeologic setting, which is comprised of a stream valley which has been filled with easily permeable materials (e.g. sand, gravel) through years of sediment deposition from the stream itself. Water from the stream can easily infiltrate through this material into groundwater sources, thus making these areas highly vulnerable to pollution of groundwater.

For Columbiana County, 243 site tests were conducted countywide. GPP indexes for Columbiana County were computed and found to range from 65 to 173. Columbiana County has a slightly wider range of GPP indexes than that of Mahoning County. As it is in Mahoning County, the largest percentage of test sites were determined to be in the hydrogeologic setting of glacial till over bedded sedimentary rock. However, this class only accounts for 32% (79 of 243) of the test sites, as compared to 46% of test sites in Mahoning County. Also similar to Mahoning County, the approximately 90% of the LBC watershed within Columbiana County has been given a GPP index of 139 or less, indicating moderate to low GPP. Of this 90%, the majority of this area has a GPP index of 119 or less. As previously discussed, two areas of the LBC watershed in Columbiana County (i.e. MF of LBC in northern Salem Township, EB of the MF of LBC in northern Fairfield Township) have been determined to have high GPP.

*Groundwater Protection*

Soil types in the LBC watershed promote groundwater of good quality. Most of these soils are deep and moderately to slowly permeable. Surface waters can infiltrate through these soils and become "cleaned" in the process. Deep wells are generally protected from surface pollution, except for wells dug in areas that have been determined to have high GPP.

Ohio has a SWAP Program that is used to protect Ohio's streams, rivers, lakes, reservoirs, and ground waters used for public drinking water from future contamination. Building on existing environmental assessment and protection programs, the SWAP program will identify drinking water source protection areas and provide information on how to reduce the potential for contaminating the waters within those areas. By focusing assessment and protection efforts on source waters, the Ohio EPA hopes to ensure the long-term availability of an abundant supply of safe drinking water for existing and future citizens of Ohio.

To take it a step further, the US EPA has the Sole Source Aquifer (SSA) Protection Program, authorized by Section 1424(e) of the Safe Drinking Water Act of 1974. US EPA defines a sole or principal source aquifer as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas can have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend upon the aquifer for drinking water. There are five Sole Source Aquifers designated in Ohio, none of which are in the LBC watershed. Any individual, corporation, company, association, partnership, state, municipality or federal agency, may apply for SSA designation. Proposed federal financially assisted projects which have the potential to contaminate the designated sole source aquifer are subject to US EPA review. Proposed projects that are funded entirely by state, local, or private concerns are not subject to US EPA review. This program provides one more tool used to protect the water resources we depend upon.

### *F. Habitat*

The LBC watershed primarily exhibits Warm Water Habitat (WWH) and Exceptional Warm Water Habitat (EWH) throughout the various tributaries and major stream reaches. The watershed generally drains from the north and northwest to the south and southeast to the LBC's confluence with the Ohio River, just north of the city of East Liverpool, at the junction point of the borders of Ohio, Pennsylvania and West Virginia. The Little Beaver Creek Valley displays uncommon characteristics of its geologic history. It is one of the few river valleys in the United States where, according to some geologists, evidence of the four major glacial periods can be found. Characterized by steep walls, high rock cliffs in the NF/MS, rolling hills in the MF and WF, this watershed occupies land in both the glaciated and unglaciated Allegheny Plateau. As a result of this difference, the MF and WF subwatersheds are utilized more for agriculture, while the NF/MS subwatershed remains largely forested, with less concentrated agriculture.

The LBC watershed has been a watershed which has had the unfortunate condition of being representative of the contradictions which are all too common throughout watersheds in the United States. Within one watershed, the community is split between the fear of chemical and industrial pollution and the pride of living within a state and federally-designated Scenic River and a state-designated Wild River watershed. However, the existence of this contradiction has actually helped the LBC watershed. It has made the LBC watershed a focal point for preservation, protection and management efforts for several years.

***G. Flora & Fauna***

The diversity of the natural flora and fauna of the LBC watershed reflects its geologic variations. The watershed lies within a region where the eastern mixed deciduous forest meets relict prairie ecosystems in the midwest. Because approximately half of the watershed was covered by icesheets during the last glacial period, the flora in the northeastern portion of the watershed varies from that of the western and southwestern portion of the watershed.

The LBC watershed is home to 60 tree species and over 160 species of wildflowers. Common tree species include the eastern hemlock (*Tsuga canadensis*), black cherry (*Prunus serotina*), yellow birch (*Betula allaghaniensis*) and Canada yew (*Taxus canadensis*). These species find preferable habitat on north-facing slopes and hillsides within the numerous valleys throughout the watershed, especially in the NF/MS watershed which exhibits greater relief in its topography. Bloodroot (*Sanguinaria canadensis*), Dutchman's breeches (*Dicentra cucullaria*), bellwort (*Uvularia grandiflora*), Virginia bluebell (*Mertensia virginica*), and several species of trillium (*Trillium spp.)* are regularly found throughout the watershed's wooded areas.

These wildflowers, along with many other species, attract many visitors to the watershed each year to view and photograph these plants.

The undisturbed wildlands and abundant waters of the LBC valley provide perfect habitat for a wide variety of fauna. Resident mammal populations include mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), opossum (*Didelphia virginiana*), red fox (*Vulpes vulpes*), beaver (*Castor canadensis*), white tail deer (*Odocoileus virginianus*), coyote (*Canis latrans*), and black bear (*Ursus americanus*). A significant fishery exists, including many preferred game species such as smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), channel catfish (*Ictalurus punctatus*), white crappie (*Pomoxis annularis*), rock bass (*Ambloplites rupestris*), bluegill (*Lepomis macrochirus*) and yellow walleye (*Sander vitreum*). The valley is also home to nearly 33 resident bird species, with an additional 236 species which migrate through the watershed and occasionally nest.

Ohio's largest population of the hellbender salamander (*Cryptobranchus alleganiensis*) is found within the LBC watershed, primarily in the WF watershed. The hellbender is the largest amphibian species in North America, with some adults reaching lengths of four feet. The hellbender is listed as an endangered species in Ohio. However, the species is more common in other Appalachian regions.

To date, comprehensive data of flora and fauna of the LBC watershed is not compiled in one location. Portions of information can be obtained from various agencies and organizations. The Ohio DNR-DOW District 3 Fisheries Unit recently completed a survey of smallmouth bass in the LBC watershed. However, regular monitoring of LBC species, especially non-game species, is not conducted. The Ohio DNR-DNAP Natural Heritage Data Services office can provide information from their Natural Heritage database concerning plants, plant communities, animals and other physical features.

The Ohio DNR-DNAP maintains a list of invasive plant species for the state *(Appendix E).* There are currently thirteen (13) invasive plant species listed by Ohio DNR-DNAP. Most of these invasive are currently found in the LBC watershed. Some species, such as reed canary grass (*Phalaris arundinacea)*, garlic mustard *(Alliaria petiolata)*, and multiflora rose *(Rosa multiflora),* are commonly found in all habitats that the LBC watershed has to offer. The aggressive nature of these invasive plants allows them to outcompete native plant species for habitats where the native plants would normally thrive. Invasive species are typically opportunistic organisms which can thrive in habitat types for which they are not specifically adapted. This allows them to force native plants out from their normal habitats. The cumulative affect of this influx of invasive species causes a reduction in plant species diversity and thereby reduces the biological integrity of the LBC watershed. Wildlife depend on certain plant species for food and shelter. The decline and possible loss of these food and shelter sources due to invasive species can therefore have secondary negative impacts on wildlife. Ultimately, the existing ecological integrity is altered and is forced to change accordingly. In such a case, the ecological landscape of the LBC watershed can be permanently altered.

### *H. Local Watershed Groups*

The LBCLF was founded in 1993 as a non-profit 501 (c) (3) organization with the intent of developing a citizen-based organization that would act to promote the protection of natural areas and resources, but also to encourage the development of natural-resource conscious policies in Columbiana County and the State of Ohio. The LBCLF currently has more than 100 members from around the United States. The LBCLF is administered by a Board of Trustees, which is made up of no more than eleven (11) trustees. Currently, the LBCLF Board of Trustees is currently made up of four (4) trustees, a treasurer, and a president. Contact information for the current LBCLF Board of Trustees is in Appendix F. According to the LBCLF's official Statement of Purpose *(Appendix F),* the LBCLF was formed in order to, "…improve and revitalize our area, and promote the preservation, renewal and restoration of the natural areas around and along Little Beaver Creek, and improve the quality of life of all area residents." Since its inception, the LBCLF has taken the initiative to pursue projects and project funding and has assisted county, state, and federal agencies in completing land acquisitions that protect unspoiled acreage within the LBC watershed. Development of the LBC WAP is being managed and completed by the LBCLF. Once the WAP has been endorsed by the Ohio EPA and Ohio DNR, the LBCLF will be the lead group which will spearhead the effort to gain local government and public support and the LBCLF will ultimately coordinate the execution of projects undertaken as a result of this WAP.

The LBCLF currently holds approximately eighty-eight (88) acres of land under three (3) conservation easements. All of these conservation easements are located in the lower LBC watershed near Beaver Creek State Park. Along with their own efforts for acquiring conservation easements, the LBCLF has also played an important role in the identification and acquisition of conservation easements by county and state agencies. The LBCLF is continuing to pursue further opportunities for land protection throughout the LBC watershed. Yet, in recent years, the LBCLF has taken a more active role in public education and resource management planning in order to provide a vehicle for the long-term enhancement and protection of the LBC watershed and its resources.

In addition to the LBCLF, the LBCWSRAC is a local group comprised of watershed residents who are concerned with protecting and monitoring the water and land resources within the Wild and Scenic River designated areas of the LBC watershed. The LBCWSRAC receives direct involvement from the Ohio DNR-DNAP SRP. Personnel from the Ohio DNR-DNAP Northeast Regional SRP office participate directly in LBCWSRAC meetings and public events. In many ways, the LBCWSRAC and the LBCLF are parallel groups that work together on many occasions in the best interest of the watershed community. However, the LBCWSRAC is limited to working within the Wild and Scenic River designated areas. But, the collective effort between these two groups for monitoring and protection of watershed resources has garnered much support from the local citizens and has helped to make progress in public education and awareness of the LBC and the issues which affect it.

### *I. Parks & Recreation*

Several parks and nature preserves are found throughout the LBC watershed. The Ohio DNR-DPR has three (3) state parks within the LBC watershed in Columbiana County. The largest of the three parks is Beaver Creek State Park, which occupies 2,726 acres along the MS of LBC. BCSP is situated within the Wild River designated area of LBC. BCSP provides many opportunities for outdoor lovers, such as hiking, kayaking canoeing, horseback riding, and wildlife observation. Adjacent to the park in an additional 2,105 acres of wildlife areas.

A second, discontinuous portion of the BCSP is located a few miles upstream of the main area of BCSP, along the MF of LBC within the Scenic River designated area. Remnants of a lock from the former Sandy & Beaver Canal, known as Lusk Lock, is found within this area. This smaller area does have a limited number of trails and is accessible to canoeists, although no formal canoe launch is present.

The Sheepskin Hollow State Nature Preserve is located along the NF of LBC in Middleton Township on the Ohio-Pennsylvania state line. As a state nature preserve, recreation is somewhat limited in this area, but provides excellent, though challenging, hiking. Sheepskin Hollow offers a unique and spectacular waterfall, which serves as the primary focal point of the preserve. All terrain vehicles (ATVs), though illegal, are rampant in Sheepskin Hollow. ATVs disturb the peace and tranquility of the nature preserve, and are frequently sighted tearing through the creek, yielding streambank erosion and disturbance to the benthic habitat. DNAP frequently patrols this area in an effort to eradicate those illegally using the nature preserve for this purpose, though the problem remains.

Guilford Lake State Park is situated around Guilford Lake in Hanover Township, and occupies a total area of 493 acres, including the lake itself. Adjacent to the park are an additional 518 acres of wildlife areas. Guilford Lake State Park provides opportunities for camping, fishing, swimming and boating for park patrons. The popularity of Guilford Lake State Park and the lake itself has made the lake area a popular place and is now being developed as a residential area.

The Columbiana County Park District maintains Scenic Vista Park in Center Township, southwest of Lisbon. Scenic Vista Park is situated atop a high hill and provides exceptional views of the surrounding area, as the park's name implies. The park provides open spaces for picnicking and other recreational uses.

There are many parks found in the cities, villages, and townships within the LBC watershed. The City of Salem, Village of Leetonia, Village of Columbiana, Village of Lisbon, Village of New Waterford, City of East Palestine, Village of Greenford, and Green Township are examples of municipalities that have parks. These parks provide areas for activities such as picnicking, walking, swimming, sports, fishing and many other typical recreational activities for which civic parks are known.

The Beaver Creek Greenway Trail provides a scenic walking and biking trail. The trail extends approximately twelve (12) miles from Lisbon to Leetonia. The trail attracts thousands of cyclists each year and is a popular attraction for nature lovers and fitness enthusiasts. The trail in maintained by the Columbiana County Park District. Eventually the Greenway Trail will extend into Mahoning County and will connect with the Mill Creek MetroParks bike trail, which currently ends at Western Reserve Road in southern Canfield Township.

In addition to parks and recreational areas, the LBC watershed provides numerous opportunities for outdoor activities. Fishing is extremely popular due to the abundance and high quality of game fishing in LBC. Canoeing and kayaking are most popular in the spring and fall while the creek flows are higher. The North Country Trail, which is a National Scenic Trail, enters Ohio near the Village of Negley in Middleton Township, Columbiana County and parallels LBC for much of its route in this area. A new loop trail connecting the North Country Trail winds through lands which are under conservation easement. Birding is very popular in the LBC watershed, with so many bird species being found there throughout the year.

### *J. Previous Plans, Studies and Management Activities*

**i. Ohio EPA Studies** *(as taken from Little Beaver Creek TMDL Report, 2005)*

Two comprehensive surveys of the LBC watershed were conducted by Ohio EPA in 1985 and 1999. Biological and chemical samples were collected at a large number of stations throughout the LBC basin, including all major tributaries (e.g., NF, WF, MF). This sampling effort was mostly targeted at stream locations upstream and downstream from NPDES permitted dischargers (*Map 15*), although impacts from potential nonpoint sources of pollutants were assessed from tributary samples. No survey findings documents were published for either the 1985 or 1999 surveys. However, raw chemical, biological, and physical habitat data are available via STORET (US EPA chemical database), FINS (Ohio EPA fish database), and MIDGES (benthic macroinvertebrate database). A number of summary tables also are available, including a biological attainment table that compiles the results of the 1985 and 1999 biological surveys. The TMDL recommendations provided in this report are based on the results of the 1999 Ohio EPA survey of the LBC basin, monthly data collected from the LBC mainstem at Grimms Bridge Road since 1999, and sampling conducted by wastewater treatment plants since 1998. Data from the 1985 Ohio EPA survey are used exclusively to document historical trends over time in chemical and biological WQ, and not to develop TMDL loading limits.

Based on the results of the 1985 survey, a fish tissue and sediment organic chemical evaluation report for the MF of LBC was completed (Estenik, 1988). In addition, a number of studies have been conducted on the levels of mirex in sediment and fish tissue from the MF of LBC for the US EPA superfund project for the Nease Chemical Company in Salem. The Ohio Department of Health issued a contact and fish consumption advisory downstream from the Nease company for a distance extending well over 20 miles downstream. The chemical of concern in this advisory is the pesticide mirex.

In 2005, US EPA began to again investigate the mirex pollution in the MF of LBC. Several open meetings were held to inform the public of the developments in the remediation plan. Since closing the Salem plant, the Nease Chemical Company has been purchased by the Rutgers Corporation. The former Salem plant site was also included in the purchase. Under the US EPA Superfund program, Rutgers is responsible to clean-up of the contamination source. Therefore, in collaboration with the US EPA, Rutgers is determining how it will attempt to remediate the former Nease Chemical Salem site where the contamination originates from. Several methods are being investigated, but a remediation plan has not been set at this time. The US EPA is currently developing a plan for remediation of the mirex-contaminated MF. Although neither a schedule for development nor a timeline for the clean-up have been established by US EPA or Rutgers, it will likely require a minimum of fifteen years for the remediation to be completed, according to a US EPA spokesperson (*quote from public meeting, Summer, 2005*).

The mirex pollution is the most well known and publicized chemical pollution issue in the LBC watershed. However, there have been a significant number of illicit chemical discharges in the LBC watershed in the past. The US EPA's Enviromapper displays locations of regulated and illicit discharges for air, water, chemical, and hazardous waste pollution (*Map 16*). Discharges are generally concentrated in more urbanized areas, such as the Village of Columbiana, City of Salem, Village of Leetonia, Village of Lisbon, and City of East Palestine. But, pollutant dischargers of all types are spread throughout the watershed. Specific data for each pollution discharger or pollution event is available from the US EPA. However, since an entire separate report would be necessary to cover all the data on pollution discharges, they will not be discussed individually in this report. Two specific instances which do warrant mentioning occurred in 1988. Both instances involved toxic releases. The American Runner Company in East Palestine released a non-specified toxic substance. In the same year, the Lakewood Chemical & Supply Company in Negley released aluminum oxide. Both of these discharges occurred to in the NF subwatershed. Although these instances were isolated, infrequent releases such as the mirex and Negly aluminum oxide discharge can have significant impacts which may linger for many years.

Prior to 1985, the Ohio EPA completed a large number of Wasteload Allocation and WQ Action plan reports as required by Section 208 of the Clean Water Act. These reports were published between 1974 and 1979 and represent a good source of historical information including geology, hydrology, WQ, land use, and status of point and nonpoint sources of pollutant loadings within the Little Beaver Creek basin. In 1979, the Ohio DNR-DNAP SRP, published the Little Beaver Creek Wild-Scenic River Assistance Manual. This report summarizes the various sections of the LBC basin that have been designated as either a Wild or Scenic River under the Ohio Scenic Rivers Act of 1974.

In September, 2005, the United State Environmental Protection Agency approved the TMDL for LBC. For more information regarding the previous Ohio EPA studies and the LBC watershed, see the *Total Maximum Daily Loads for the Little Beaver Creek Watershed* (2005).

### ii. Local Planning & Management Efforts

The CSWCD received a $50,000 grant from Ohio DNR-DSWR in 1994 to address NPS pollutants in the Guilford Lake area along the WF (HUC 05030101-080-010, 05030101-080-020) which has historically been highly impacted by local agriculture. The majority of the funds were used to construct storage units for silage and for nutrient management. The local agricultural community was highly supportive of the effort. A second grant of $43,000 was awarded to the CSWCD in 1998 to conduct a detailed WQ assessment in the WF tributaries in the Guilford Lake area. A contract was awarded to a consulting geologist to complete the assessment. A watershed treatment action plan was completed in December, 1998. The plan proposed for implementation activities to begin in Spring, 1999.

The CSWCD received two rounds of NatureWorks funding through the Ohio DNR-DSWCD in 1998 and 1999. The primary goal for each of these grants was to purchase conservation easements on property adjacent to the Wild and Scenic segments of the LBC watershed. One of these grants was used as match funds by the CSWCD to acquire additional funding from the §319 NPS Pollution Program. That grant was awarded to the CSWCD in July, 1999. The CSWCD and its match partners implemented the plan by purchasing several easements and identifying further potential properties and property owners for future easements.

USDA farm programs have been utilized on participant farms throughout the watershed. In an average year, six acres of grassed waterways are built and three animal-waste storage structures are installed. Additionally, the local USDA staff provided education for the local farming community on soil conservation practices. In conjunction with the USDA efforts, the CSWCD has a successful no-till drill rental program that results in an annual average of 1,200 acres of agricultural land being under conservation-tillage practices.

In addition to the CSWCD programs, the CSWCD has previously attempted to develop two watershed action plans for the LBC watershed. However, neither of the previous plans were submitted for endorsement under Ohio EPA or Ohio DNR review. The first plan was completed and provided general guidelines for CSWCD programs, outlined funding opportunities and provided timelines for management activities. The second plan was not completed. This provided the impetus for the current watershed planning effort under a 2003 §319 NPS Pollution Program grant for the development of a comprehensive watershed action plan for the LBC watershed.

In early 1996, Columbiana County officials commissioned Youngstown State University's Center for Urban Studies to develop a comprehensive land use plan for the county. The plan was completed and submitted to the county officials in late 1996. The plan met the expectations of the county officials. However, the plan was never formally adopted by the Columbiana County Commissioners, township trustees, or village and city councils. The failure of this plan to gain local public and government endorsement meant that there was and continues to be little legal protective regulations, restrictions or guidelines for the land and water resources within Columbiana County, and subsequently the LBC watershed. No formal action was ever taken by any government entity within Columbiana County regarding the 1996 land use plan.

In Spring, 2005, a second effort was undertaken to develop a comprehensive land use plan for Columbiana County. At the time this document is being written, the initial draft of the Columbiana County land use plan is being written by the Ohio State University Extension Office in Columbiana County. The emphasis in the development of the current land use plan is to include knowledgeable members of the local community. Part of the blame for the failure of the original land use plan has been placed on its development process. The entire planning process was carried out by the YSU Center for Urban Studies with no input or involvement from the county citizens. For the current planning effort, it is hoped that in the inclusion of volunteers from the county will help to carry the plan through to implementation. At this time, a completion date for the new Comprehensive Land Use Plan is unknown. However, the success of this watershed action plan is significantly reliant upon the development and endorsement of the land use plan.

Along with formal and specific action plans, watershed protection has been part of the strategic plans for several local and state agencies. These groups include the CSWCD, Ohio DNR Divisions of Wildlife, Forestry, Natural Areas and Preserves, and Mineral Resources Management, the Crossroads RC&D, the LBCLF and the LBCWSRAC. Despite the lack of a formal, endorsed, unifying watershed action plan, these groups have acted to monitor activities within the watershed and to take appropriate actions to prevent major impacts to the land and water resources. This watershed action plan will detail a comprehensive strategy for these groups to utilize to continue their management efforts. This plan will also be presented to municipal, township and county governments for their review, consideration, and endorsement.

The most successful method of resource management in the LBC watershed to date has been the acquisition of lands under conservation easements. Aside from state and county park lands, approximately 2,700 acres of land have been placed under conservation easements by the Ohio DNR-DNAP, CSWCD, and the LBCLF *(Map 17).* Most of these easements are located along the lower reaches of the NF of LBC and the lower reaches of the MF of LBC. This concentration of protected lands has created a corridor of land which is now perpetually protected from development. The area of concentrated easements also coincides with the reaches of the LBC and its major forks which are designated as Wild and Scenic Rivers. The presence of these easements should help to ensure that these designations are not threatened by encroachment and development. A private land trust also holds and protects approximately 6,000 acres of land along the MS of LBC. The combined effort and cooperation between private land owners, citizen-based groups, county agencies, and state agencies has lead a highly successful movement to protect resources within the LBC watershed through the use of conservation easements.

**III. Watershed Demographics**

As previously discussed, the LBC watershed occupies 408mi$^2$ within Ohio, in Columbiana, Mahoning and Carroll Counties. The vast majority of the watershed lies within Columbiana County in the entirety or portions of the following townships: Perry, Butler, Salem, Fairfield, Unity, Hanover, Center, Elkrun, Middleton, Franklin, Wayne, Madison, St. Clair. Within these townships, the City of Salem, City of East Palestine, Village of Columbiana, Village of Lisbon and the Village of Leetonia are the largest populated placed within the entire Ohio-portion of the watershed. Other small populated centers are spread throughout the predominantly rural county. The total population for Columbiana County, according to the year 2000 census, is 112, 075, with 76,022 of the population being 25 years of age or older. Of the total county population, an estimated 90,000 persons reside within the LBC watershed. 96.4% of county residents are Caucasian. The largest minority group within the county is African-Americans, which make up 2.2% of the county population. There are 46,083 total housing units, with an average household size of 2.52 persons. Eighty percent of individuals over 25 years of age (61,252) hold a high school diploma or higher degree of education. Eleven percent of individuals over 25 years of age (8,198) hold a bachelor’s degree or higher level of college or university education. Sixty percent of individuals age 16 or older (52,918) are employed. The median household income throughout the county in 1999 was $34, 226 annually, which is about $8,000 below the national average for that year. Per capita income in 1999 was $16,665 annually, $5,000 below the national average in that year. Twelve percent of individuals in the county (12,478) have an income below the poverty level, which is 0.9% below the national average for 1999 (U.S. Census Bureau, 2000).

The portion of the LBC watershed within Mahoning County lies within Goshen, Green, Beaver and Springfield Townships. These townships are predominantly rural agricultural areas mixed with forested, undeveloped areas. Residential areas are dispersed with few clusters of housing occupying a common area. There are no significantly populated areas in Mahoning County within the LBC watershed. The total population for Mahoning County, according to the year 2000 census, is 257,555, with 174, 803 of the population being 25 years of age or older. Of the total county population, less than 25,000 persons reside within the LBC watershed. Eighty-one percent of county residents are Caucasian. The largest minority group within the county is African-Americans, which make up 15.9% of the county population. There are 111,762 total housing units, with an average household size of 2.44 persons. Eighty-three percent of individuals over 25 years of age (114,100) hold a high school diploma or higher degree of education. Eighteen percent of individuals over 25 years of age (30,557) hold a bachelor's degree or higher level of college or university education. Fifty-nine percent of individuals age 16 or older (118,973) are employed. The median household income throughout the county in 1999 was $35,248 annually, which is about $7,000 below the national average for that year. Per capita income in 1999 was $18,818 annually, $3,000 below the national average in that year. Thirteen percent of individuals in the county (31,328) have an income below the poverty level, which is less than 0.1% above the national average for 1999 (U.S. Census Bureau, 2000).

A very small portion of the WF sub-watershed, less than 10 $mi^2$ on the LBC watershed's southwest boundary, lies within East Township, Carroll County. This township is, like other typical townships in the LBC watershed, predominantly a rural agricultural area mixed with forested, undeveloped areas. The population on this portion of the watershed is widely dispersed. Less than 3,000 people reside within the LBC watershed in Carroll County. There are no significantly populated areas in Carroll County within the LBC watershed. The total population for Carroll County, according to the year 2000 census, is 28,826, with 19,460 of the population being 25 years of age or older. Ninety-eight percent of county residents are Caucasian. The largest minority group within the county is African-Americans, which make up 0.5% of the county population. There are 13,016 total housing units, with an average household size of 2.56 persons. Eighty percent of individuals over 25 years of age (15,586) hold a high school diploma or higher degree of education. 9.1% of individuals over 25 years of age (1,775) hold a bachelor's degree or higher level of college or university education. Sixty-two percent of individuals age 16 or older (13,807) are employed. The median household income throughout the county in 1999 was $35,509 annually, which is about $6,500 below the national average for that year. Per capita income in 1999 was $16,701 annually, $5,000 below the national average in that year. Twelve percent of individuals in the county (3,245) have an income below the poverty level, which is 1% below the national average for 1999 (U.S. Census Bureau, 2000).

### *A. Education in the LBC Watershed Region*

Fourteen (14) school districts serve the LBC watershed in Columbiana, Mahoning, and Carroll counties *(Map 18).* According to year 2007 data, these 14 districts serve approximately 25,000 students. The following school districts serve the LBC watershed:

**Columbiana County**

| *School District Name* | *Number of Students* | *Grades* |
|---|---|---|
| Columbiana Exempted Village | 1,011 | Pre K – 12 |
| Crestview Local | 1,133 | Pre-K – 12 |
| East Liverpool City | 3,104 | Pre-K – 12 |
| East Palestine City | 1,496 | Pre-K – 12 |
| United Local | 1,461 | Pre-K – 12 |
| Leetonia Exempted Village | 877 | Pre-K – 12 |
| Beaver Local | 2,492 | Pre-K – 12 |
| Lisbon Exempted Village | 1,196 | Pre-K – 12 |
| Salem City | 2,472 | Pre-K – 12 |
| Columbiana County Joint Vocational | N/A | 6 – 12 |

**Mahoning County**

| *School District Name* | *Number of Students* | *Grades* |
|---|---|---|
| Springfield Local | 1,255 | Pre-K – 12 |
| South Range Local | 1,331 | Pre-K – 12 |
| West Branch Local | 2,542 | Pre-K – 12 |

**Carroll County**

| *School District Name* | *Number of Students* | *Grades* |
|---|---|---|
| Carrollton Exempted Village | 2,997 | Pre-K – 12 |

Of these districts, Crestview, East Palestine, Leetonia, Beaver Local, Lisbon and Salem have district boundaries entirely within the LBC watershed. The remaining school districts also serve areas outside of the LBC watershed to varying degrees.

Kent State University (KSU) maintains two (2) branch commuter campuses in Columbiana County, one in Salem and one in East Liverpool. The KSU Salem branch campus has an average enrollment of 1,500 students. The KSU East Liverpool campus has an approximate enrollment of 1,000 students. Students commute to these two campuses from surrounding Ohio Counties, western Pennsylvania, and northern West Virginia.

Youngstown State University (YSU) is located in downtown Youngstown in northern Mahoning County. The Fall semester enrollment for YSU averages 13,000 students. YSU serves a significant proportion of college students which reside in the LBC watershed.

# CHAPTER 2

# Significant NPS Pollutants

The three sub-watersheds of LBC are susceptible to similar pollution pressures. However, the sub-watersheds are not currently being impacted by these pollution sources equally. According to the Ohio EPA's 2006 Integrated Report, the MS sub-watershed, which includes the NF, currently has 90 percent of streams and tributaries in attainment of aquatic life use standards. This is largely due to the fact the NF/MS sub-watershed is the least developed of the three sub-watersheds in Ohio. NPS pollution sources are present. But the more natural condition of the sub-watershed allows the streams and tributaries to better withstand NPS inputs.

Only 50% of the WF sub-watershed is in attainment of aquatic life use standards. The main impact on the WF sub-watershed comes from extensive agriculture along and near the WF. The WF sub-watershed has relatively level topography in comparison to the MF and NF/MS sub-watersheds, and is therefore heavily utilized for livestock and crop farming. The MF sub-watershed is currently at the lowest level of attainment within the LBC watershed with only 46% of streams and tributaries being in attainment of aquatic life use standards. The MF sub-watershed is the most developed of the three LBC sub-watersheds in Ohio and thereby is subjected to the most NPS sources. Impacts to the MF come from both urbanization and agriculture, which are the general sources for most NPS pollution throughout the LBC watershed.

Although the MF and WF sub-watersheds are in a highly degraded state, they, along with the NF/MS sub-watershed are at significant risk of further degradation if no measures are taken to eliminate NPS sources.

The following text of the watershed plan will outline significant NPS pollution sources in each of the three 11-digit HUC watersheds considered part of the LBC watershed.

### I. Failed Septic Systems

Because the LBC watershed is predominantly rural with few significantly populated areas, public sewage systems are not common. Septic systems, or HSTS, are the predominant form of human waste disposal in the area. There are an estimated 35,000 septic systems in Columbiana County alone. Of that number, it is estimated that 23,000 of those systems lie within the LBC watershed. The MCBH estimates that 25% of the septic systems they encounter are in a state of failure. There are approximately 45,000 septic systems in Mahoning County, with less than 10,000 of those septic systems being located in the LBC watershed. There are fewer than 10,000 HSTS systems in Carroll County, with only about 100 of those systems being located within the LBC watershed. There are few, if any, municipal sewer systems which serve the LBC watershed area in Mahoning County. Therefore, it is almost certain that there are FSS in this area.

When septic systems are no longer functioning properly, they can release raw sewage from homes directly into a LBC tributary or roadside ditch. Some failed systems may leak raw waste into the soils, which can then pollute groundwater sources. The untreated waste contains large amounts of organic materials. Those organic materials, once released into a surface water system, provide a great food source for bacteria residing in the water. Therefore, FSS are a source of organic nutrient enrichment. The bacteria must break down the organic molecules into smaller particles they can then utilize as an energy source. This process requires oxygen, and as the bacteria break down and digest the organics, they burn off large amounts of oxygen. This leads to a condition in the water called anoxia, or low dissolved oxygen. This condition will result in stream habitat that is unsuitable for most aquatic macroorganisms. In time, as dissolved oxygen nears depletion, the bacteria cannot process the organic materials as fast as they are supplied from the failed septic system. Because of this, the raw waste begins to accumulate and eventually moves downstream. The condition will spread further downstream and the effects of the condition will extend even further downstream, thereby creating significant stream reaches where very little to no aquatic life can be found.

The anoxic condition of this water and accumulation of untreated waste not only creates problems for wildlife that would utilize or inhabit the water. This water resource may be a drinking water resource for a downstream community. In order to make the water safe for consumption, the water must be treated. And as the level of organic pollution increases, the level of treatment must be increased as well. This has the potential to cause treatment costs to increase dramatically. As previously mentioned, in the LBC watershed there are very few highly populated places. With small populations come small tax bases from which small communities can draw to pay the costs of operating a water treatment plant. As the increasing level of treatment causes costs to increase, those same small communities struggle to find funding. It becomes an unfortunate possibility that a community may have to take the risk of utilizing water that may not be adequately treated to prevent illness and the spread of waste-borne diseases.

The CCHD and MCBH are charged with locating and monitoring repairs to septic systems. However, the sheer number of systems far outweighs the manpower available to these agencies. Consequently, regular monitoring of septic systems is rarely completed. In the majority of cases, failed systems are only identified when citizens contact the agencies to report the possible presence of a failed system. In these cases the nuisance septic complaints are investigated. If the system is failing, the system's owner is informed of his responsibility to repair the system along with any options which may be available to assist them in completing a repair or replacement. The common problem with FSS, aside form the water pollution they generate, is the cost associated with repairs or replacement. A septic repair can cost several thousand dollars, and replacement of systems can cost as much as $12,000. Because of the substantial cost, many home and property owners that may have failed systems will not repair the system. Since the likelihood of the failed or failing system being reported to the health department or being discovered by a sanitarian is quite low, they will take the risk of not properly repairing the system in lieu of assuming the high cost of the repair.

It is also generally the case that households or properties where systems are failed and not repaired are low-income families or elderly individuals on fixed incomes. The health departments have difficulty with handling such cases. Health departments have the authority to fine a property owner that is polluting land or water resources. However, it does little good for the agency to fine a property owner that cannot afford to repair a failed system, let alone pay the additional cost of a fine.

As enforcement agencies, the MCBH and CCHD do not offer financial assistance to households in need of septic repairs or replacement. If a property owner is found to have a FSS, the MCBH and CCHD agents will inform the property owner of opportunities for financial assistance, such as CHIP grants and revolving loan funds through the counties, low interest loans through Ohio EPA approved lenders, and USDA assistance programs. For cases in which the property owner does not comply with the county's order to repair the FSS, the CCHD or the MCBH may take the property owner to court. In terms of public relations, it is not in the best interest of the county agencies to take property owners to court. However, the CCHD and MCBH must act in the best interest of county residents by eliminating threats to the residents' health and safety.

**II. Illicit Dumps**

The steep valleys and hillsides in the LBC watershed have provided ideal places for illicit dumping of garbage. Isolated areas on back roads are common locations for locals to dump garbage, appliances, tires, furniture and other miscellaneous trash. At this time, the lack of land use regulations and an enforcement presence means there is no way to prevent illicit dumping. The most notorious illicit dump is located along a hillside within a portion of the stream that is designated as a Scenic River. The location is commonly known as Grimms Bridge. At the far southeastern corner of the LBC watershed in St. Clair Township, Columbiana County, in an isolated and sparsely populated area, a steel bridge known as Grimms Bridge crosses the LBC. Grimms Bridge Road then travels north along the eastern bank of LBC and then ascends the steep hillside before making a turn to head east into Pennsylvania. It is along this ascending portion of the road that tremendous volumes of trash have been dumped from the road down the hillside toward the creek. The hillside is very steep and some of the trash actually travels down the wooded hillside several hundred feet and ends up in the creek. Several clean-up days have been held to remove the garbage. And despite many hours of collecting and removing the garbage, the dumping continues to occur.

In cases such as this, the only chance of preventing further illicit dumping is for the CCHD, township police or county sheriff to catch the perpetrator in the act. Limitations in personnel and capital for these agencies prevent them from taking on the task of frequently monitoring the common dump sites. Again, unfortunately, the lack of land use or zoning regulations prevents township or county agencies from preventing illicit dumping. Many private landowners simply dump their garbage onto the back of their properties, which in some cases means trash is dumped into the LBC floodplain or into the creek itself.

However, whether illicit dumping of trash has a negative effect on WQ has yet to be determined. Obviously, if the materials being dumped are considered hazardous, then there is a negative impact. But, in the absence of hazardous materials, the illicit dumps have more of a negative impact on the aesthetics of the area than they do on WQ. Although illicit dumps are not necessarily considered common sources of NPS pollution, a management strategy for illicit dumps will be included in this action plan.

**III. Agriculture**

As discussed in previous sections, the dominant land use throughout the LBC watershed has historically been and continues to be agriculture in the form of livestock, pasture, hay and wheat fields and row crops, which occupies 46.9% (about 152,000 acres) of land within the LBC watershed in Ohio. With such a high percentage of the watershed's acreage being used for various forms or agriculture, it is not difficult to realize that agriculture is the predominant contributor of NPS pollution in the LBC watershed. Agriculture is evenly divided into two primary practices; crop production and livestock. The crops most commonly produced in the watershed area are corn, soybeans, wheat and oats. In regard to livestock farming, dairy cattle, beef cattle and horses are the most common. The rugged and picturesque landscape of the LBC watershed has made it a very popular location for horse-back riding. Riding trails pass through the many forested gorges and valleys in private and public park lands. Due to the popularity of horse-back riding in the watershed, there are many horse boarding stables and farms, especially in the MF and NF watersheds, where the trails are more prevalent. And along with the livestock are the fields used for growing hay and feed grains for those livestock. The negative impacts to WQ as a result of agriculture are discussed in more detail in two sections; crop production pollution and livestock pollution.

### *A. Crop Production Pollution*

#### i. Soil Erosion

Farming has long been the backbone of the economy within the LBC watershed and the surrounding region. Despite a slow but steady decline in cropland and overall production over the last twenty-five years (1.5% loss since 1980), crop production continues to occupy the majority of land in agriculture. As mentioned in Chapter 1, Section II, Part F, Sub-part ii, the USDA and CSWCD have successfully introduced a conservation-tillage program in Columbiana County, which has made progress in informing local farmers of conservation-tillage practices and its benefits to both land and water.

Despite the successes of conservation-tillage programs, the vast majority of crop farming continues to be carried out through the traditional deep-till method carried out in the early-spring. This method brings sub-surface soils to the soil surface so that trapped organic materials and essential minerals are more accessible to the planted crops. However, this method is highly invasive and the soil becomes very loose and becomes more easily eroded by precipitation and snow and ice melts. The eroding soils are washed into field drains which lead to tributaries of LBC. This soil becomes suspended in stream waters which increases turbidity. The turbidity increase can and does have significant negative impacts on sensitive species of aquatic biota, such as fishes, amphibians and macroinvertebrates. Soil erosion is a natural process and most certainly occurs in undisturbed, natural areas. It is impossible to prevent all soil erosion, and aquatic species are accustomed to periodic influxes of turbidity during more significant precipitation events. However, the annual tilling of soils results in measurable increases in the volume of soil eroded each year, a volume which reaches LBC tributaries and main branches. Specific soil erosion data is not available for the LBC watershed. However, according to the USDA NRI, cropland has an average annual soil loss of 4.6 tons per acre farmed. Based on this average, crop production in the LBC watershed results in soil losses in excess of 800,000 tons per year.

Aquatic organisms which respire using gills, such as fishes and aquatic insects, and those that filter feed, such as mussels, suffer significantly from this increased turbidity. Ultimately, they die or are forced to relocate in an attempt to find more desirable habitat. Submerged aquatic vegetation is also heavily impacted by increased turbidity, which reduces the amount of solar energy that can penetrate the water and reach the submerged plants. The loss of energy input causes the submerged plants to die or causes submerged plant beds to decrease in size. The loss of this aquatic vegetation results in the loss of habitat for aquatic species and, equally important, results in a substantial reduction of DO and an increase in $CO_2$ in the water, since plants serve to absorb $CO_2$ from the water and release $O_2$ back into the water through respiration.

Excessive soil erosion has the potential to affect human interests as well. During significant precipitation, eroded soil settles out of the water column in slower moving areas and is deposited in these areas, such as at the inflow to culverts and bridge abutments. The soil can clog these openings, resulting in pooling and a back-up of water which can then flood roads and other stream crossings. The additional stress placed on these structures by the pooling water can lead to their failure. The deposition of eroded soil within the stream channel can force flowing water to alter its course, which can potentially endanger buildings and infrastructure. Also, the deposition of eroded soil along stream banks can entrench or further channelize the stream. This entrenchment confines flowing water and, especially during flood events, causes the flowing water to gain velocity. As the water gains velocity, it further erodes the stream bank as it moves, particularly on sharp bends in sinuous streams. Therefore, excessive soil erosion in headwater and upstream areas has the potential to cause continual soil and streambank erosion downstream. Once excessive soil erosion is allowed to begin, it becomes a self-compounding problem.

### ii. Fertilizers

It is well known that fertilizers are used by crop-producing farmers to enrich the soils, by adding phosphorous (P), nitrogen (N) and carbon (C), in which they are growing their crops. As with all other rural watersheds where agriculture is practiced, a combination of manufactured chemical fertilizers and natural fertilizers (e.g. manure) are spread onto crop fields in preparation for the growing season. This preparatory spreading of fertilizers may take place on a daily basis for several months. This additional spreading is done to offset the amount of fertilizer which is washed off of the fields from snow and ice melts and rainfalls.

Farmers who prefer to use manure as a fertilizer face the issue of having to store the manure before using it. This is referred to as silage. As the manure sits, it begins to rot. If the manure sits for too long, the organic material is broken down and consumed by fungi and bacteria and other "decomposers". The longer the manure rots, more and more nutrients are extracted by the decomposers and it provides less organic enrichment. Farmers often attempt to spread the manure as early as possible in the spring so that the manure can release its nutrients into the soil as it rots. If the silage has sat for an extended period of time and may soon be ineffective, some farmers will spread the manure even if snow or ice still lies on their fields in late winter or early spring. Farmers who use chemical fertilizers sometimes may also spread them while snow and ice are still present on the fields. Farmers who practice this early fertilizing believe that they are allowing the soil to become more thoroughly enriched because the fertilizer has a longer time to penetrate deeper into the soil.

These fertilizers, regardless of their origin, are often washed from fields during spring rainfalls and snow and ice melts and are then deposited into streams. The bounty of nutrients from these fertilizers will generate algal blooms even while surface water temperatures remain near freezing. The algal blooms will intensify as water temperatures increase. The explosion of algal growth is most evident in stream stagnant pools and oxbows and other slackwater areas, where the combination of nutrient enrichment, plentiful sunlight, and minimal water flow allows the algae to form sizable "algal mats". These algal mats can be several inched thick, which will prevent sunlight and oxygen from reaching the benthos and the lower strata of the water column. As the algal mat continues to grow and thicken, the underside will die off from the lack of sunlight and oxygen. As the dead algal material settles to the stream bed, it is decomposed by bacteria, fungi and molds. The decomposition process requires respiration, which in turn requires $O_2$. Therefore, as the dead algae are decomposed, available $O_2$ is consumed. In stagnant pools where no surface mixing occurs, $O_2$ is not added back into the water. This creates anoxic conditions, or streams reaches in where very little to no oxygen is present. These anoxic areas are often referred to as “dead zones” because, due to the extreme lack of oxygen, no aquatic macroorganisms (i.e. insects, fishes, plants, mollusks, amphibians) can exist in such conditions. As greater quantities of fertilizers are washed into streams, the cumulative effects extend further downstream until significant stream reaches may become devoid of “desirable” aquatic organisms.

### iii. Pesticides

Along with fertilizers used to enhance crop growth, farmers following traditional methods may apply chemical pesticides to prevent crop loss to rodent and insect pests. If left unchecked, herbivorous pests can cause tremendous damage to crops, which in turn means heavy financial losses for farmers and the agricultural community. Despite the current developing trend of organic farming, whereby chemical fertilizers and pesticides are not used, most farmers prefer to continue to use pesticides so their annual crop yields will remain high and profitable. Since organic farmers do not use pesticides, a percentage of their crop is lost to pests. The smaller crop yields by organic farms causes the market prices of their produce to be markedly higher than those grown using traditional farming practices. Within the LBC watershed, about 95% of crop farming is done using traditional methods, which include the use of pesticides which may be applied several times throughout each growing season. Some farmers have decided to use biodegradable pesticides, typically composed of soaps combined with mild acids or ammonia. Although these forms of pesticides are more “environmentally-friendly”, overuse or misapplication can still have negative impacts on the surface waters.

The technology and application techniques for pesticides have improved significantly in recent decades. Unfortunately, the current standards for pesticide production and use have largely been dictated by lessons learned in the past. The most well-known example of misuse of chemical pesticides is detailed in Rachel Carson’s book “Silent Spring” (1962, 2002). The book explains how the overuse of the pesticide DDT in California to control herbivorous insects resulted in massive die-offs of birds. Insectivorous birds consumed insects which had been subjected to DDT. The insectivorous birds began to accumulate DDT in their tissues, a process known as bioaccumulation. The insectivorous birds began to die from the effects of the DDT. However, predatory birds that preyed on the insectivorous birds also bioaccumulated DDT from consuming the tainted flesh of the insectivorous birds.  Aside from the immediate die-offs of the birds, many of the populations of the local bird species experienced extremely low birth rates and a significant increase in birth defects. The effects of the DDT exposure lasted several years. Although the case presented in “Silent Spring” is not an example of how an aquatic system may be affected by pesticides, a strong case can be made for the possible ramifications of misuse of pesticides or how an improper understanding of the possible side-effects of pesticides can have drastically negative impacts on a natural system. Pesticides that run off into streams can be actively or passively ingested by aquatic organisms, and may become embedded in the stream sediments. Through direct contact with the sediment and through bioaccumulation, the effects of the pesticides can potentially follow the exact path as that described in “Silent Spring”.

A more immediate example of the effects of pesticides is presence of the chemical pesticide mirex in the LBC watershed. As already briefly discussed in Chapter 1, Section II, Part F, the Nease Chemical Company manufactured the chemical pesticide mirex at a plant in the city of Salem. The plant was located in the primary headwaters of the MF watershed. The Salem plant was the site of many illegal discharges of untreated plant waste and improper on-site storage of chemicals. The following is a narrative on Nease Chemical published in the Federal Register on September 8, 1983:

> *Conditions at listing (December, 1982): The Nease Chemical Site occupies 20 acres in Salem, Columbiana County, Ohio. It manufactured chemicals such as pesticides and fire retardants from 1961 until 1973, when the State of Ohio closed it because it discharged wastewater illegally. While the plant was operating, process of wastes were put into drums, which were buried on site. Also, wastes were put into unlined lagoons as part of wastewater treatment. The drums are leaking, and the lagoons are leaching. An on-site well and leachate from the lagoon contain organic compounds, including chlorinated organics.*

As a result of the mirex contamination of the MF of LBC, the ODH has maintained contact advisories for over two decades and the Ohio EPA maintains fish consumption advisories, recommending that common carp *(Cyprinus carpio)* and catfishes (*Ameiurus sp., Ictalurus sp.)* not be consumed at all. As of the time of this document, the ODH is planning to reassess the level of the mirex contamination and thereby apply an updated advisory. However, the current contact advisory recommends that there be no unnecessary contact with stream sediments from the origin of the mirex leak (northwest of the city of Salem) to the point at which the MF passes under SR 11 east of the village of Lisbon, a distance of approximately 22 miles.

The mirex in the MF of LBC is a point-source pollutant, and this WAP, which was developed under a Clean Water Act §319 NPS Pollution Grant, is not intended to plan for remediating the mirex contamination. However, the point of how pesticides can affect a watershed directly applies to this plan. Currently, there are no accurate figures for the volume of pesticides which are applied within the LBC watershed since applications and pesticide types vary from farm to farm. The number of applications will increase in “wet” years and decrease in “dry” years.

### *B. Livestock Pollution*

Within the LBC watershed, dairy and beef cattle and horses utilize tens of thousands of acres of agricultural pastureland for grazing and exercise. The land on which they trod receives a great deal of abuse. Areas where the animals frequently walk and graze are disturbed to the point that vegetation, even grass, does not grow. This exposed soil is highly erosive and washes into streams channels during precipitation events and snow and ice melts.

Streams pass through the majority of grazing pastures to provide water for livestock. The grazing livestock usually have unrestricted access to the stream. The hooves of the livestock cause extensive damage the stream banks and channels, which further contribute to erosive damage and instability of the stream.

In addition to soil and stream damage caused by livestock, the manure left in the fields and feces defecated directly into the streams contribute considerably to nutrient enrichment, similar to the effects of FSS.

***Figure 3:*** *Typical soil erosion pattern in streams which pass through pastures.*

Livestock pollution, as briefly described above, is one contributor to sediment loading and nutrient enrichment within the LBC watershed. Further details of how the presence of livestock increases NPS pollution are included in the appropriate following sections.

**IV. Soil & Sediment Loading**

Chapter 2, Section III, Part A, Sub-part i began to discuss the likely effects of excessive soil and sediment deposition in streams and waterways. In summary, eroding soils washed into field drains and streams become suspended in the waterway, which increases turbidity (*Figure 3*). Turbidity is measured and quantified as TSS. Elevated TSS impacts sensitive aquatic biota, such as plants, fishes, amphibians and macroinvertebrates. Prolonged periods of very high TSS concentrations can be fatal to aquatic organisms (Newcombe and Jensen, 1996). Aquatic organisms that breathe through gills, such as fishes and aquatic insects, and those that filter feed, such as mussels, suffer significantly from this increased turbidity. Submerged aquatic vegetation is impacted by the reduction of solar radiation which can penetrate the water column as a result of the reflectivity of the suspended sediment. The loss of energy input causes the submerged plants and plant beds to die off. The reduction in aquatic vegetation means there is a loss of habitat for aquatic species and a loss of $CO_2$ absorption and $O_2$ production in the aquatic environment. As TSS settles to the bottom of a stream, critical habitats such as spawning sites and macroinvertebrate habitats can be covered in sediment. This is referred to as siltation. Excess sediment in a stream bottom can reduce dissolved oxygen concentrations in stream bottom substrates, and it can reduce the quality and quantity of habitats for aquatic organisms (Ohio EPA, 2005).

Excessive soil erosion affects human interests. Eroded soil settles out of the water and is deposited in areas of reduced flow, particularly at culvert inlets and bridge abutments. The soil blocks these openings, causing flooding of roads and stream crossings, which can also facilitate the failure of such structures. Deposition of eroded soil along stream banks can entrench or channelize a stream. The entrenchment causes the velocity of flow to increase which further erodes the stream bank.

Soil erosion rates vary greatly, depending on the land use for a given acreage. Soil erosion is a natural process which does occur in the absence of human encroachment or development. Based in USDA NRI figures, forests and woodlots have an average annual rate of soil loss of less than one ton per acre (<1.0 ton/acre/year). As one might expect, the "forestland" has the lowest annual soil loss rate of all classes of land uses. Pastureland has an average annual rate of soil loss of about one ton per acre (1.0 ton/acre/year). The presence of grasses and other herbaceous plants on the pastureland help to bind the soil in place with their roots, thus reducing soil less. However, as the plants die from disproportionate grazing damage or from being trampled by livestock, they die and no are longer functional in soil stabilization. As previously discussed, cropland has an average annual rate of soil loss rate of 4.6 tons per acre (4.6 tons/acre/year). The consistent tilling of land for crop planting causes a marked increase in soil loss, as the soil is only bound by the roots of plants for a portion of the growing season. The greatest source of soil erosion is urban land. Specific annual rates of soil loss are not available for all of the possible land uses which may occur in urban and suburban areas. However, the USDA NRI has measured soil loss rates as high as 200 tons per acre (200 tons/acre/year) in areas where prolonged development and construction occurs.

Soil loss rates in the LBC watershed meet and in some cases exceed these USDA estimates. The topographical nature of the watershed unfortunately lends itself to above-normal rates of erosion. However, by not having specific figures for the LBC watershed, a purposefully overestimated loss rate would be highly inaccurate and unreliable. A reliable estimate for the total annual soil lost within the LBC watershed can be calculated using the following figures:

| | |
|---|---|
| *Urban* = 12, 937 *acres x* 3 *tons/acre/year (soil loss)* = | 38,811 tons |
| *Cropland* = 42, 792 *ac x* 4.6 *t/ac/yr* = | 196, 843 tons |
| *Pastureland* = 108, 768 *ac x* 1.0 *t/ac/yr* = | 108,768 tons |
| *Forest* = 151,800 *ac x* 0.5 *t/ac/yr* = | 75,900 tons |
| ***Total annual soil loss for LBC watershed (est.) =*** | ***420,322 tons*** |

The figure above (i.e. 1,675, 211 tons) represents an estimate of soil loss which attempts to account for the variation of soil loss rates within each category (i.e. urban, cropland, pastureland, forest). For instance, the 200 tons-per-acre estimated rate of soil loss for urban areas is for construction sites. All urban areas are not under construction. Therefore, to calculate soil loss for all urban areas using the 200 tons-per-acre figure would return highly unreliable results. This similarly applies to the forest area figure. The USDA estimate is non-specific. So to return a more realistic figure for soil loss, the approximate rate was cut in half. The estimated soil loss rate for the LBC watershed of 1,675, 211 tons per year is a median estimate, not an overestimated or underestimated loss rate.

### V. Nutrient Enrichment

Nutrients generally do not pose a direct threat to the designated uses of a waterbody. However, excess nutrients can cause an undesirable abundance of plant and algae growth and this process is called eutrophication (*Figure 4*). One possible effect is low dissolved oxygen concentrations caused by excessive plant respiration and/or decay. Aquatic organisms need oxygen to live and they can experience lowered reproduction rates and mortality with lowered dissolved oxygen concentrations. Excessive plant growth caused by eutrophication can also increase the pH of water due to alteration of the carbonic acid-carbonate balance. Because plants and algae provide food and habitat to animals, changing the relative abundance of these primary producers can affect the composition and diversity of the animal community, resulting in loss of biotic integrity as measured by Ohio EPA using the fish IBI and benthic macroinvertebrate ICI. Eutrophication also interferes with recreational and aesthetic enjoyment of water resources, and may impart taste and odor to public drinking waters. The negative economic implications of eutrophication caused by release of excessive nutrients to waters can be significant for many communities (Ohio EPA, 2005).

***Figure 4:*** *Algal bloom resulting from an unknown source of nutrient enrichment.*

The most common sources of nutrient enrichment in the LBC watershed are human and animal waste. Human waste finds its way into the watershed's surface and ground waters through discharges from FSS and undertreated effluent from wastewater treatment plants. As previously discussed in Chapter 2, Section I, there are an estimated 1,500 FSS in the LBC watershed. FSS will have the greatest negative impact in areas where there is a concentration of failed systems. In these areas, the added nutrients cannot be processed quickly enough by aquatic microorganisms and plants, and therefore the remaining nutrients will continue to move downstream and spread the effect.

In Chapter 2, Section III, Parts A and B, the effects of nutrient enrichment from manure used as fertilizer and animal waste being deposited into waterways have been discussed. Refer to these sections of the plan for a review of these NPS pollutants.

The pollution potential of chemical fertilizers as contributors to nutrient enrichment from crop farming has been discussed in Chapter 2, Section III, Part A, Sub-section ii. However, a common source of nutrient-enriching fertilizers is residences, in both rural and urban areas.

Within the LBC watershed, as within all other watersheds, its residents enjoy having densely green lawns, full flower beds, big vegetables and picture-perfect landscaping. This is typically achieved in part through the application of fertilizer and plant food products from greenhouses, garden centers and many other vendors. It is very difficult to assess the volume of fertilizer that is used across the entire watershed. Some homeowners regularly use them, some occasionally, and some not at all. If used properly in accordance with the manufacturers' instructions, these fertilizers should not contribute to nutrient enrichment through rainwater runoff during times of year when the fertilizers are typically applied. Yet, it is not uncommon for some individuals to ignore the application instructions.

The idea of "more is better" is hard to ignore. Thereby, some homeowners apply fertilizers in greater concentrations per area or apply the fertilizers more often than necessary, assuming that the extra nutrients will result in greener grass or fuller vegetable gardens. It is important that fertilizers be used in the correct concentrations and at the correct times to prevent an excess of nutrients that can potentially become NPS pollution.

As previously discussed, human waste can contribute to nutrient enrichment through FSS. In addition, human waste can reach the streams of the LBC watershed as untreated and insufficiently treated sewage. Wastewater treatment plants and sewage are classified as PS pollutants. In order for a municipality, plant or any other location to legally operate a wastewater treatment facility, it must acquire a NPDES permit through the Ohio EPA and US EPA.

There are no current storm water Phase II cities in the Little Beaver Creek watershed, although Ohio EPA is now reviewing whether the city of Salem should be designated a Phase II community under Appendix 7 wording of the Phase II NPDES storm water regulations. The only CSO community in the watershed is the village of Lisbon and the city is working with Ohio EPA to prepare a long-term control plan. There are sixteen NPDES permitted facilities with design flows greater than 16,000 gallons per day in the LBC watershed. All of these facilities are presented in *Table 5*. There are also some smaller facilities under NPDES permit as well as numerous on-lot dissipation systems approved by Ohio EPA (Ohio EPA, 2005). The pollution potential from NPDES-permitted locations will be managed through implementation of management strategies developed under the LBC TMDL study.

Several streams in the LBC watershed are listed as being impaired due to organic nutrient enrichment and low dissolved oxygen concentrations. These streams are the East Branch of MF, the upstream segment of the Brush Creek, Longs Run, and Honey Creek (*Map*

*19*). These impairments are believed to largely result from elevated nutrient concentrations contributing to excessive algal growth and therefore large swings in dissolved oxygen concentrations (Ohio EPA, 2005). Proper control and management of the nutrient enrichment which affects these specific streams and other non-specified streams will require the joint application of this LBC WAP and the LBC TMDL plan developed by Ohio EPA.

***Table 5:*** *NPDES permits for significant wastewater discharges within the LBC watershed.*

| OHIO EPA NPDES ID | US EPA NPDES ID | Facility Name | Design Flow (million gallons per day) | Receiving Stream |
|---|---|---|---|---|
| 3BP00017 | OH0021652 | Leetonia STP | 0.340 | East Branch |
| 3BP00059 | OH0026735 | New Waterford WWTP | 0.130 | Bull Creek |
| 3PD00027 | OH0027324 | Salem STP | 4.000 | Middle Fork Little Beaver Creek |
| 3PK00016 | OH0122084 | Columbiana County Elkton WWTP | 1.143 | Middle Fork Little Beaver Creek |
| 3PH00043 | OH0063681 | Guilford Lake WWTP | 0.400 | West Fork Little Beaver Creek |
| 3PB00051 | OH0028011 | Village of Washingtonville | 0.120 | Cherry Valley Run |
| 3PB00042 | OHL021784 | City of East Palestine | 1.400 | Leslie Run |
| 3PH00016 | OH0037273 | New Middletown WWTP | 0.550 | Honey Creek |
| 3PT00059 | N/A | Crestview Schools | 0.030 | Little Bull Creek |
| 3PV00018 | N/A | Colonial Villa Mobile Home Park | 0.0475 | Middle Fork Little Beaver Creek |
| 3PR00346 | N/A | Chaparral Family Campground | 0.035 | Tributary to Middle Fork Little Beaver Creek |
| 3PV00107 | N/A | Breezeway Mobile Manor | 0.020 | Little Beaver Creek |
| 3PV00024 | N/A | Echo Dell Mobile Home Park | 0.025 | Little Beaver Creek |
| 3PT00096 | N/A | Beaver Local High School | 0.016 | West Fork Little Beaver Creek |
| 3PR00352 | N/A | Stoneridge Terrace | 0.0175 | Cold Run |
| N/A | PA0090557 | Extendicare Health Facilities Inc. | N/A | Tributary of Painters Run |

## VI. Acid Mine Drainage

### *A. Bedrock Geology*

As indicated earlier in this report, the strata exposed in the LBC watershed belong to the Pennsylvanian System, which is divided in ascending stratigraphic order (oldest to youngest) into the Pottsville, Allegheny, Conemaugh and Monongahela Groups. Of these groups, the Pottsville, Allegheny and Conemaugh formations are exposed in Columbiana County and southern portions of Mahoning County.

The Pottsville formations are comprised of mostly interbedded shales, sandstones and siltstones along with economically important coals, underclays, and limestones. The Tionesta and Brookville clays are mined more commonly in the northern portion of the watershed and at the base of steeply entrenched streams in the southern portion of the watershed.

The dominant units of the Allegheny group are widespread throughout the watershed and are comprised of shales, sandstones, as well as important beds of coal and limestone. Of particular importance are the Lower Kittanning (#5), Middle Kittanning (#6) and Upper Freeport (#7) coal seams. The Brookville (#4) coal seam is present, although is not marketed widely in the area. Rocks of the Conemaugh formation are found along hilltops throughout the southern portion of the watershed, of which the Mahoning Coal (#7A) is the only important seam mined. Limestone units exist throughout, although are generally too thin to be marketable.

### *B. Mining History*

Coal was used primarily by various industries in the 1920's although mining of coal in Ohio began as early as the mid-1800's. Other uses of coal at the turn of century included private homes and railroads. By the 1940's about half of the coal used in the United States was used by the power industries. Clays that underlie several of the coal seams were typically removed and used for general refractory purposes.

Several different types of mining techniques were used in the LBC watershed. Earlier mining included various forms of underground mining that includes *drift* or *slope* mining. In this mining, a tunnel is driven into the side of the hill at a coal outcrop. The coal is then mined out by following the contour of the bed. In *shaft* mining, a vertical opening is driven into the coal seam. The mining then proceeds along the coal seam with excessive depth, whereby increasing hazards associated with entries, exists and ventilation *(ILGARD, AMDAT for Moxahala Creek Watershed, 2005)*.

These forms of mining techniques dominated prior to the 1940's until *strip*, or *surface* mining was introduced and became more common. Large earth moving equipment and techniques were introduced that had the capacity to move large amount of earth very quickly. During strip mining, soil and rock overburden is removed and the coal is taken out before the overburden is replaced. Occasionally *auger* mining may accompany strip mining by drilling auger holes from the last contour cut and extracting the coal in the same manner that shavings are produced by a carpenter's drill bit. Auger mining allows additional coal to be removed at a limited depth from behind the highwall after contour mining is complete. In many instance, auger mining is utilized for economic reasons where overburden height becomes problem some or cost-prohibitive.

Surface mine operators were not required to restore disturbed mined lands prior to the federal legislation of the Surface Mining Control and Reclamation Act (SMCRA) of 1977. SMCRA ensures that coal mines are operated in a manner that protects citizens and the environment during mining and assures that the land is restored to beneficial use following mining. As a result, water collected in unreclaimed underground mine voids and open surface impoundments discharge directly to streams or as seepage through mine spoils. Abandoned surface mines leave highly erodible land that has been exposed to the elements, in addition to mine refuse which is high in pyritic minerals. These abandoned mine lands contribute sediment, metals, and acidity to the watershed drainage area. The presence of these pollutants in streams, which originate from mine discharge, are most often observed as a rust-colored precipitate, often called "yellow boy, caused by bacteria which oxidize the iron (Fe) in the stream, or by the presence of a white precipitate and milky-colored water, which are results of an overabundance of aluminum (Al) in the stream.

AMD is formed when pyritic material (coal) and other rocks are exposed to oxygen and water. The oxidation of pyritic minerals result in the formation of sulfuric acid and metal hydroxides. As this acid passes over different rock strata surrounding the pyritic materials, metals, including iron, manganese, and aluminum are dissolved resulting in AMD. *(Rice, Hoy, et.al. AMDAT Headwaters of the Raccoon Creek Watershed, 2002)*

### *C. Hydrogeology and Metal Trends*

AMD can be categorized as having one or many of four major components: high acidity (low pH), high metals concentrations, elevated sulfate levels, and excessive suspended solids and/or siltation. The marine shales and sandstones of the Allegheny formation contain more iron and manganese than other formations *(Razem and Sedam, 1985).* WQ criteria limits that may indicate impact or influence from mine drainage are illustrated in *Table 6*.

AMD has the capability to effect many different aspects of a stream's biological and ecological integrity. AMD may impact, or contaminate streams in many different ways. With respect to chemical impacts, most organisms have a well-defined range of pH tolerance. If pH falls below a certain range, death can occur due to respiratory or osmoregulatory failure. Low pH also causes a loss of sodium ions from the blood and a loss of oxygen in the tissues and ultimately affects gill function. Studies have indicated that a pH of 4.5 has accounted for complete loss of fish in 90% of streams examined. *(Gannett-Fleming Assoc, Huff Run AMDAT, 2000).*

***Table 6:*** *Ohio DNR-MRM water quality criteria limits.*

| WQ Parameter | Criteria Limit |
|---|---|
| pH | < 6 |
| Alkalinity | <20 mg/l |
| Iron | > 0.5 mg/l |
| Manganese | >0.5 mg/l |
| Sulfate | >74 mg/l |
| Aluminum | 0.3 mg/l |
| Conductivity | >800 ms/cm |

The pH tolerance level of aquatic organisms generally tends to decrease as the concentration of dissolved metals increases, particularly dissolved iron and aluminum concentrations. Elevated aluminum and iron concentrations can affect both WQ and suitability of physical habitat. Aluminum and iron can be found in a dissolved or in a precipitated form. In the dissolved form, the metals can act as metabolic poisons, mainly by reducing aquatic life pH tolerance levels, increasing carbon dioxide tensions, and decreasing oxygen availability as they form precipitates. Once the metals are in the precipitated form, they may coat gills and body surfaces, smother eggs, and cover the stream bottom, filling in crevices and rocks. The scouring of the precipitate also increases turbidity, which may inhibit fish feeding *(Earle, 1998)*.

Of the two major metals present in mine drainage, aluminum has the most severe adverse effects on stream aquatic life. Aluminum rarely occurs naturally in water at concentrations greater than a few milligrams per liter. The addition of aluminum ions compounds the effect of low pH. Dissolved aluminum is most toxic to fish at a pH between 5.2 and 5.4, and least soluble between pH of 5.7 and 6.2. Precipitated aluminum coats the stream substrate, causing slippery surfaces and making it difficult for insects to maintain position in the current. The deposition of aluminum hydroxides on macroinvertebrates blocks surfaces important for respiratory or osmoregulatory exchanges and accumulates on fish gills which interferes with their breathing. Aluminum precipitates also significantly eliminate most of the filter feeders, which normally comprise a major portion of total stream macroinvertebrates *(Earle, 1998).*

**VII. Urbanization**

The development of rural or forested lands for the purpose of creating residential, commercial and/or other populated places is generally what defines urbanization. This is often also referred to as "urban sprawl" or simply "sprawl". These secondary terms reference the outwardly-radiating expanding growth of urban or populated areas from previously existing population centers. The topic of urbanization has become a topic of great interest in recent decades due to common trends occurring in cities throughout the United States, and the world for that matter. In recent decades, many of the people who comprised the populations of cities, large and small, have left the confines of more centralized and condensed areas, opting for suburban neighborhoods and residential communities. Rather than living in apartments and row houses common in many older cities, suburban residences typically have larger home structures as well as yards and surrounding property. A household (e.g. house, yard and surrounding property) in a suburban community occupies much more land area than a similar household in a concentrated urban environment. Therefore, as suburban communities develop and populations spread out, large amounts of land are impacted, with significant tracts of forested, wetland and shrubland habitat begin eliminated.

The process of urbanization is responsible for the increase of several NPS pollutants. During the construction phase, soil erosion and sedimentation can be extremely high, as discussed in Chapter 2, Section IV, if proper erosion control methods are not followed. Construction most often requires the clearing of land by removing trees, shrubs and other vegetation. Plant roots bind and hold soil, thus preventing soil erosion. When vegetation is removed for construction, the roots are removed as well, thus eliminating the natural mechanism which serves to prevent soil erosion.

An indirect affect of urbanization is an increase of chemical pollution. With increased numbers of households with yards to maintain, greater volumes of fertilizers and pesticides are used for lawn and garden maintenance. Even if these non-industrial fertilizers and pesticides are used properly in accordance to manufacturer's directions, the net volume of these chemicals is significantly increased.

In recent years, much attention has been shifted to a specific aspect of urbanization, impervious surfaces, that is becoming more and more significant. Impervious surfaces are surfaces that do not absorb water but rather shed it rapidly. Common examples of impervious surfaces in urban and suburban areas are roads, sidewalks, parking lots, driveways and roofs of houses and buildings. Since these surfaces do not absorb water from precipitation, they drastically increase surface runoff during rain and snow melts. This runoff can carry oil, propylene glycol (i.e. antifreeze/coolant), and grease from vehicles, road salt in the winter, misapplied pesticides and fertilizers from residences, and many other pollutants. There are countless numbers of potential pollutants that can be carried into surface waters by impervious surfaces. For example, an incidental side effect of impervious surfaces is the proliferation of the effects from acid rain. When acid rain falls to earth and reaches, for example, a parking lot, that acid rain is channeled to a storm sewer which eventually leads the run off to a surface water body, such as a stream, river, lake or pond. The presence of impervious surfaces eliminates the soil and plants that would normally absorb the acid component of the rain and prevent it from reaching the surface water.

In regard to the LBC watershed, it is difficult to estimate the percentage of land area which is covered by impervious surfaces. Analyses of impervious surfaces have been conducted for high-density population areas, such as Columbus and Cleveland in Ohio. However, due to the land use distribution within the LBC watershed, which is primarily wooded and agricultural, an analysis has not been completed. However, it can be said with certainty that the area of impervious surfaces has increased markedly in the last decade, as areas such as the cities of Columbiana, Salem, and Calcutta have continued to grow and expand. In comparison to more urbanized watersheds, the area of impervious surfaces in the LBC watershed is relatively low. However, as development continues throughout the watershed as it is planned to do, impervious surfaces will likely become a much more significant contributor of NPS pollution.

The ODOD maintains records of housing units in each county in Ohio by year. The data is not area specific, let alone watershed specific. However, the data does provide a framework within which urbanization can be characterized. Data is available from years 1990 to 2006. Yearly housing units numbers for 1990 and 2000 are taken directly from census data, while information for non-census years are estimates.

In 1990, Columbiana County had 44, 035 housing units. By 2000, housing units had increased by 4.6% to 46,083 housing units. The most recent data from 2006 estimates that

47,049 housing units now stand in Columbiana County. This represents a 2.1% increase since 2000. Columbiana County has experienced a cumulative 6.8% increase in housing units from 1990 to 2006.

In 1990, Mahoning County had 107,915 housing units. By 2000, housing units had increased by 3.6% to 111,762 housing units. The most recent data from 2006 estimates that 113,931 housing units now stand in Mahoning County. This represents a 1.9% increase since 2000. Mahoning County has experienced a cumulative 5.6% increase in housing units from 1990 to 2006.

In 1990, Carroll County had 11,536 housing units. By 2000, housing units had increased by 12.9% to 13,032 housing units. The most recent data from 2006 estimates that 13,081 housing units now stand in Carroll County. This represents a 0.4% increase since 2000. Carroll County has experienced a cumulative 13.3% increase in housing units from 1990 to 2006.

A total of 174,061 housing units exist in Mahoning, Columbiana, and Carroll Counties. Sixty-five percent (65%) of these housing units are in Mahoning County, with 27% of the housing units being located in Columbiana County, and 8% of the housing units being located in Carroll County.

Percentagewise, Carroll County has seen the largest development in terms of housing unit increases. Percentages are thereby misleading in regard to urbanization because Carroll County in the least populated county within which the LBC watershed is located. Carroll County has by far the fewest housing units of the three counties in the LBC watershed, and is therefore the least urbanized. Mahoning County has over 700% more housing units than Carroll County.

As previously discussed, the most significant area of development in the LBC watershed is the Columbiana-Mahoning County border area, which includes Columbiana Village and the City of Salem. Other primary areas of development are the area surrounding Guilford Lake in Hanover Township and in the Calcutta area in St. Clair Township, both of which are in Columbiana County. Although Mahoning County is the most developed county of the three counties in the LBC watershed, the main areas of development in Mahoning County are in adjacent watersheds to the north (e.g. Mill Creek, Yellow Creek, Meander Creek, all of which are part of the Mahoning River watershed (HUC 05030103)).

# CHAPTER 3

# NPS & Watershed Analyses

The following sections will describe specific analyses completed under the 2003 LBC watershed planning grant as well as the results from these analyses. These analyses were carried out to determine NPS hotspot areas to better determine locations for concentrating management efforts.

## I. Failed Septic Systems

### *A. Methods*

For the development of this action plan, data on FSS was sought from the MCBH and CCHD. The MCBH does not keep running records of FSS in the county. The general practice of the MCBH is to deal with individual FSS as they are identified. Therefore, a list of FSS locations is not available for Mahoning County. Approximations of FSS, pollution from FSS, and pollutant load reductions for the Mahoning County portion of the LBC watershed will have to be approximated.

The CCHD agreed to act as a project partner for the development of the LBC WAP and to share its information on nuisance septic systems. Over the two-year development period, the CCHD provided three periodic lists of nuisance septic complaints. These lists contained nuisance complaints from the entire county. Therefore, complaint locations not within the LBC watershed had to be excluded. For each case, if the determination was made by a CCHD sanitarian that the septic system had failed, it was included in a revised list. Complaint locations that were determined not be problematic systems were not included in the revised list.

A second method for acquiring information on nuisance septics was developed by the CCHD. Township road crews were asked to make note of any failed system they discovered while on a job site. Township Trustees boards from all Columbiana County townships were approached to ask their assistance and approval of this method of data collection. All of the thirteen townships agreed to have their road crews submit monthly reports of failed systems they encountered during a six month period, from May to October, 2004. Only two monthly report sheets were received from Perry Township. No further reports were received.

The goal of these data collections was not to identify every failed septic system within the LBC watershed in Columbiana County. This task was unrealistic for the CCHD to achieve over decades, so it was entirely unrealistic to expect to achieve this over a two-year planning period. The goal of this data collection was to obtain a representative sample of FSS.

### *B. Results*

A combined total of 155 (0.7%) of the estimated 23,000 septic systems in the LBC watershed in Columbiana County have been identified as failed systems (*Appendix G*). This sample is estimated to be one-tenth of the actual total number of failed systems, which would be approximately 1,500. The representative sample of 155 has assisted the LBCLF and the CCHD to identify hotspots for failed systems (*Map 20*). These areas will be targeted as locations to complete repairs to FSS in order to reduce the concentration of septic-based pollution, and thereby reduce the significant impact of localized groupings of failed systems. Based on the CCHD's recent records of positively identified FSS, the largest hotspots for FSS are in the greater Salem city area, the greater East Palestine city area, eastern Fairfield Township in the general area of Lower Elkton Road, southwest St. Clair Township in the Glenmoor area, and the northeast corner of Center Township along State Route 164. Several other locations have been identified by the CCHD sanitarians, but these locations are more widespread.

The management strategy for FSS is outlined in Chapter 4, Section I. During the process of developing the planning grant for this action plan, much emphasis was placed on locating and cataloguing FSS as it was assumed that failed systems were contributing extensive levels of NPS pollution. The initial results of this data collection suggest that, although FSS are contributing NPS pollution in the LBC watershed, they are not as widespread as previously assumed. However, the number of FSS identified is more likely to represent a sample of FSS within the watershed. Therefore, FSS as a NPS pollution source cannot be underestimated.

## II. Illicit Dumps

### *A. Methods*

To determine the locations of illicit, non-regulated and non-monitored dumps, a simple field survey was completed. Locations were investigated based on CCHD records, CCHD personnel recommendations and through responses from private citizens to published requests for information. Articles regarding NPS were printed in local newspapers to inform the public of general watershed issues. Amongst other things, the articles requested that any citizens living within the watershed who may have useful information to contact the Watershed Coordinator of the CCHD sanitarians. Members of the public responded by providing general locations of common dumping sites.

**Figure 5:** *Illicit dump along McCormick Run.*

### *B. Results*

Seven dumps were identified and confirmed (*Figure 5*, *Table 7*, *Map 21*). Several other small dumps were identified. However, most of these smaller dumps were not directly accessible without specific consent of the landowners, and landowners were not willing to allow access for this purpose. Therefore, the dumps identified were those which were visible and/or accessible from roadsides or stream banks.

**Table 7:** *Locations of illicit dumps in the LBC watershed.*

| ***Township*** | ***General location*** |
|---|---|
| Madison | Hellbender Bluff County Park |
| Madison | Leslie Road property now owned by LBCLF |
| St. Clair | Grimms Bridge Road |
| Unity | Jimtown; at the end of Jimtown Rd |
| Madison | Along McCormick Run Rd; just south of WF of LBC along trib |
| Unity | Bridge along State Line Road near East Palestine |
| Elk Run | Village of Rogers; south of Rogers Market grounds along SR 517 |
| St. Clair | Sprucevale Overlook in Beaver Creek State Park |

## III. Agriculture

### *A. Methods*

Due to the extensive amount of land within the LBC watershed being used for agriculture (152,000 acres), a complete and comprehensive analysis of each farm or analysis of each stream could not be completed in the short two-year term of the planning period of the grant which funded this plan. Therefore, information regarding all aspects of agricultural NPS pollution was acquired through the advisement of the USDA-NRCS District Conservationist which has jurisdiction over the LBC watershed. CSWCD personnel also contributed information as to areas of concern for agricultural pollution. Meetings were held to discuss specific NPS pollutants and the areas where these pollutants have the most impact or impact potential. The agricultural NPS hotspots are generalized, as the sources of the pollutants cannot always be pinpointed.

### *B. Results*

The areas of greatest concern for crop production pollution are: (1), the west-central portion of the WF watershed surrounding Guilford Lake; (2), the area between the villages of Lisbon and Leetonia, centered around Adams Road; (3), Green and Goshen Townships north of the city of Salem; (4), Springfield Township around Honey Creek; (5), Middleton and Unity Townships from just north of Lake Tomahawk to northeast of the village of New Waterford (*Map 22a*).

The areas of greatest concern for livestock-induced pollution are: (1), the northern portion of the WF watershed surrounding Guilford Lake; (2), the area between the villages of Lisbon and Leetonia, centered around Adams Road; (3), Springfield Township around Honey Creek; (4), the region surrounding Beaver Creek State Park in Middleton, St. Clair, Madison and Elkrun Townships (*Map 22b*).

## IV. Soil & Sediment Loading

### *A. Methods*

As with the hotspot locations for agricultural NPS, areas of concern in regard to soil and sediment loading were evaluated primarily through recommendations made by the local USDA-NRCS District Conservationist and CSWCD personnel. Areas with persistent soil erosion and sediment deposition were recorded and verified through further discussion and field reviews. The soil and sediment pollution hotspots are defined by the general area where locations of elevated soil erosion and sediment loading are concentrated.

### *B. Results*

Hotspots for soil and sediment loading are: (1) Goshen and Green Townships, north of the city of Salem; (2), eastern Butler Township in the Guilford Lake area and the headwater area of Cold Run; (3), northern Franklin and Wayne Townships; (4), north of the village of Lisbon in the area of Mill Site Creek; (5), central Fairfield Township in the headwater areas of Elk Run and Little Bull Creek and south to the MF of LBC; (6), Springfield Township in the area of Honey Creek and NF of LBC headwaters; (7), Unity Township in the areas around the city of

East Palestine; (8), west of the village of Columbiana; (9), northern St. Clair Township in and around Beaver Creek State Park (*Map 23*).

These soil and sediment loading hotspots are largely attributable to agricultural practices, both crop- and livestock-related. One can easily see the similarity of the hotspot locations when compared to that of the agricultural hotspots. Although development is occurring in several locations, the primary areas of soil and sediment loading impact are the west of the village of Columbiana and in the Guilford Lake area. Lake houses and developments are being constructed and planned around Guilford Lake State Park, while a condo community is being constructed around a golf course west of Columbiana village. The latter development has already proven to have a noticeable impact on the upstream reaches of Bull Creek in the northeast corner of Unity Township.

## V. Nutrient Enrichment

### *A. Methods*

Hotspots for nutrient enrichment were evaluated also primarily through recommendations made by the local USDA-NRCS District Conservationist and CSWCD personnel. Areas known by the USDA and CSWD to contribute increased nutrients were recorded and verified through further discussion and field reviews. Nutrient enrichment hotspots are defined by the general area where locations of elevated nutrient loads are concentrated.

### *B. Results*

Hotspots for soil and nutrient enrichment are: (1), Green and Goshen Townships north of the city of Salem; (2), north of the village of Lisbon in the area of Mill Site Creek; (3), Springfield Township in the area of Honey Creek and NF of LBC headwaters; (4), Unity Township in the areas around the city of East Palestine; (5), northern St. Clair Township in and around Beaver Creek State Park (*Map 19*).

Nutrient enrichment as a NPS pollutant occurs in areas in combination with sediment and soil erosion and agricultural NPS. In addition, since FSS contribute to nutrient enrichment as an NPS pollutant, hotspots for FSS and agriculture-based nutrient enrichment need to be considered together to develop a proper understanding of the extent of nutrient enrichment and enrichment hotspots in the LBC watershed. Other known locations of nutrient enrichment are associated with untreated or under-treated sewage effluent from WWTPs (*Table 4*).

However, as government-regulated facilities, effluent from WWTPs is classified as PS pollution and therefore is not included in this NPS action plan.

## VI. Acid Mine Drainage

### *A. Methods*

To determine the level of impact to the LBC watershed from AMD pollution, physical sampling of selected streams was conducted, followed by lab analyses of the samples. Sampling was carried out by the Watershed Coordinator. Lab analyses of the samples were conducted by the Ohio DNR laboratory in Cambridge, Ohio. Analysis and summation of the lab results was completed by Ohio DNR-MRM personnel.

For purposes of this AMD assessment study and for obligations of delineation and characterization emphasized in "Protecting Little Beaver Creek Watershed – Phase II" Ohio EPA 2003 Planning Grant, water a sampling plan was established for the Middle Fork (MF) and West Forks (WF) of LBC, including major tributaries of these streams (Cold Run, Willard Run, Rawley Run, Brush Run and Long Run) and large water bodies (Guilford Lake and Salem Reservoir).

During the last few years, a more standardized three-phase approach has been used to complete a watershed characterization study for acid mine drainage abatement plans. In this instance, Phase I would involve collect only field parameters (including pH, specific conductivity, acidity and alkalinity) to provide investigators with a quick snapshot of WQ conditions to be used as an initial screening. Phase II involves collection of seasonal WQ grab samples analyzed for certain parameters and discharge measurements at the confluence of AMD impacted tributaries that were identified in Phase I, other net alkaline tributaries, and selected sites along the mainstem and tributaries. Phase III involves evaluation of potential project sites within the sub-watershed or specific project area *(ILGARD, Moxahala AMDAT, 2005).* For purposes of this watershed characterization assessment of MF and WF, Phase II sampling was completed.

In order to develop sampling goals and plan for the MF and WF of LBC, it was necessary to gather various forms of background information, that includes topographic maps, mining maps (active or fairly recent mine permits within the study area), OGS Underground Mine location maps, geology and hydrogeology, USGS stream gauging station information, soil and land-use maps, and existing water-quality data and reports.

In order to establish baseline data for MF and WF of LBC the WQ sampling plan took into consideration several factors including frequency, parameters and site/sample location. Sampling would be necessary at least twice to account for seasonal variation in flow and chemical concentration. Sample collection occurred during critical low-flow, stable conditions. This strategy assumes that low-flow will correspond to high-pollutant concentrations. Sampling also occurred during conditions of high flow to account for differentiation of flows and loading.

Select sample locations in MF and WF of LBC were near the mouth of stream (downstream of any surface water conveyance to the tributary), mouth of select tributaries, and at locations that provided for easy access and that would allow for representative flow conditions and where the streambed was stable. Other sample locations were at those points where potential for mine drainage might be prevalent (discharges from mine entries, base of spoil or waste piles, etc) (*Map 24, Appendix H*).

Sampling included collecting field parameters and measurements of pH, conductivity, temperature, and flows prior to physical collection of samples to be submitted for laboratory analysis. Samples were collected as that method described in the approved *QAPP (Quality Assurance Procedure Plan) Protecting Little Beaver Creek—Phase 2,* December 2004. Water for each sample was collected in either a bucket or directly from the stream or discharge in appropriate location and split into two bottles. Samples were placed in a 250 ml bottle or 1000 ml cubitainer. At each sample location, a non-acidified and an acidified sample were taken. The non-acidified sample was collected in a collapsible cubitainer that was completely filled so that the sample was preserved in an oxygen-free environment. Samples were not filtered. Samples were then submitted to Ohio DNR-MRM Cambridge laboratory. Parameters analyzed were the Ohio DNR Group II suite (pH, total acidity as $CaCO_3$ , total alkalinity, specific conductance, total dissolved solids, total suspended solids, sulfate, total iron, total manganese, total aluminum, calcium, magnesium, sodium, potassium, chloride, and hardness. The Group II parameters allow for balancing the anions and cations of the AMD source water.

### *B. Results*

By analyzing the collected WQ, the tributaries and other non-point and point-source discharges that contribute the most poor WQ to LBC can be determined. The full WQ dataset for sampling efforts is included in *Appendix I*. Specifically, the pH, specific conductivity, and metal concentrations of the tributaries were reviewed. Typically, data from monthly, or even less frequent sampling events, are averaged in order to determine typical WQ characteristics.

Differences in flow rates and loading are typically reviewed to note if there are any significant changes due to either spatial, or temporal (rainfall) influences. For purposes of this characterization study, only two samples were collected from each selected monitor location in order to evaluate differentiation from low and high seasonal periods, therefore averaging was not necessary.

### i. West Fork – LBC

Based on a review of USGS and OGS Underground Mine Inventory quadrangle maps for the area, and a review of more recent mining activity through the WF watershed, there is considerable disturbance to land surface from past and recent coal surface mining throughout the WF watershed *(Map 25).* Overall, the pH and metal concentrations are consistently well below those dissolved concentrations representative from mine drainage influence. Several headwater MS monitor sites #LBC 019 and #LBC 020, located just south of the Guilford Lake, and headwater main stem monitor sites #LBC 051 and #LBC 052 (Wilford Run) have average neutral pH (7.5), low conductivity values (< 400 us/cm), and total metal concentrations (aluminum, iron, and manganese) well below 1.0 mg/l. These metal concentrations are typical throughout the WF watershed and reflect little, if any, influence to stream WQ from mine drainage influence.

### ii. Middle Fork – LBC

Close to the northern headwaters of MF, sample location #LBC 001 is located on the MS just northeast of the city of Salem (Mahoning County). Immediately after, a series of prominent metal-laden seeps and discharges from a number of abandoned underground mines were noted along Egypt Road (*Figure 6*). These include sample locations #LBC 002 through #LBC 009 which origin are from numerous abandoned underground coal and clay mines that are located in the Lower Kittanning (#5), Brookville (#4) and Lower Mercer (#3) coal and associated clay seams. These drift mines

***Figure 6:*** *Stream affected by AMD along Egypt Road.*

include, in Mahoning County, the *Bonsall (Mg-22)*, *Redinger (Mg-57)* and the *John Pow (Mg-13)* mines. In Columbiana County, contributing discharges from the *Canage & Anderson (Ca-16)*, *Brookwood (Ca-122)*, *Carbon Hill No2 (Ca-10)*, *Beach Hollow (Ca-37)*, and the *Empire (Ca-22)* mines flows to MF. Due to the interconnectivity of these mines and potential for unmapped mines, there are likely several others contributing drainage to MF.

Data from both the June, 2004, and January, 2005, sampling efforts reveal WQ typical of mine drainage influence. Low pH (3.4 to 5.8) values were measured at sample locations #LBC002 through #LBC006. Conductivity and total dissolved solids (TDS) concentrations were well in excess of 1000 us/cm, and 1000 mg/l respectively. Metal concentrations (iron, manganese, aluminum and sulfate) at these sites were much higher during lower flow period (June, 2004), verses sampling data collected in December. Discharges from sample locations #LBC 004 and #LBC 006 were both net acid (acidity > alkalinity) with sulfate concentrations greater than 1000 mg/l. Sulfate is usually only found in fresh coal and is commonly the result of weathering and recent oxidation of sulfide sulfur. AMD is commonly neutralized naturally by carbonate rocks or neutral-to-alkaline receiving streams, and most metals will precipitate out of solution. Although, carbonate neutralization does not change the concentration of sulfate, therefore sulfate is a reliable indicator of mine drainage (Toler, 1980).

The area is covered with thick iron (reddish-orange) precipitate and white coating, which is a result of iron and aluminum hydroxides. Flows (volume) were difficult to assess due to the laminar nature of the discharges and very soft ground conditions due to saturation from the mine drainage. The main acid-producing sites, deep-mine seeps, have the capacity to produce higher acid loads with increased flow. Discharge rates, at best, are insignificant with respect to dilution from the receiving stream (MF).

The majority of the discharges from these mines are captured in a large, existing wetland located in the stream valley, prior to final discharge to the main stem. The wetland appears to continue to collect and retain adequate amounts of metals and dissolved solids that would otherwise pose physical (biological and chemical) impacts to MF. Sample Location #LBC 010, which is located immediately downstream on MF, is very low in dissolved metal concentrations, and does not appear, based on sampling data and information contained in the *TMDL Report: Little Beaver Creek Watershed* (August, 2005) to exhibit any indication of impact from mining.

With the exception of those sites identified near the northern headwaters of MF, all other sample locations are similar (neutral pH, low metals) as those sampled in the WF. In general, it would appear there are more impacts to LBC (as identified in the *TMDL Report*) from sediment, total dissolved solids, and nutrient-related impairments more so than from past or current mining practices.

## VII. Urbanization

### *A. Methods*

Hotspots for urbanization were determined through recommendations from USDA-NRCS, CSWD and CCDOD personnel. Hotspots are based on recent development trends, which primarily consider new home and housing unit construction and new business development (*Figure 7*).

### *B. Results*

Hotspots for urbanization are: (1), the northern border of Columbiana County/southern border of Mahoning County; (2), the area immediately surrounding Guilford Lake State Park; (3), the city of Calcutta and its surrounding area (*Map 26*).

These areas represent where the greatest amount of development and construction is and has been occurring in the last decade. In addition to urbanization in relation to development and construction, plans for future extension of a waterline by the Buckeye Water District, from the city of East Liverpool to West Point, will create additional development opportunities along the utility corridor. Pressure to allow CD&D dumps to operate within the watershed is increasing. The presence of a CD&D dump in the Negley area is highly controversial for community members. CD&D materials are hauled in to these dumps in trucks and by train. Due to the current economic climate in Columbiana County, it is difficult for county and local officials to reject new business opportunities. Additional CD&D dumps may be developing in the next few years. Although CD&D dumps would typically be considered industrialization rather than urbanization, for the purposes of this plan, industrialization will be grouped under urbanization, based on the idea that undisturbed land will be converted to a high-impact commercial area.

## VIII. Riparian Corridor Assessment

### *A. Background*

The riparian corridor, or buffer, is the width of undisturbed, vegetated land immediately adjacent to each bank of a stream. The riparian corridor in a natural, undisturbed system is typically occupied by dense tree, shrub or large herbaceous plants. In some areas of an undisturbed system, the plant growth may be less dense or may be occupied by smaller plants, such as regularly occurs in floodplains or riparian wetlands. Regardless of the plant species composition, the riparian corridor functions as a critical stop-gap between a surface water body and altered habitat. “Altered habitats” refers to areas where human encroachment has occurred, such as agricultural properties, residences, suburban neighborhoods, urban areas, and industrial or commercial areas and other human land uses (*Figure 8*).

In areas where human encroachment has occurred, and thus the land has been developed beyond its natural state, the land has been deforested and/or has had the vegetation removed to some extent. In some locations, the vegetation has been removed completely to the immediate stream bank, while in other places the riparian corridor remains intact to varying degrees.

The health of riparian corridor is critical to the health of that particular stream reach. Many of the NPS sources that have been discussed in previous sections reach surface waters through surface runoff during precipitation events or ice melts. As the runoff carries fertilizers, pesticides, etc., toward the stream channels, the runoff can be slowed, captured and absorbed by the soil and plant roots which comprise the riparian corridor. Plants serve a dual purpose in the riparian corridor. Roots of plants help to anchor the soil and sub-soil layers in place, which limits soil erosion, and thereby reduced sediment loading. The second function served by plants is to act as a reservoir for the capture and absorption nutrients and chemicals. Plants have the ability to store elements and chemicals which may be toxic while not suffering any ill effects because plants do not metabolize compounds that it cannot use as a food source. Therefore, riparian plants are very important for removing pollutants from runoff before they can reach streams or drainage channels. The soils of the riparian corridor also serve as a reservoir for binding and storing potential NPS pollutants. Larger chemical compounds which cannot be taken up by plant roots can be trapped inside the soil and sub-soils themselves. Many of these compounds can be metabolized by bacteria within the soil. The bacteria break the

***Figure 7:*** *Soil disturbed by construction erodes at extremely high rates and is easily washed into streams by precipitation.*

chemicals down into their molecular components, which are usually inert. Therefore, the binding and storage of NPS pollutants can result in the elimination of those pollutants.

Through the loss of riparian vegetation, streambanks can be easily eroded. As the streambanks and riparian soils continue to erode, the pollutant storage capacity of the riparian corridor is reduced two-fold by the combined loss of riparian vegetation and soils. Therefore, as riparian corridors are lost or reduced due to land development, the pollutant storage capacity within a stream reach is reduced as well. NPS pollutants can have a greater impact in these impacted areas. In addition, the eroding streambanks contribute to sediment loading, further impacting the stream, and ultimately the watershed.

### *B. Methods*

Since it is understood that a healthy and established riparian corridor is critical for clean water and a healthy watershed, a proper survey of the LBC riparian corridor was completed. Likewise with other NPS pollutants, hotspot areas are located where the riparian corridor is narrow or non-existent. These areas are important locations for targeted management activities for the improvement of WQ and watershed health.

Due to time constraints and personnel limitations, it was not conceivable for a survey of the riparian corridor for the LBC watershed to be completed by actual ground-truthed observations in the field. Also, too many small tributaries exist for all of them to be assessed. Therefore, an alternative method was chosen.

A comprehensive riparian corridor survey was completed for the NF (from the Ohio state line near Negley to Fredericktown), MF, WF and MS of LBC by using aerial photographs. This method was based upon the riparian corridor assessment method outlined in the Upper Tuscarawas Watershed Action Plan (NEFCO). Aerial photos were gathered by personnel at the CCEO. The most recent aerial photos available were taken in 1998. These photos were aligned, using a mosaic method, at a scale of 1”:400’. Each LBC branch was divided into segments being 600 feet (183 m) long. At scale, each segment was 1.5 in (3.7 cm) long. For each segment, the width of the riparian corridor was measured for both banks of the stream. Four categories were used to classify riparian corridor widths. The categories are: 3 (> 10m wide), 2 (5-10 m wide), 1 (1-5 m wide), 0 (< 1 m wide). Segments often did not have a uniform riparian corridor width across their lengths. For these segments, the average width was taken and appropriately classified.

***Figure 8:*** *Examples of a stream with a healthy riparian corridor and a stream with no riparian corridor.*

### *C. Results*

The WF watershed (HUC 05030101-080) assessment began at the Guilford Lake spillway (40º 47’ 41” N, 80º 52’ 19” W) and ends at the confluence with the MF (40º 43’ 16” N, 80º 37’ 43” W) near Williamsport. A total of 211 segments were delineated and assessed for both banks (*Appendix J*). Due to the meandering nature of the streams, the banks are defined as the SW and NE banks, where SW refers to the Southwest, South or West stream bank and NE refers to the Northeast, North or East stream bank, depending on the direction the stream is flowing in a given segment. The average riparian corridor width categorization for the WF on the NE bank is 2.43, 2.56 for the SW bank. Therefore the riparian corridor of the WF averages a width between 5 and 10 meters. Since the average width is high relative to the available categories, the majority of the WF watershed has a riparian corridor width of at least 10 meters.

The MF watershed (HUC 05030101-070) assessment began at the headwaters west of the city of Salem (40º 56’ 26” N, 80º 53’ 06” W) and ends at the confluence with the WF (40º 43’ 16” N, 80º 37’ 43” W) near Williamsport. A total of 311 segments were delineated and assessed for both banks (*Appendix K*). Due to the meandering nature of the streams, the banks are defined as the SW and NE banks, where SE refers to the Southwest, South or West stream bank and NE refers to the Northeast, North or East stream bank, depending on the direction the stream is flowing in a given segment. The average riparian corridor width categorization for the MF on the NE bank is 2.43, 2.53 for the SW bank. Therefore the riparian corridor of the MF averages a width between 5 and 10 meters. Since the average width is high relative to the available categories, the majority of the MF watershed has a riparian corridor width of at least 10 meters.

The NF watershed (HUC 05030101-090) assessment began at the Ohio state line (40º 47’ 22” N, 80º 31’ 09” W) just east of Negley and ends at the confluence with the MS (40º 42’ 47” N, 80º 32’ 38” W) at Fredericktown. A total of 70 segments were delineated and assessed for both banks (*Appendix L*). Due to the meandering nature of the streams, the banks are defined as the SW and NE banks, where SE refers to the Southwest, South or West stream bank and NE refers to the Northeast, North or East stream bank, depending on the direction the stream is flowing in a given segment. The average riparian corridor width categorization for the NF on the NE bank is 2.81, 2.73 for the SW bank. Therefore the riparian corridor of the NF averages a width of between 5 and 10 meters. Since the average width is high relative to the available categories, the majority of the MF watershed has a riparian corridor width of at least 10 meters.

The MS watershed (part of HUC 05030101-090) assessment began at the confluence of the MF and WF (40º 43’ 16” N, 80º 37’ 43” W) near Williamsport and ends at the mouth of LBC (40º 39’ 01” N, 80º 31’ 09” W) at the Ohio River. A total of 135 segments were delineated and assessed for both banks (*Appendix M*). Due to the meandering nature of the streams, the banks are defined as the SW and NE banks, where SE refers to the Southwest, South or West stream bank and NE refers to the Northeast, North or East stream bank, depending on the direction the stream is flowing in a given segment. The average riparian corridor width categorization for the MS on the NE bank is 2.87, 2.93 for the SW bank. Therefore the riparian corridor of the MS averages a width of between 5 and 10 meters. Since the average width is high relative to the available categories, the majority of the MS watershed has a riparian corridor width of at least 10 meters.

A color-coded map was produced by the Center for Urban Studies at YSU (*Map 27*). The map provides a visual representation of the riparian corridor for the WF, MF, NF and MS. The majority of riparian encroachment occurs in agricultural properties, particularly along the WF. Crop lands typically have minimal buffers comprised of low grasses. Livestock pastures through which the LBC branches pass have degraded stream banks with little to no riparian vegetation. The streams themselves are often used as water sources for livestock. In these cases, livestock have unrestricted access to the streams. The livestock destroy riparian vegetation where they repeatedly tread while entering and exiting the stream.

Riparian encroachment also occurs as a result of commercial, industrial and urban activities, particularly along the MF. Hotspots for urban/commercial/industrial riparian encroachment are located, appropriately, in association with populated areas (e.g. city of Salem, village of Leetonia, village of Washingtonville, village of Lisbon).

# CHAPTER 4

# NPS Management Strategies

The following sections will outline the preferred management strategies which are being proposed for implementation in the LBC watershed. The implementation activities are broken down by 12 digit HUC. The current WAP, as it is written, goes through 2016. After the initial implementation period, the WAP will be reviewed and revised to reflect success and failures and to re-prioritize management goals for the future. *Appendix K* outlines the schedule and goals for WAP implementation. Categories of BMPs included in Appendix K include Agriculture, Riparian, Sewage and Septic, and Stormwater, and each BMP within that category is also listed as a high, medium, or low priority, as identified by the LBC WAP Committee. The following sections discuss the load reductions needed in each subwatershed to bring it into attainment for pollutants that are discussed in the LBC TMDL and what BMPs have been recommended by the LBC WAP Committee and Subcommittees to bring the pollutants into attainment. This is broken down simply into Problem Statements, Goals, Objectives, and Actions. In addition to the subwatersheds that have Problem Statements listed below for each pollutant that is not in attainment according to the LBC TMDL, Appendix K also lists activities that have been suggested for subwatersheds that are in attainment in order to protect those subwatersheds and keep them in attainment, as well as activities that have been recommended that impact more than one subwatershed, such as educational activities. An expected timeline for each implementation action is also given. Load reduction calculations have been done using the Load Reduction Spreadsheet and Region 5 Model programs available on the ODNR Ohio Watershed Program webpage at (http://ohiodnr.com/soilandwater/water/watershedprograms/default/tabid/9192/Default.aspx).

## I. Brush Creek

### A. Ammonia

**Problem Statement:** The Brush Creek of the Little Beaver Creek is not in attainment for ammonia due to cattle and failing septic systems. To meet attainment, total non-point sources of ammonia need to be reduced from 11,244 lbs per year to 6,570 lbs per year.

- Goal 1: Reduce ammonia from failing septic systems in the watershed by 328 lbs per year.
    - Objective 1: Repair or replace 10 failing septic systems in the watershed

        - Action 1: Educate homeowners on the importance of repairing and replacing failing septic systems

        - Action 2: Seek funding to provide cost-share for repairing and replacing failing septic systems

- Goal 2:Reduce non point sources of ammonia from agriculture by 4,346 pounds per year.

    - Objective 1: Install 20,000 feet of exclusion fencing

        - Action 1: Educate farmers on exclusion fencing benefits

        - Action 2: Seek funding to provide cost-share for exclusion fencing

    - Objective 2: Install a waste storage facility or facilities that stores the waste of at least 37 dairy or beef cattle

        - Action 1: Educate farmers on waste storage facility benefits

        - Action 2: Seek funding to provide cost-share for waste storage facilities

**B. Sedimentation**

**Problem Statement:** Brush Creek is not in attainment for sedimentation due to cattle access to the stream. To meet attainment, total non-point sources of sedimentation need to be reduced from 964,544 lbs per year to 306,884 lbs per year.

- Goal 1: Reduce sedimentation from cattle access to the stream by 657,670 lbs per year.

    - Objective 1: Install 3,900 feet of exclusion fencing

        - Action 1: Educate farmers on exclusion fencing benefits

        - Action 2: Seek funding to provide cost-share for exclusion fencing

**C. Fecal Coliform**

**Problem Statement:** Brush Creek is not in attainment for fecal coliform due to cattle access to the stream. To meet attainment, total non-point sources of fecal coliform need to be reduced from 65,948 lbs per day to 2,202 lbs per day.

- Goal 1: Reduce fecal coliform from cattle access to the stream by 637,746 lbs per day.

    - Objective 1: Install 3,900 feet of exclusion fencing

    - Action 1: Educate farmers on exclusion fencing benefits
    - Action 2: Seek funding to provide cost-share for exclusion fencing

**II. East Branch**

**A. Phosphorous**

**Problem Statement:** The East Branch of the Little Beaver Creek is not in attainment for phosphorous, which is also causing low dissolved oxygen levels, due to channelization, agriculture, failing septic systems, stormwater runoff, and the Leetonia and Washingtonville Waste Water Treatment Plants. To meet attainment, total non-point sources of phosphorous need to be reduced from 2,094 lbs per year to 1,830 lbs per year and point sources need to be reduced from 4,564 lbs per year to 1,433 lbs per year.

- Goal 1: Reduce phosphorous loading by 84.7 lbs per year
  - Objective 1: Renaturalize 7,000 linear feet of channelized stream
    - Action 1: Educate local landowners and businesses about the benefits of stream renaturalization
    - Action 2: Seek funding to allow for stream renaturalization
- Goal 2: Reduce phosphorous from the Leetonia and Washingtonville Waste Water Treatment plants by 69%, or 3,131 lbs per year (4,564 lbs per year to 1,433 lbs per year).
  - Objective 1: update the Leetonia and Washingtonville Waste Water Treatment Plants to reduce phosphorous discharges by at least 3,131 pounds per year.
    - Action 1: Educate municipalities about the benefits of Waste Water Treatment Plant upgrades
    - Action 2: Seek funding to allow for Waste Water Treatment Plant upgrades
- Goal 3:Reduce non point sources of phosphorous from agriculture by 3131 pounds per year.
  - Objective 1: Install 15,000 feet of exclusion fencing
    - Action 1: Educate farmers on exclusion fencing benefits
    - Action 2: Seek funding to provide cost-share for exclusion fencing

  - Objective 2: Establish 160 acres of filter strips

    - Action 1: Conduct pasture walks and agricultural field days showcasing this and other methods of conservation in farming practices

    - Action 2: Seek funds to help provide incentive for establishing filter strips

  - Objective 3: Establish continuous no-till on 155 acres

    - Action 1: Conduct pasture walks and agricultural field days showcasing this and other methods of conservation in farming practices

    - Action 2: Seek funds to help provide a no-till incentive

**III. Headwaters West Fork Little Beaver Creek**

**A. Phosphorous**

**Problem Statement:** The Headwaters of the West Fork of the Little Beaver Creek subwatershed is not in attainment for phosphorous due to agriculture, failing septic systems, stormwater runoff, and the Guilford Lake Waste Water Treatment Plant. To meet attainment, total non-point sources of phosphorous need to be reduced from 904 lbs per year to 507 lbs per year and point sources need to be reduced from 1,565 lbs per year to 617 lbs per year.

- Goal 1: Reduce phosphorous from the Guilford Waste Water Treatment Plant by 61%, or 948 lbs per year (1,565 lbs per year to 617 lbs per year).

  - Objective 1: update the Guilford Lake Waste Water Treatment Plant to reduce phosphorous discharges by at least 948 lbs per year.

    - Action 1: Educate the local community about the benefits of Waste Water Treatment Plant upgrades

    - Action 2: Seek funding to allow for Waste Water Treatment Plant upgrades

- Goal 2: Reduce non point sources of phosphorous form agriculture by 209 lbs per year

  - Objective 1: Install 2,500 feet of exclusion fencing

    - Action 1: Educate farmers on exclusion fencing benefits

    - Action 2: Seek funding to provide cost-share for exclusion fencing

- Goal 3: Utilize streambank stabilization to reduce phosphorous by 85 lbs per year.

  - Objective 1: Stabilize 1,000 feet of streambank

- Action 1: Educate local landowners about the benefits of streambank stabilization
- Action 2: Seek funding to allow for streambank stabilization

- Goal 4: Utilize riparian plantings to reduce phosphorous by 57 lbs per year
  - Objective 1: Restore 670 feet of riparian planting
    - Action 1: Educate local landowners and Beaver Creek State Park administration on the benefits of riparian planting
    - Action 2: Seek funding to allow for riparian plantings
- Goal 5: Reduce non point sources of phosphorous from failing septic systems by 16 lbs per year
  - Objective 1: Repair or replace one failing septic system in the watershed
    - Action 1: Educate homeowners on why repairing and replacing failing septic systems is important
    - Action 2: Seek cost-share funding to assist homeowners with repairing or replacing failing septic systems

## IV. Honey Creek

### A. Phosphorous

**Problem Statement:** The Honey Creek subwatershed is not in attainment for phosphorous due to row crop agriculture, failing septic systems, stormwater runoff, and the New Middleton Waste Water Treatment Plant. To meet attainment, total non-point sources of phosphorous need to be reduced from 1,720 lbs per year to 970 lbs per year and point sources need to be reduced from 2,227 lbs per year to 838 lbs per year.

- Goal 1: Reduce phosphorous from the New Middleton Waste Water Treatment Plant by 63%, or 1,389 lbs per year (2,227 lbs per year to 838 lbs per year).
  - Objective 1: update the New Waterford Waste Water Treatment Plant to reduce phosphorous discharges by at least 1,389 lbs per year.
    - Action 1: Educate the local community and elected officials about the benefits of Waste Water Treatment Plant upgrades
    - Action 2: Seek funding to allow for Waste Water Treatment Plant upgrades

- Goal 2: Reduce non point sources of phosphorous form agriculture by 536 lbs per year
    - Objective 1: Establish 22 acres of filter strips
        - Action 1: Conduct pasture walks and agricultural field days showcasing this and other methods of conservation in farming practices
        - Action 2: Seek funds to help provide incentive for establishing filter strips
    - Objective 2: Establish continuous no-till on 75 acres
        - Action 1: Conduct pasture walks and agricultural field days showcasing this and other methods of conservation in farming practices
        - Action 2: Seek funds to help provide a no-till incentive
- Goal 3: Reduce non-point sources of phosphorous from stormwater runoff by 86 lbs per year
    - Objective 1: Implement stormwater control measures for 130 acres of commercial land or 210 acres of residential land
        - Action 1: Educate businesses and homeowners about the benefits of stormwater management
        - Action 2: Seek funds to help provide stormwater management incentives
- Goal 4: Reduce non-point sources of phosphorous from failing septic systems by 128 lbs per year
    - Objective 1: Repair or replace 5 failing septic systems in the watershed
        - Action 1: Educate homeowners on the importance of repairing and replacing failing septic systems
        - Action 2: Seek funds to provide cost-share for homeowners to assist with repairing or replacing failing septic systems

**B. Ammonia**

**Problem Statement:** The Honey Creek subwatershed is not in attainment for ammonia due to agriculture, failing septic systems, stormwater runoff, and the New Middleton Waste Water Treatment Plant. To meet attainment, total non-point sources of ammonia need to be reduced from 11,277 lbs per year to 5,203 lbs per year and point sources need to be reduced from 3,053 lbs per year to 1,521 lbs per year.

- Goal 1: Reduce ammonia from the New Middleton Waste Water Treatment Plant by 50%, or 1,532 lbs per year (3,053 lbs per year to 1,521 lbs per year).
    - Objective 1: update the New Middleton Waste Water Treatment Plant to reduce ammonia discharges by at least 1,532 lbs per year.
        - Action 1: Educate the local community and elected officials about the benefits of Waste Water Treatment Plant upgrades
        - Action 2: Seek funding to allow for Waste Water Treatment Plant upgrade
- Goal 2: Reduce ammonia from failing septic systems in the watershed by 329 lbs per year
    - Objective 1: Repair or replace 10 failing septic systems in the watershed
        - Action 1: Educate homeowners on the importance of repairing and replacing failing septic systems
        - Action 2: Seek funding to provide cost-share for repairing and replacing failing septic systems
- Goal 3: Reduce non point sources of ammonia from agriculture by 5,745 lbs per year
    - Objective 1: Establish 100 acres of filter strips
        - Action 1: Conduct pasture walks and agricultural field days showcasing this and other methods of conservation in farming practices
        - Action 2: Seek funds to help provide incentive for establishing filter strips
    - Objective 2: Establish continuous no-till on 450 acres
        - Action 1: Conduct pasture walks and agricultural field days showcasing this and other methods of conservation in farming practices
        - Action 2: Seek funds to help provide a no-till incentive

## V. Little Beaver Creek Main Stem

### A. Sedimentation

**Problem Statement:** The Little Beaver Creek Main Stem (all streams upstream of East Liverpool except Patterson Run and Brush Creek which have their own TMDL for sedimentation) is not in attainment for sedimentation primarily due to row crop agriculture. To meet attainment, total non-point sources of sedimentation need to be reduced from 31,226,275 lbs per year to 5,291,904 lbs per year.

- Goal 1:Reduce non point sources of sedimentation from agriculture by 25,934,371 pounds per year.
    - Objective 1: Establish 700 acres of filter strips
        - Action 1: Conduct pasture walks and agricultural field days showcasing this and other methods of conservation in farming practices
        - Action 2: Seek funds to help provide incentive for establishing filter strips
    - Objective 2: Establish continuous no-till on 3,000 acres
        - Action 1: Conduct pasture walks and agricultural field days showcasing this and other methods of conservation in farming practices
        - Action 2: Seek funds to help provide a no-till incentive

## VI. Longs Run

### A. Phosphorous

**Problem Statement**: The Longs Run subwatershed is not in attainment for phosphorous due to cattle-related agriculture. To meet attainment, total non-point sources of phosphorous need to be reduced by 10%, from 860 lbs per year to 772 lbs per year.

- Goal 1: Reduce non point sources of phosphorous form agriculture by 88 lbs per year
    - Objective 1: Install 1,040 feet of exclusion fencing
        - Action 1: Educate farmers on exclusion fencing benefits
        - Action 2: Seek funding to provide cost-share for exclusion fencing

## VII. Headwaters of the Middle Fork

### A. Phosphorous

**Problem Statement:** The Middle Fork Headwaters is not in attainment for phosphorous due to row crop agriculture, stormwater, and failing septic systems. To meet attainment, total non-point sources of phosphorous need to be reduced from 1,742 lbs per year to 981 lbs per year, and total point sources of phosphorous need to be reduced from 115,280 lbs per year to 6,173 lbs per year.

- Goal 1: Reduce phosphorous from the Salem Waste Water Treatment Plant by 95%, or 109,107 lbs per year (115,280 lbs per year to 6,173 lbs per year).
    - Objective 1: update the Salem Waste Water Treatment Plant to reduce phosphorous discharges by at least 109,107 lbs per year.
        - Action 1: Educate the local community and elected officials about the benefits of Waste Water Treatment Plant upgrades
        - Action 2: Seek funding to allow for Waste Water Treatment Plant upgrades
- Goal 2: Reduce non point sources of phosphorous form agriculture by 664 lbs per year
    - Objective 1: Establish 10 acres of filter strips
        - Action 1: Conduct pasture walks and agricultural field days showcasing this and other methods of conservation in farming practices
        - Action 2: Seek funds to help provide incentive for establishing filter strips
    - Objective 2: Establish continuous no-till on 90 acres
        - Action 1: Conduct pasture walks and agricultural field days showcasing this and other methods of conservation in farming practices
        - Action 2: Seek funds to help provide a no-till incentive
- Goal 3: Reduce non point sources of phosphorous from stormwater runoff by 97 lbs per year
    - Objective 1: Implement stormwater control measures for 150 acres of commercial land or 240 acres of residential land
        - Action 1: Educate businesses and homeowners about the benefits of stormwater management
        - Action 2: Seek funds to help provide stormwater management incentives

In addition to reducing non point sources of phosphorous by 44%, the Little Beaver Creek TMDL also suggests fixing 100% of the failing septic systems in the watershed:

- Goal 4: Reduce non-point sources of phosphorous from failing septic systems by 460 lbs per year

- Objective 1: Repair or replace 28 failing septic systems in the watershed (28 known failing systems)
  - Action 1: Educate homeowners on the importance of repairing and replacing failing septic systems
  - Action 2: Seek funds to provide cost-share for homeowners to assist with repairing or replacing failing septic systems

## VIII. Patterson Creek

### A. Sedimentation

**Problem Statement:** Patterson Creek is not in attainment for sedimentation due to row crop agriculture, cattle access, and surface mining activities. To meet attainment, total non-point sources of sedimentation need to be reduced from 639,341 lbs per year to 57,541 lbs per year.

- Goal 1:Reduce non point sources of sedimentation from agriculture by 581,800 pounds per year.
  - Objective 1: Install 3,000 feet of exclusion fencing
    - Action 1: Educate farmers on exclusion fencing benefits
    - Action 2: Seek funding to provide cost-share for exclusion fencing
  - Objective 2: Establish continuous no-till on 5 acres
    - Action 1: Conduct pasture walks and agricultural field days showcasing this and other methods of conservation in farming practices
    - Action 2: Seek funds to help provide a no-till incentive

One group of implementation actions that are listed in Appendix K and the Problem Statements, and recommended by the TMDL is upgrades to WWTPs in the watershed. Despite this, there has been no commitment from any of the cities and villages that would have to be invested in these upgrades. If the communities choose not to upgrade their WWTPs then other BMPs will have to be identified in order to bring the subwatersheds into attainment.

## IX. Public Involvement

The LBC WAP has been introduced to the public as “their watershed plan”. The implementation of management strategies will affect them, so they must be part of the implementation as well as the planning. Members of the public will be encouraged to volunteer for clean-up efforts, to assist in creating educational materials, help distribute information to the community through mailings and at local events, etc. Individuals and groups will also be asked to volunteers as watershed monitors to help keep the community aware of activities that may affect them positively or negatively. During the planning phase of this WAP, public involvement activities have already begun.

A LBC Stream Team Monitoring Program was initiated. In the program, individuals, couples, or groups volunteered to conduct quarterly monitoring of a selected section of the LBC and its main branches. The upper reaches of the MF and WF were divided into 4-mile (approximately) segments (*Map 28*). Volunteers could select their areas and where then responsible to submit quarterly monitoring reports to the Scenic Rivers Coordinator. This provides additional sets of eyes and ears to help monitor activities within the watershed that may impact the natural integrity of the watershed. This program was designed to work in conjunction with an existing stream monitoring program led by the Ohio DNR-DNAP SRP. The SRP conducts volunteer monitoring in the designated Wild & Scenic River reaches of LBC. The LBC Stream Team Monitoring program covers the reaches which are not designated as Wild and/or Scenic. Through the cooperation of the two programs, volunteer monitoring is conducted along the entire length of the LBC MS, NF, WF and MF. Such volunteer based programs will continue to be developed in order to provide the public various options for participating. Volunteer programs will developed to ensure that there is some activity for everyone to participate, whatever their physical capabilities, availability or level of interest.

In addition to the Stream Team Monitoring Program, the Scenic Rivers program runs a volunteer macroinvertebrate monitoring program at various locations within the Scenic Rivers section of the watershed. Families, school groups, individuals, and others can become involved in their watershed by adopting a monitoring location. Those that adopt a monitoring location are then trained in Stream Quality Monitoring for macroinvertebrates at a training with Scenic Rivers staff and then monitor their location several times per year. The results are then sent to Scenic Rivers staff to compile as part of an Annual Report.

Many activities completed as part of the WAP execution will be completed with participation from the watershed community. Table 10 provides a list of activities which will involve public participation.

***Table 8***. *WAP activities involving public participation.*

| ***Activity*** | ***Targeted Participants*** | ***Activity Manager*** | ***Completion Date*** |
|---|---|---|---|
| Stream Monitoring program | Private citizens, high school/university students | OHIO DNR-DNAP SRP | 2015 |
| Illicit Dump clean-ups | All willing participants | LBCLF | 2014 |
| Stream Sweeps (river clean-ups) | All willing participants | LBCLF | Annually |
| Watershed Awareness Day | Entire watershed community | Columbiana Conservation Partners | Annually |
| Public Meetings for WAP Partners | All interested citizens | LBC WAP Partners | Semiannually through 2012 |

Since public support is vital to the success of the LBC WAP, a public information campaign will be maintained so that information about the WAP and about WAP-related projects will regularly be made public. Past efforts for volunteer drives and public information dissemination through local print media (e.g. newspapers) have been very successful. Therefore, regular newspaper articles will be printed in local papers. Information will also be printed in the LBCLF's quarterly newsletter. Periodic reports will be written and distributed to the project partners and the groups listed in the WAP distribution list. These reports will be made available by each of these groups for distribution at their offices or meeting places. Finally, if public interest warrants them, periodic public meetings (e.g. quarterly or semi-annually) will be held where interest members of the watershed community can meet with the WC and other project partner representatives to inquire about the progress of the WAP. The WC will be responsible for writing and distributing news articles and reports, as well as organizing and leading public meetings.

## X. Summary of Management Strategies

Management of NPS pollution across an entire watershed is an expensive and time-intensive effort. In the process of planning the preferred management strategies, the effort was made to select projects and programs that would address multiple NPS sources. For instance, the exclusionary fencing project, detailed in Appendix K, will address soil and sediment loading and nutrient enrichment as well as establishing minimum riparian corridors where none currently exist.

The objective to planning in this multi-management manner is to reduce the number of funding sources which must be acquired. Also, it will reduce the amount of time spent on writing grant proposals. With less spent being occupied by locating funding and by authoring proposals, more management initiatives can be undertaken. More time can be spent “on the ground” at project sites getting real work done that will have visible and measurable results. Finally, in the interest of efficiency, the multiple-management method will increase the acres of land and volumes of surface waters improved for each dollar spent in the watershed. Each project dollar must be utilized to the fullest extent to achieve the maximum positive results.

***WAP Partner Organizations/Entities***

WAP partner entities and organizations *(Table 1)* will provide assistance in identifying funding sources, recruitment of volunteers, be present on-site during implementation of management activities, and will provide knowledge and expertise throughout the planning and implementation of management projects and programs.

Upon receiving endorsement by the Ohio EPA and Ohio DNR, this WAP will be distributed to each of the primary partner organizations *(Table 1).* These groups will serve as the primary managing agents of the WAP, with each group managing WAP activities in which they specialize. Direct supervision of project activities will be undertaken by the project partners which have the specific technical expertise. For example, on-the-ground management activities for FSS will be directed by the CCHD in Columbiana County and by the MCBH in Mahoning County. Agricultural NPS management activities will be directed by the CSWCD, MSWCD, and the USDA. Management activities involving protection of sensitive areas and species will be directed by the Ohio DNR-DNAP and Ohio DNR-DOW. Management activities targeting AMD discharges will be directed by the Ohio DNR-MRM.

The combined efforts of the CSWCD, MSWCD and the USDA-NRCS local district have been successful in monitoring and managing agricultural NPS. Due to their successes, this proposed action plan will complement their existing programs and efforts as opposed to replacing it. In fact, the NPS source information and ideal NPS management practices have been primarily by these agencies. A significant part of the management activities will simply be to help these agencies to develop contacts with land owners, distribute their existing educational materials, aid in developing new materials, and to aid in increasing local awareness of resource conservation programs and practices.

The primary factor which has limited the prevention and management of agricultural NPS has long been locating and securing financial support. There is no shortage of projects to undertake, only the money to pay for it. Therefore, much of the agricultural NPS management effort will be spent identifying and acquiring funding. In Summer, 2005, the LBCLF, CSWCD, and USDA-NRCS developed a project to create protected riparian corridors for streams that flow through horse and cattle pastures. This project provides for the installation of fencing which will be placed to prevent livestock from having unrestricted access to streams. In addition, heavy-use pads will be installed. These heavy-use pads are constructed of non-erosive materials so that, in areas where groups of horses are gathered in close proximity (during feeding, for instance), there will no longer be heavy damage to the soil in these areas. Funding was applied for from the Ohio EPA under a 2006 §319 NPS Implementation grant and the grant was awarded in late 2006. The grant was completed in 2009 with the instillation of 14,872 linear feet of exclusion fencing, 16 heavy use pads, 1 stream crossing, and 6 stock tanks.

The LCBLF will serve as the lead agency in the execution of the WAP. As long as the WC is employed under the LBCLF, the LBCLF will be responsible for monitoring the progress of WAP activities, providing reports to state agencies for oversight, and acting as the primary storehouse for data collected before, during, and after management activities. Each partner organization will maintain copies of data for activities in which they are involved.

### *WAP Distribution List*

Once the LBC WAP has been endorsed by the Ohio DNR and Ohio EPA, it will be distributed amongst the WAP project partners and local governments and municipalities for their review. Ideally, the WAP will be supported by all of the watershed governments and local communities. Execution of WAP will be directly dependent upon local support. Copies of the endorsed WAP will be distributed to the following parties:

- LBCLF
- LBCWSRAC
- CSWCD
- MSWCD
- CCHD
- MCBH
- Ohio DNR-DNAP SRP
- Ohio DNR-DOW

- Ohio DNR-MRM
- USDA-NRCS
- Columbiana County Commissioners
- Goshen Township Trustees (Mah.)
- Green Township Trustees (Mah.)
- Springfield Township Trustees (Mah.)
- Butler Township Trustees (Col.)
- Perry Township Trustees (Col.)
- Salem Township Trustees (Col.)
- Fairfield Township Trustees (Col.)
- Unity Township Trustees (Col.)
- Middleton Township Trustees (Col.)
- Elkrun Township Trustees (Col.)
- Center Township Trustees (Col.)
- Hanover Township Trustees (Col.)
- Franklin Township Trustees (Col.)
- Mahoning County Commissioners
- Carroll County Commissioners
- Beaver County Trustees (Mah.)
- Wayne Township Trustees (Col.)
- Madison Township Trustees (Col.)
- St. Clair Township Trustees (Col.)
- East Township Trustees (Car.)
- Village of Columbiana
- City of Salem
- Village of Leetonia
- Village of Washingtonville
- Village of Lisbon
- Village of New Waterford
- City of East Palestine
- Village of Summitville

# CHAPTER 5

## Conclusion

The LBC watershed is a natural jewel which has become caught in the struggle for economic and social development and the push to protect natural resources. This struggle must be addressed from a bi-partisan stance, whereby neither party is ignored or forced into a situation within which they are not comfortable. Such a condition can only lead to increased discord and will create more conflict between the two sides. By asking for the cooperation of government and their agencies and private citizens, there is hope that progress can be made for the betterment of the lives of all those with interests in the LBC watershed. This WAP will impact more than those individuals who live and work within the LBC watershed. The success or failure will affect the region. Improvements in the watershed's health will be proof to others that such an effort can be successful and will hopeful spark similar initiatives in surrounding watersheds and regions.

Many local governing bodies have expressed concerns that supporting the WAP will force them into a position of becoming legally responsible for enforcing the WAP and any policies or regulations that may result from it. They have also expressed the concern that along with support of the WAP comes a financial obligation for its implementation. It must be understood that the LBC WAP is an instrument for guiding NPS management for the betterment of the entirety of the LBC watershed. By supporting the LBC WAP, governments, agencies, or individuals are simply agreeing that NPS management is important for watershed health and human health and that they will consider the information and plans contained within the WAP when making decisions that have the potential to affect the natural integrity of the LBC watershed. Supporting the WAP does not mean that any entity is agreeing to a financial obligation. If they are willing to provide some assistance, it will be greatly appreciated and put to good use. But, there are no such preconceived notions of financial contributions from WAP supporters. Although the need for funding has been repeatedly mentioned throughout this WAP, without the support of the watershed community the WAP cannot be truly successful.

The partner groups and individuals that will undertake the implementation of this WAP understand the need for cooperation and compromise. They understand that the WAP is fluid and dynamic, so that it can change to meet new challenges that may present themselves. These participants are also prepared to handle the frustrations that are all too likely to occur along the way. We must hold fast to the presence of mind to keep the goals of the WAP in perspective. The WAP is intended to have long-term effects. Therefore, the goals of the WAP do not need to be accomplished overnight. Persistent and steady progress will be the ultimate measure of success.

## WAP Endorsement Signature Page

Little Beaver Creek Land Foundation ____________________

Little Beaver Creek Wild and Scenic Rivers Advisory Council ____________________

Columbiana Soil and Water Conservation District ____________________

Mahoning Soil and Water Conservation District ____________________

Columbiana County Health Department ____________________

Mahoning County Board of Health ____________________

Ohio Department of Natural Resources, Division of Watercraft, Scenic Rivers Program ____________________

Ohio Department of Natural Resources, Division of Wildlife ____________________

Ohio Department of Natural Resources, Mineral Resources Management ________________

USDA, Natural Resources Conservation Service ____________________

Columbiana County Commissioners ____________________

Mahoning County Commissioners ____________________

Carroll County Commissioners ____________________

Beaver Township Trustees ____________________

Goshen Township Trustees ____________________

Green Township Trustees ____________________

Springfield Township Trustees ____________________

Butler Township Trustees ____________________

Perry Township Trustees ____________________

Salem Township Trustees ____________________

Fairfield Township Trustees ____________________

Unity Township Trustees ____________________

Middleton Township Trustees ____________________

Elkrun Township Trustees ____________________

Center Township Trustees ____________________

Hanover Township Trustees ____________________

Franklin Township Trustees ____________________

Wayne Township Trustees ____________________

Madison Township Trustees ____________________

St. Clair Township Trustees ____________________

East Township Trustees ____________________

City of Columbiana ____________________

City of Salem ____________________

Village of Leetonia ____________________

Village of Washingtonville ____________________

Village of Lisbon ____________________

Village of New Waterford ____________________

Village of East Palestine ____________________

Village of Summitville ____________________

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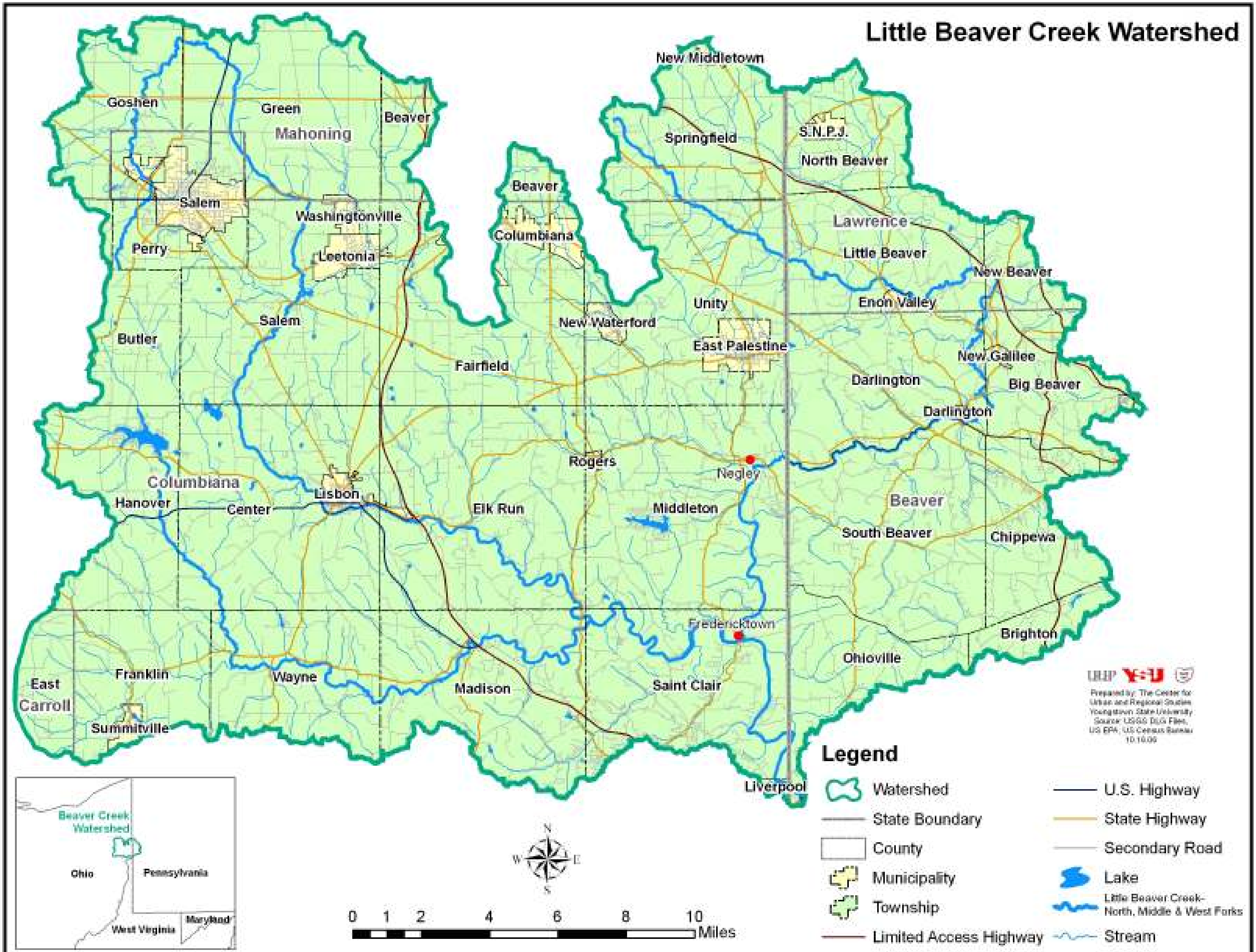
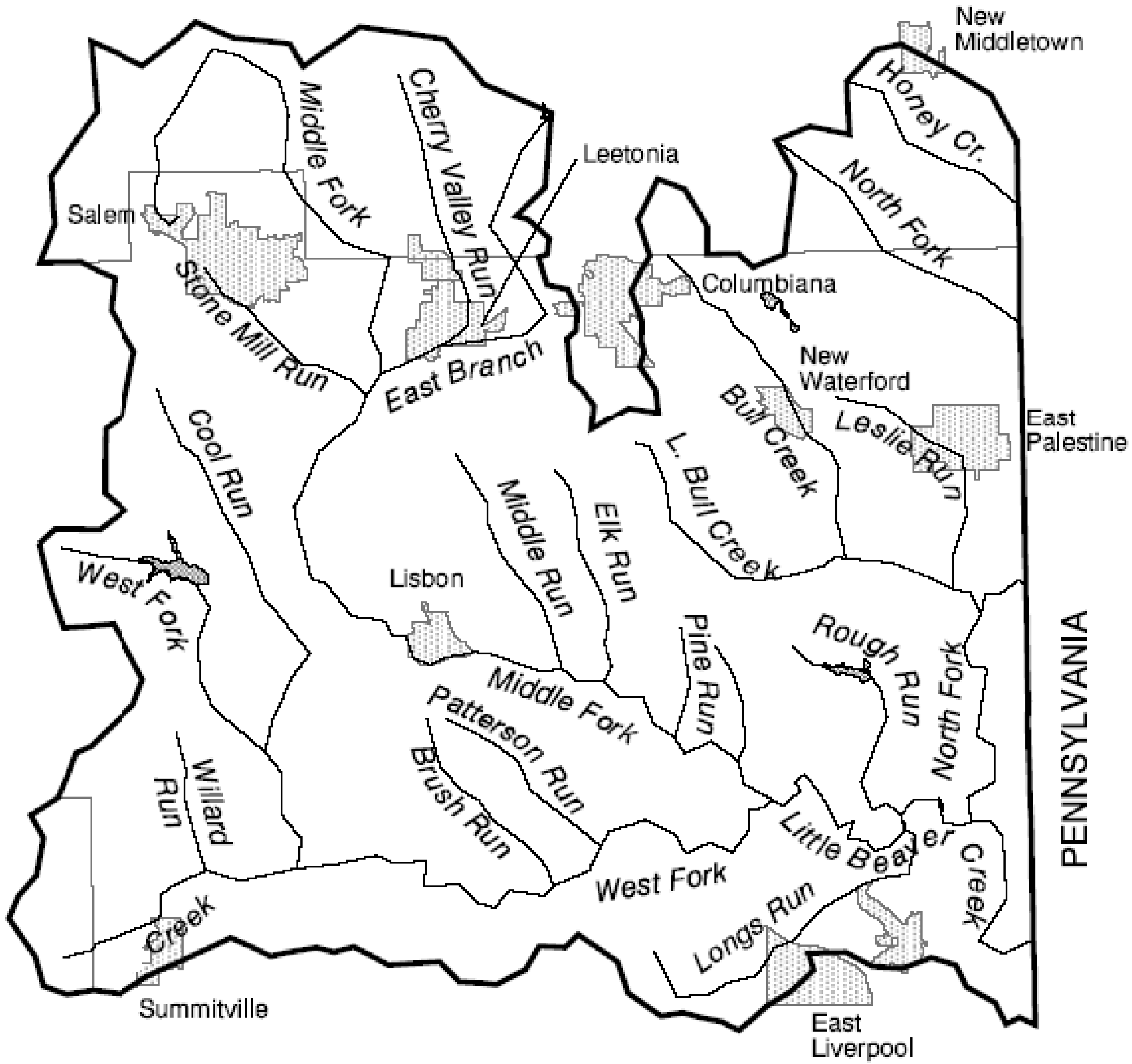
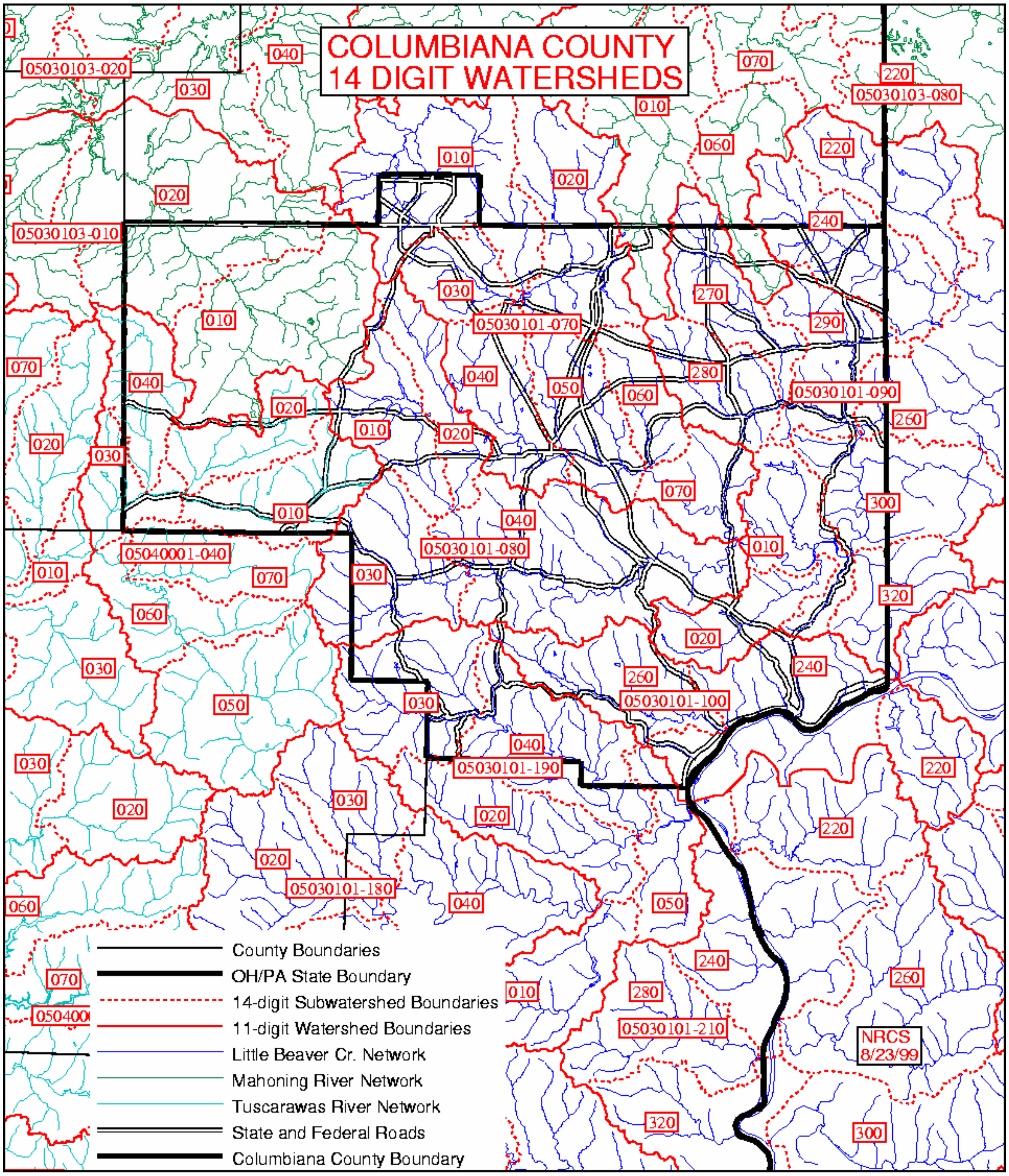


Little Beaver Creek Watershed
New Middletown
Goshen
Green
Beaver
Mahoning
Springfield
S.N.P.J.
North Beaver
Salem
Beaver
Washingtonville
Columbiana
Lawrence
Perry
Leetonia
Little Beaver
New Beaver
Enon Valley
Unity
Salem
New Waterford
Butler
East Palestine
New Galilee
Fairfield
Darlington
Big Beaver
Darlington
Rogers
Negley
Columbiana
Beaver
Lisbon
Hanover
Center
Elk Run
Middleton
South Beaver
Chippewa
Fredericktown
Brighton
Ohioville
East
Franklin
Wayne
Madison
Saint Clair
Carroll
Summitville
Liverpool
Legend
Watershed
State Boundary
County
Municipality
Township
Limited Access Highway
U.S. Highway
State Highway
Secondary Road
Lake
Little Beaver Creek-
North, Middle & West Forks
Stream
Beaver Creek
Watershed
Ohio
Pennsylvania
West Virginia
Maryland
N
W
E
S
0
1
2
4
6
8
10
Miles

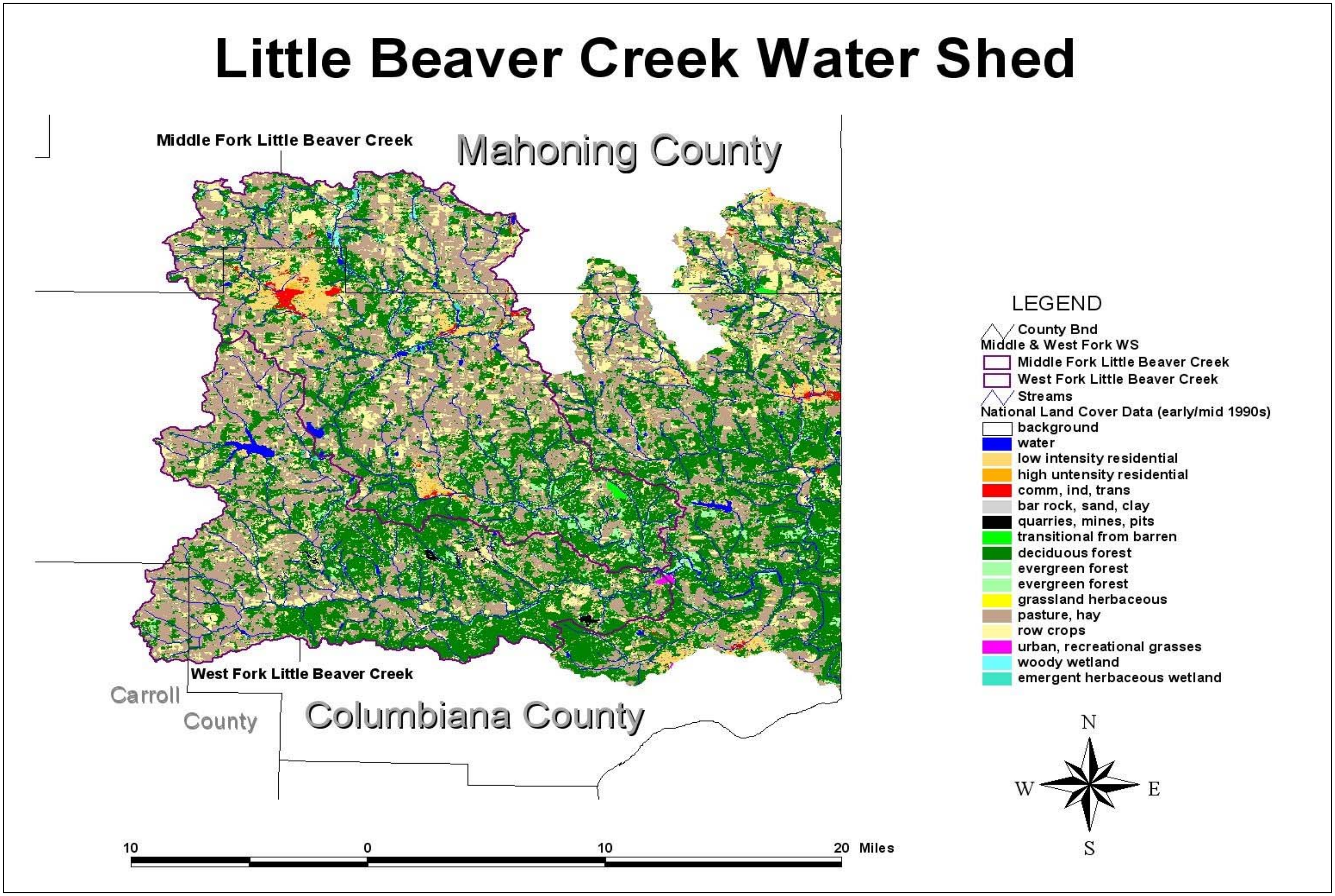
## MAP 2: Little Beaver Creek & tributaries



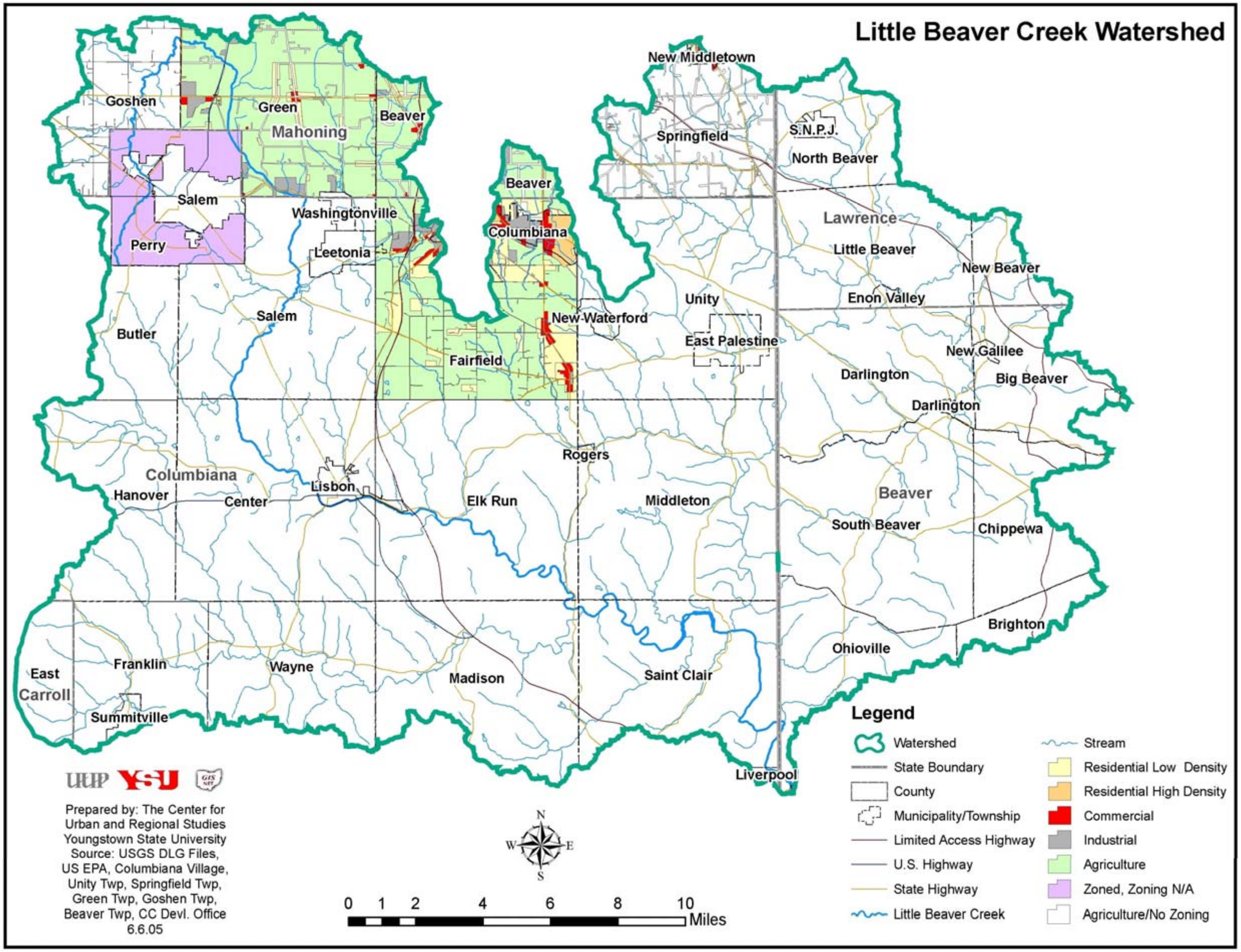
MAP 3: USGS HUC designations for the LBC watershed.



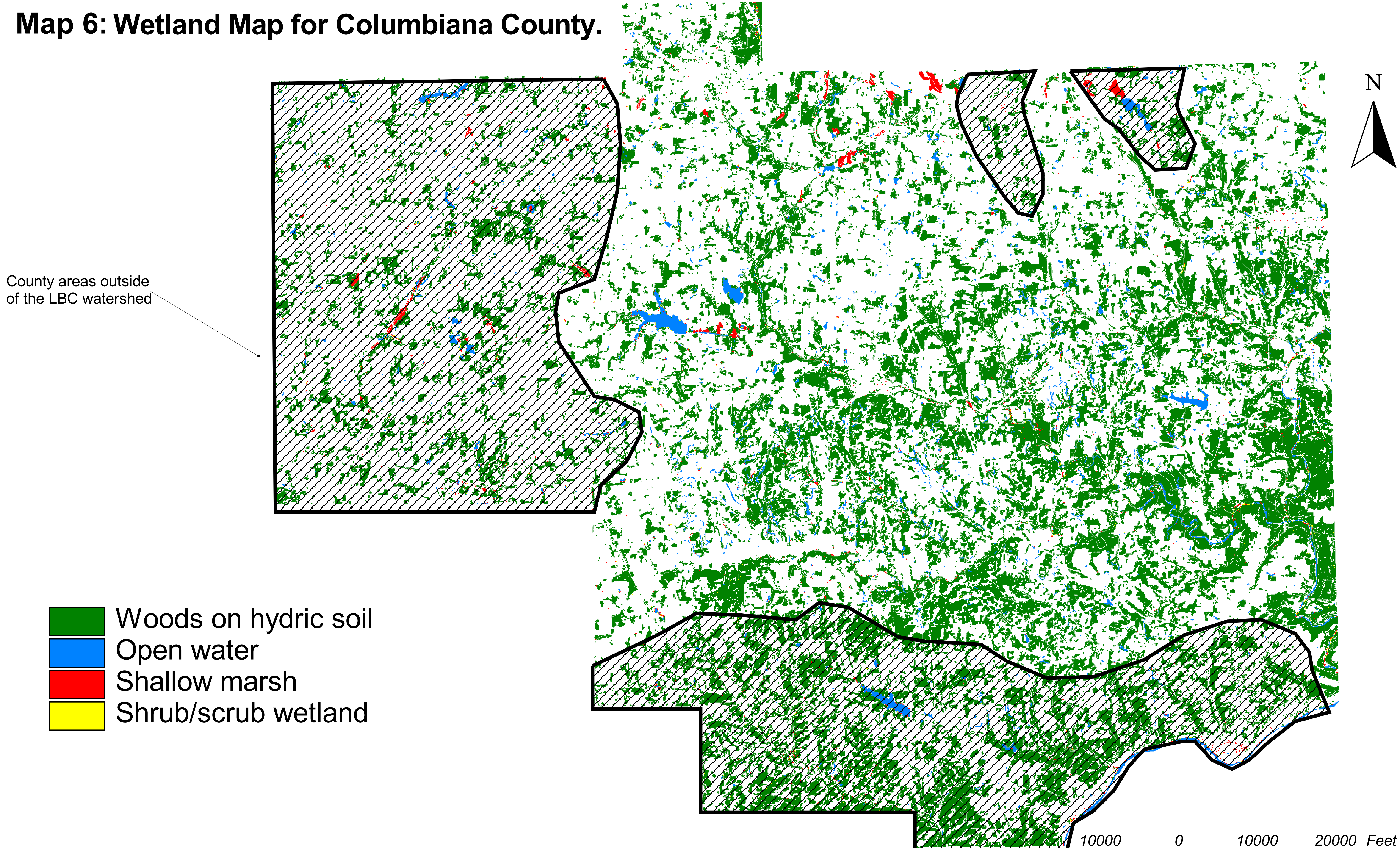
**MAP 4: Land use within the LBC watershed.**



**MAP 5: Current zoning ordinances within the LBC watershed.**

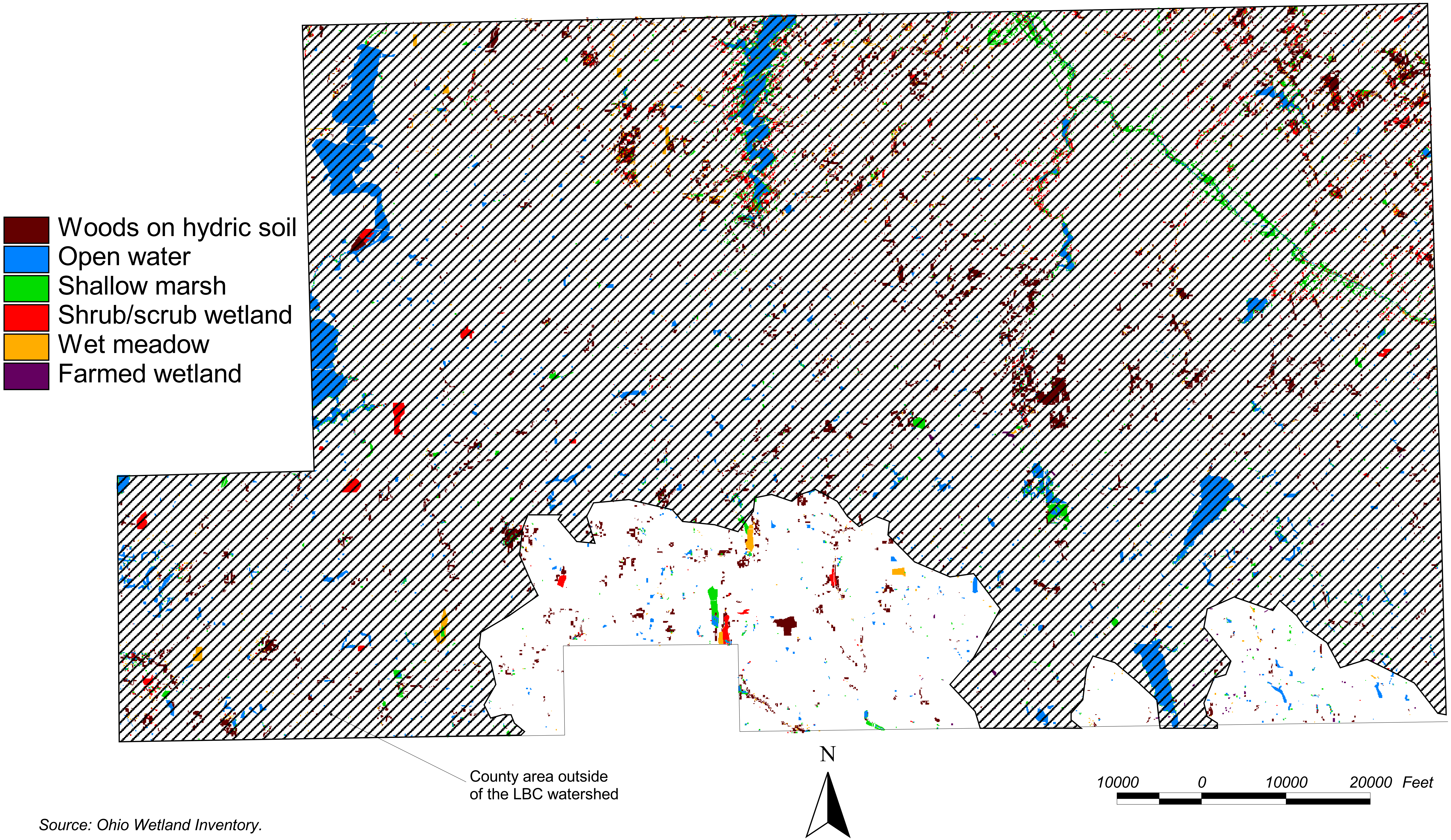


# Map 6: Wetland Map for Columbiana County.



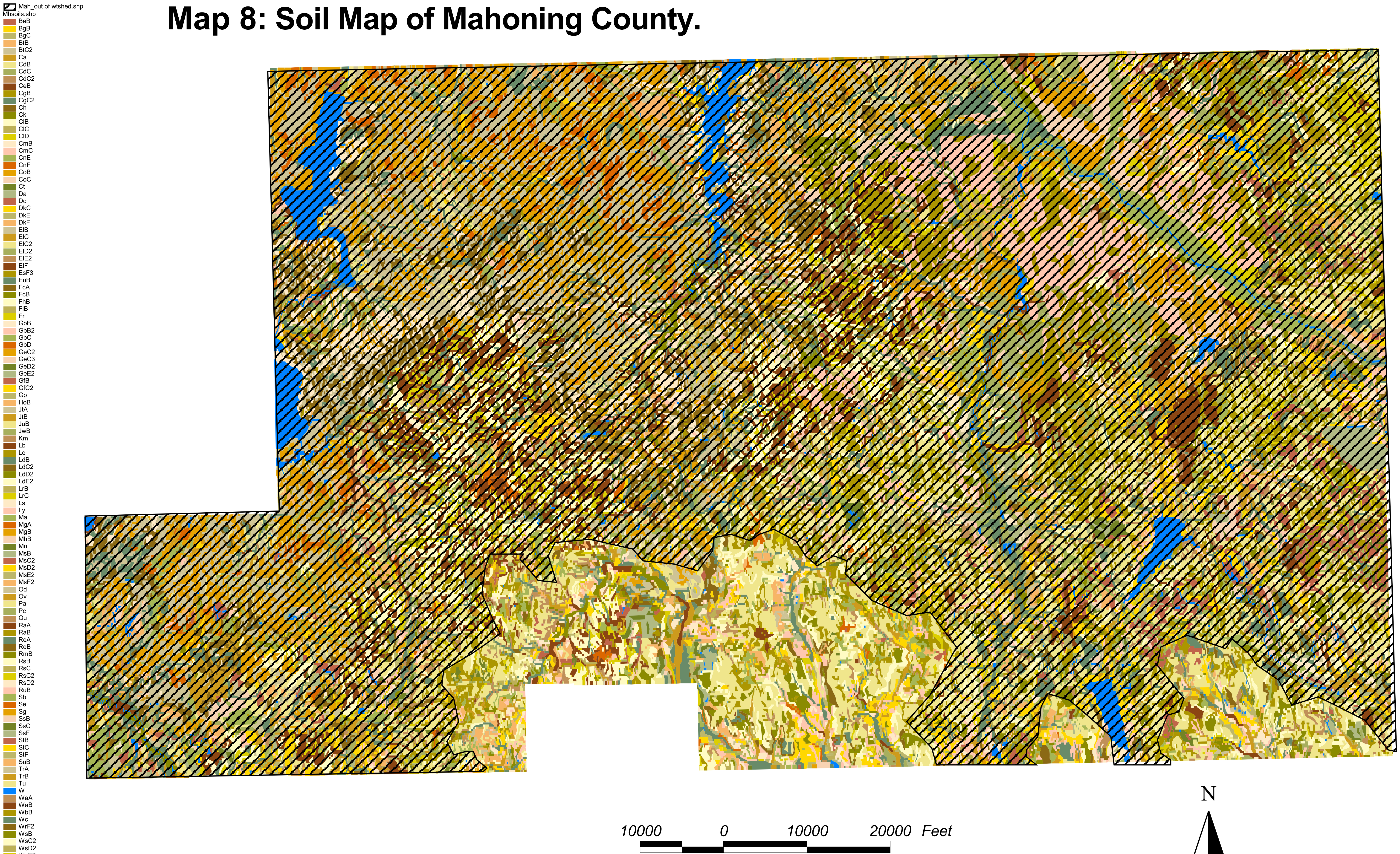

*Source: Ohio Wetland Inventory.*

# Map 7: Wetland Map for Mahoning County.



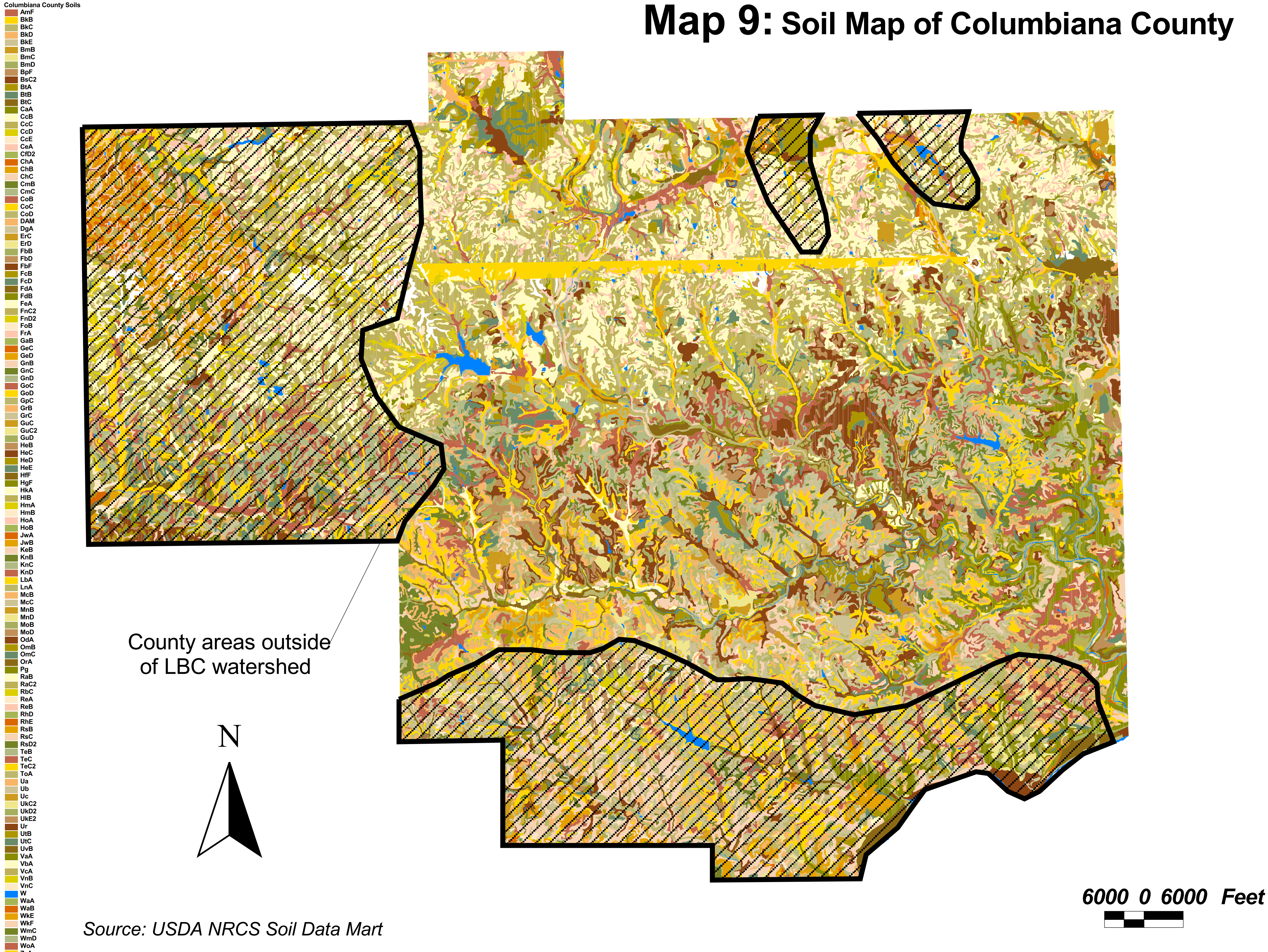

*Source: Ohio Wetland Inventory.*

# Map 8: Soil Map of Mahoning County.



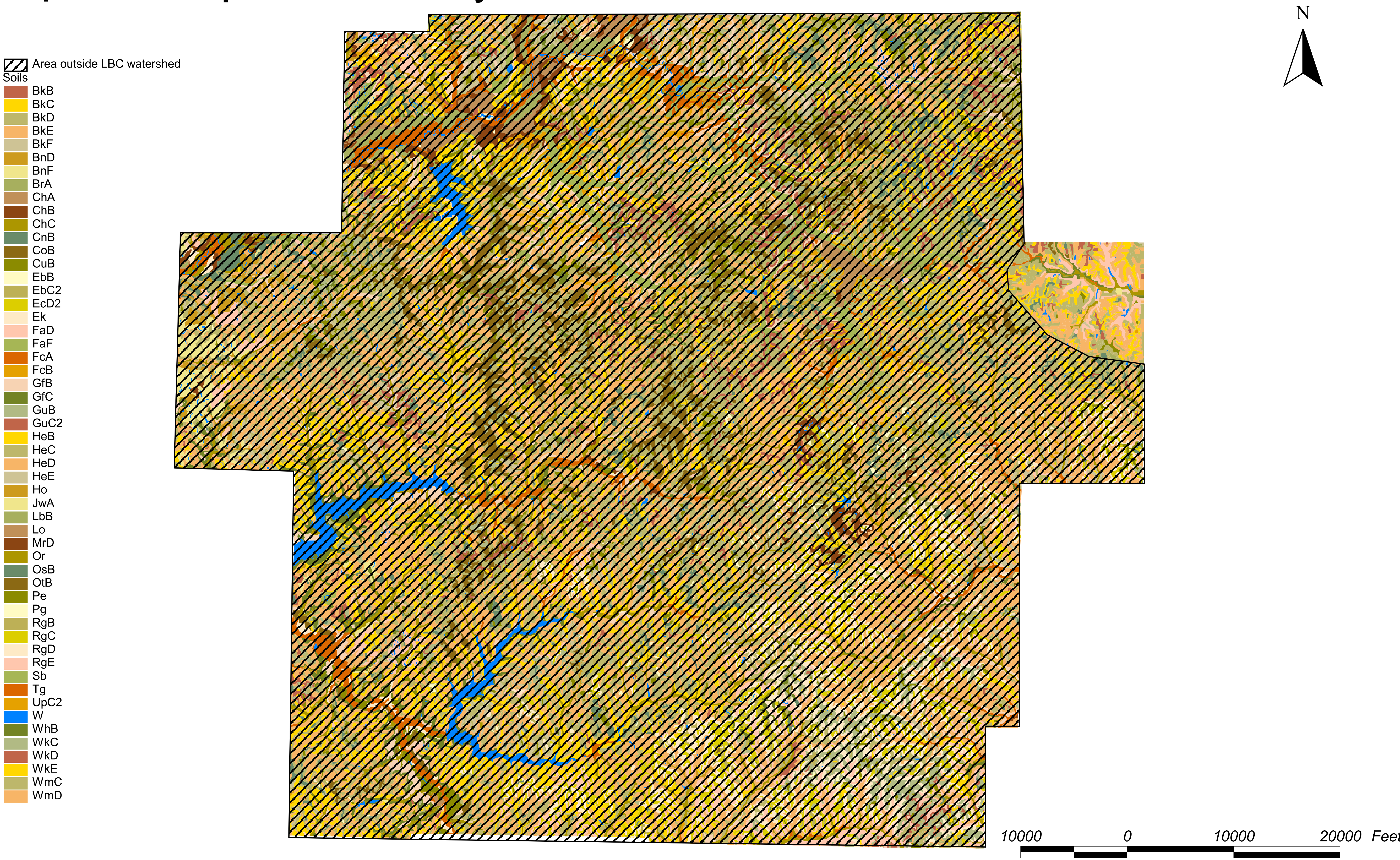

*Source: USDA SCS Soil Survey of Mahoning County, Ohio.*

# Map 9: Soil Map of Columbiana County




*Source: USDA NRCS Soil Data Mart*

# Map 10: Soil Map of Carroll County.




*Source: USDA SCS Soil Survey for Carroll County, Ohio.*

# MAP 11: Ground Water Resources of COLUMBIANA COUNTY

by
Katie Crowell

County Line

Township Line

Incorporated City Limit

1 0 1 2 Miles

1 0 1 2 Kilometers

CONTOUR INTERVAL 10 TO 20 FEET

**Well Site Symbols**

WELL INFORMATION
(SEE NOTE)

AQUIFER TYPE
Water bearing formation.

DEPTH (ft.)
Total depth of well in feet

YIELD (gpm)
Amount of water a well produces in gallons per minute.

WELL SITE
Approximate location of a well.

**75-SS-20**
**26**

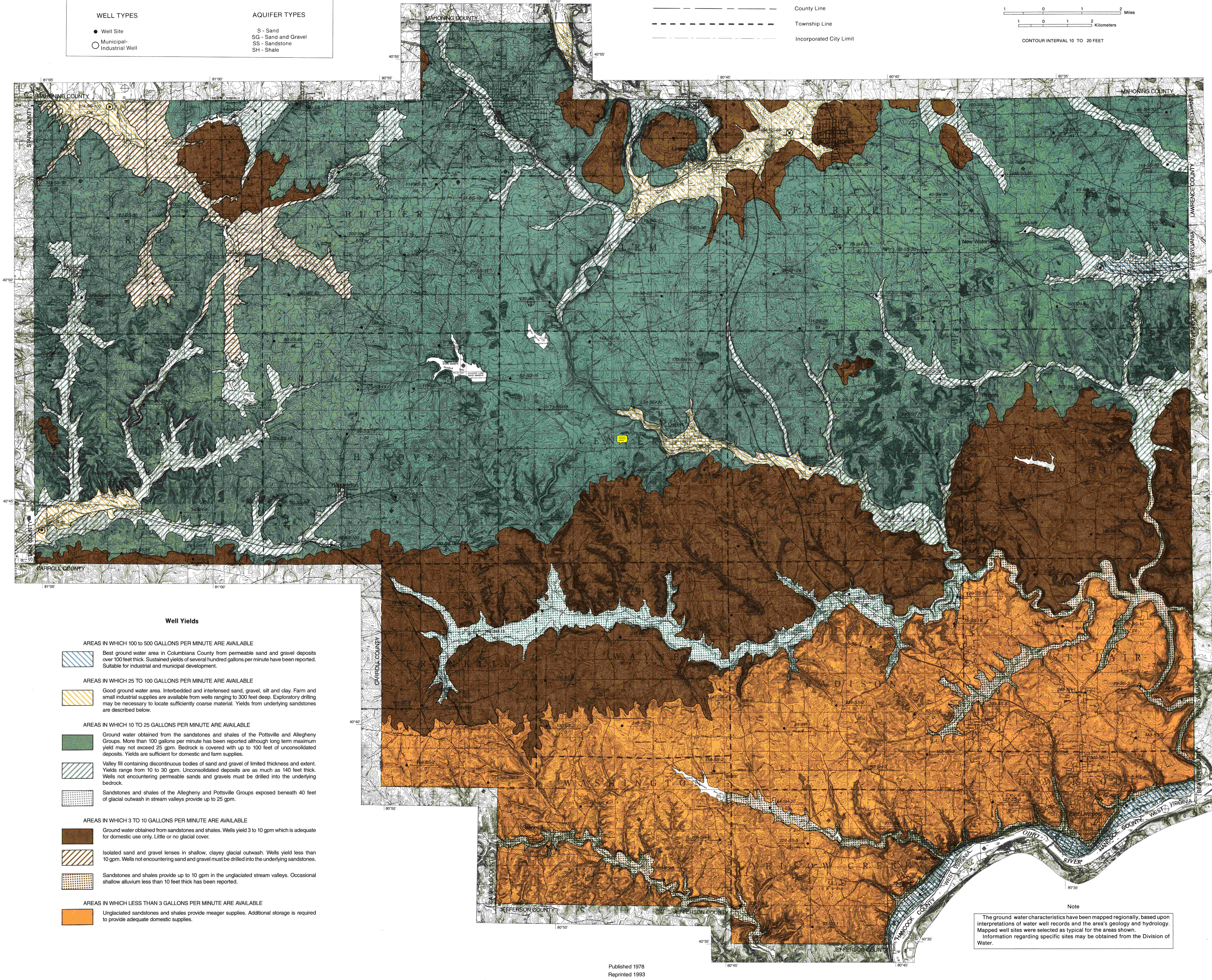
DEPTH TO BEDROCK (ft.)
Depth to bedrock in feet.

WELL TYPES

- Well Site
- Municipal-Industrial Well

AQUIFER TYPES

S - Sand
SG - Sand and Gravel
SS - Sandstone
SH - Shale




**Well Yields**

AREAS IN WHICH 100 to 500 GALLONS PER MINUTE ARE AVAILABLE

Best ground water area in Columbiana County from permeable sand and gravel deposits over 100 feet thick. Sustained yields of several hundred gallons per minute have been reported. Suitable for industrial and municipal development.

AREAS IN WHICH 25 TO 100 GALLONS PER MINUTE ARE AVAILABLE

Good ground water area. Interbedded and interlensed sand, gravel, silt and clay. Farm and small industrial supplies are available from wells ranging to 300 feet deep. Exploratory drilling may be necessary to locate sufficiently coarse material. Yields from underlying sandstones are described below.

AREAS IN WHICH 10 TO 25 GALLONS PER MINUTE ARE AVAILABLE

Ground water obtained from the sandstones and shales of the Pottsville and Allegheny Groups. More than 100 gallons per minute has been reported although long term maximum yield may not exceed 25 gpm. Bedrock is covered with up to 100 feet of unconsolidated deposits. Yields are sufficient for domestic and farm supplies.

Valley fill containing discontinuous bodies of sand and gravel of limited thickness and extent. Yields range from 10 to 30 gpm. Unconsolidated deposits are as much as 140 feet thick. Wells not encountering permeable sands and gravels must be drilled into the underlying bedrock.

Sandstones and shales of the Allegheny and Pottsville Groups exposed beneath 40 feet of glacial outwash in stream valleys provide up to 25 gpm.

AREAS IN WHICH 3 TO 10 GALLONS PER MINUTE ARE AVAILABLE

Ground water obtained from sandstones and shales. Wells yield 3 to 10 gpm which is adequate for domestic use only. Little or no glacial cover.

Isolated sand and gravel lenses in shallow, clayey glacial outwash. Wells yield less than 10 gpm. Wells not encountering sand and gravel must be drilled into the underlying sandstones.

Sandstones and shales provide up to 10 gpm in the unglaciated stream valleys. Occasional shallow alluvium less than 10 feet thick has been reported.

AREAS IN WHICH LESS THAN 3 GALLONS PER MINUTE ARE AVAILABLE

Unglaciated sandstones and shales provide meager supplies. Additional storage is required to provide adequate domestic supplies.

Note

The ground water characteristics have been mapped regionally, based upon interpretations of water well records and the area's geology and hydrology. Mapped well sites were selected as typical for the areas shown.

Information regarding specific sites may be obtained from the Division of Water.

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Reprinted 1993
Ohio Department of Natural Resources
Division of Water
Ground Water Resources Section
1939 Fountain Square
Columbus, Ohio 43224

Total copies printed: 500
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Publication date: 3/93

George V. Voinovich
Governor
Frances S. Buchholzer
Director

Xiaoning Jiang, Cartographer

# MAP 12: Ground-Water Resources of MAHONING COUNTY

by

Katie Shafer Crowell

AREAS IN WHICH 100 TO 500 GALLONS PER MINUTE ARE AVAILABLE

Excellent ground-water area. Pennsylvanian sandstone aquifer underlies 100 feet of permeable sand and gravel. Sustained yields of 200 gallons per minute are available from wells averaging over 300 feet deep. Area is suitable for municipal and industrial development.

Best ground-water area in Mahoning County. Permeable sand and gravel deposits over 100 feet thick provide sustained yields of several hundred gallons per minute. Supply is sufficient for municipal and industrial use.

AREAS IN WHICH 25 TO 100 GALLONS PER MINUTE ARE AVAILABLE

Ground water obtained from Pennsylvanian and Mississipian sandstones overlain by 30 to 40 feet of glacial debris. Principal aquifers are the Berea and Sharon sandstones. Wells will produce sustained yields of 50 to 80 gallons per minute. Greater yields, up to 200 gallons per minute, may be available for intermittant pumping. This area is suitable for small industrial and municipal development.

Good ground-water area. Valley fill contains deposits of sand and gravel 200 feet thick in the central portion of the county. Wells encountering coarse gravel yield over 100 gallons per minute. Exploratory drilling may be necessary to locate such deposits. Reliable yields of 40 to 60 gallons per minute are sufficient for small industrial and farm supplies.

AREAS IN WHICH 10 TO 25 GALLONS PER MINUTE ARE AVAILABLE

Mississippian and Pennsylvanian sandstones produce 10 to 25 gallons per minute of ground water. Bedrock is covered with up to 40 feet of unconsolidated deposits. Supply is sufficient for domestic and farm use.

Valley fill containing sand and gravel deposits 100 feet thick in the western portion of the county, discontinuous and limited in thickness and extent in the eastern portion. Yields range from 10 to 30 gallons per minute. Wells not encountering permeable sands and gravels must be drilled into the underlying bedrock.

AREAS IN WHICH 3 TO 10 GALLONS PER MINUTE ARE AVAILABLE

Mississippian sandy shales and shales have reported yields from 4 to 25 gallons per minute with a reliable yield of less than 10 gallons per minute. Glacial cover ranges from 0 to 70 feet in thickness. Supply is adequate for domestic use only.

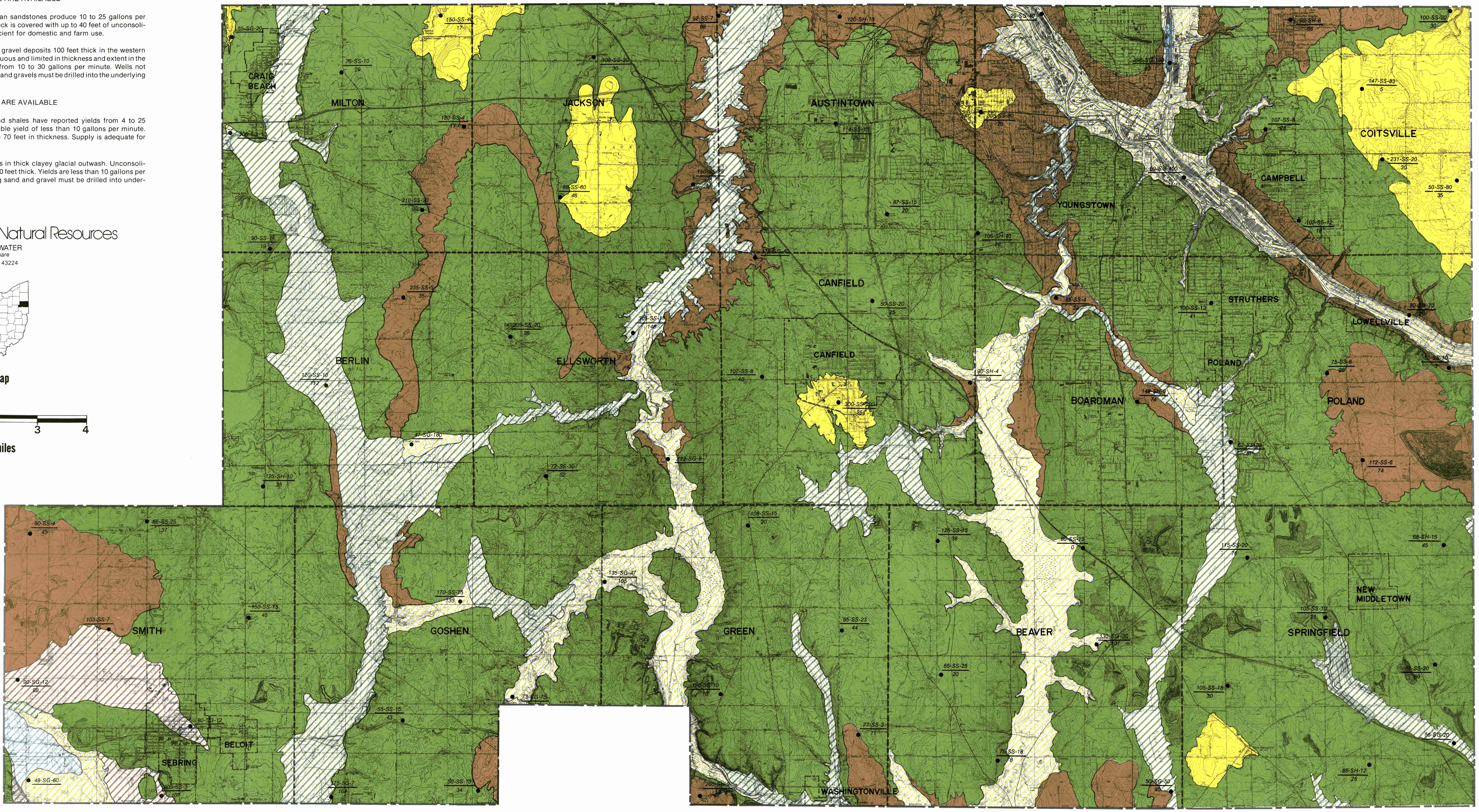
Isolated sand and gravel lenses in thick clayey glacial outwash. Unconsolidated material is as much as 100 feet thick. Yields are less than 10 gallons per minute. Wells not encountering sand and gravel must be drilled into underlying sandy shales.

Ohio Department of Natural Resources
DIVISION OF WATER
Fountain Square
Columbus, Ohio 43224

Index Map

0 1 2 3 4

Scale in miles




Depth (ft.)-Water-bearing Formation-Yield (gpm)

Depth to Bedrock (ft.)

• Water Well

SS-Sandstone SH-Shale

SG-Sand & Gravel

N

PUBLISHED, 1979

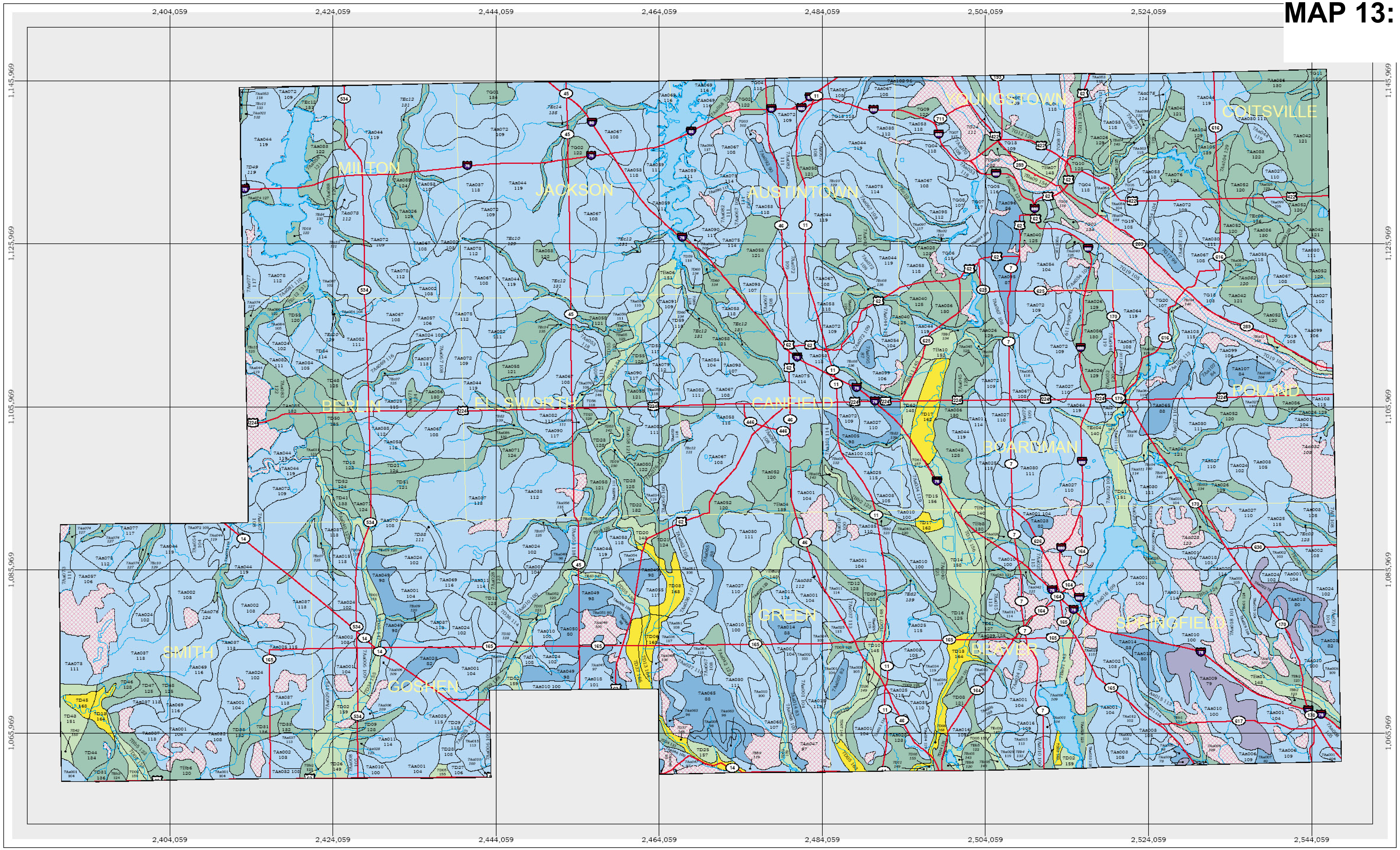
CARTOGRAPHY: TARRY A. CRUMLEY

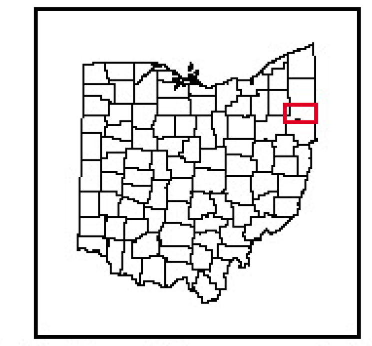
# MAP 13: Ground Water Pollution Potential of Mahoning County


*by*

*Michael P. Angle*

*Ohio Department of Natural Resources*

Ground Water Pollution Potential maps are designed to evaluate the susceptibility of ground water to contamination from surface sources. These maps are based on the DRASTIC system developed for the USEPA (Aller et al., 1987). The DRASTIC system consists of two major elements: the designation of mappable units, termed hydrogeologic settings, and a relative rating system for determining the ground water pollution potential within a hydrogeologic setting. The application of DRASTIC to an area requires the recognition of a set of assumptions made in the development of the system. The evaluation of pollution potential of an area assumes that a contaminant with the mobility of water is introduced at the surface and is flushed into the ground water by precipitation. DRASTIC is not designed to replace specific on-site investigations.

In DRASTIC mapping, hydrogeologic settings form the basis of the system and incorporate the major hydrogeologic factors that affect and control ground water movement and occurrence. The relative rating system is based on seven hydrogeologic factors: Depth to water, net Recharge, Aquifer media, Soil media, Topography, Impact of the vadose zone media, and hydraulic Conductivity. These factors form the acronym DRASTIC. The relative rating system uses a combination of weights and ratings to produce a numerical value called the ground water pollution potential index. Higher index values indicate higher susceptibility to ground water contamination. Polygons (outlined in black on the map at left) are regions where the hydrogeologic setting and the pollution potential index are combined to create a mappable unit with specific hydrogeologic characteristics, which determine the region's relative vulnerability to contamination. Additional information on the DRASTIC system, hydrogeologic settings, ratings, and weighting factors is included in the report.

## Description of Map Symbols

Hydrogeologic Region → 7D24 ← Hydrogeologic Setting

170 ← Relative Pollution Potential

## Legend

Colors are used to depict the ranges in the pollution potential indexes shown below. Warm colors (red, orange, yellow) represent areas of higher vulnerability (higher pollution potential indexes), while cool colors (green, blue, violet) represent areas of lower vulnerability to contamination (lower pollution potential indexes).

- Roads
- Streams
- Lakes
- Townships

**Index Ranges**

- Not Rated
- Less Than 79
- 80 - 99
- 100 - 119
- 120 - 139
- 140 - 159
- 160 - 179
- 180 - 199
- Greater Than 200

*Black grid represents the State Plane South Coordinate System (NAD27, feet).*

0 1 2 3 4 5
Miles

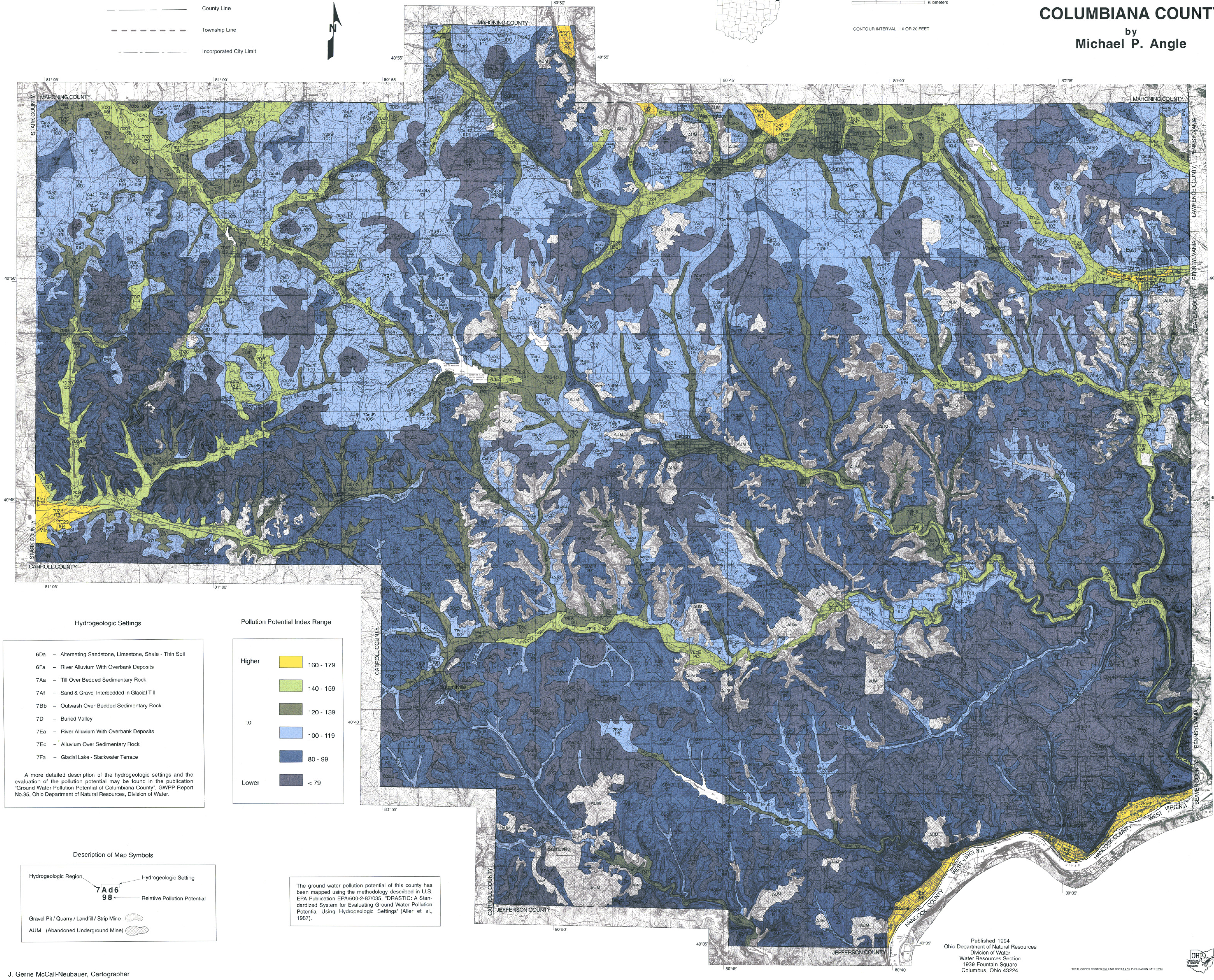
0 1 2 4 6 8
Kilometers


Ohio Department of Natural Resources
Division of Water
Ground Water Resources Section
1939 Fountain Square
Columbus Ohio 43224
www.dnr.state.oh.us
2003

# MAP 14: Ground Water Pollution Potential of COLUMBIANA COUNTY

by

**Michael P. Angle**




## Hydrogeologic Settings

| | | |
|---|---|---|
| 6Da | – | Alternating Sandstone, Limestone, Shale - Thin Soil |
| 6Fa | – | River Alluvium With Overbank Deposits |
| 7Aa | – | Till Over Bedded Sedimentary Rock |
| 7Af | – | Sand & Gravel Interbedded in Glacial Till |
| 7Bb | – | Outwash Over Bedded Sedimentary Rock |
| 7D | – | Buried Valley |
| 7Ea | – | River Alluvium With Overbank Deposits |
| 7Ec | – | Alluvium Over Sedimentary Rock |
| 7Fa | – | Glacial Lake - Slackwater Terrace |

A more detailed description of the hydrogeologic settings and the evaluation of the pollution potential may be found in the publication "Ground Water Pollution Potential of Columbiana County", GWPP Report No.35, Ohio Department of Natural Resources, Division of Water.

## Pollution Potential Index Range

| | |
|---|---|
| Higher | 160 - 179 |
| | 140 - 159 |
| | 120 - 139 |
| to | 100 - 119 |
| | 80 - 99 |
| Lower | < 79 |

## Description of Map Symbols

Hydrogeologic Region — 7Ad6 — Hydrogeologic Setting
98 — Relative Pollution Potential

Gravel Pit / Quarry / Landfill / Strip Mine

AUM (Abandoned Underground Mine)

The ground water pollution potential of this county has been mapped using the methodology described in U.S. EPA Publication EPA/600-2-87/035, "DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings" (Aller et al., 1987).

J. Gerrie McCall-Neubauer, Cartographer

Published 1994
Ohio Department of Natural Resources
Division of Water
Water Resources Section
1939 Fountain Square
Columbus, Ohio 43224

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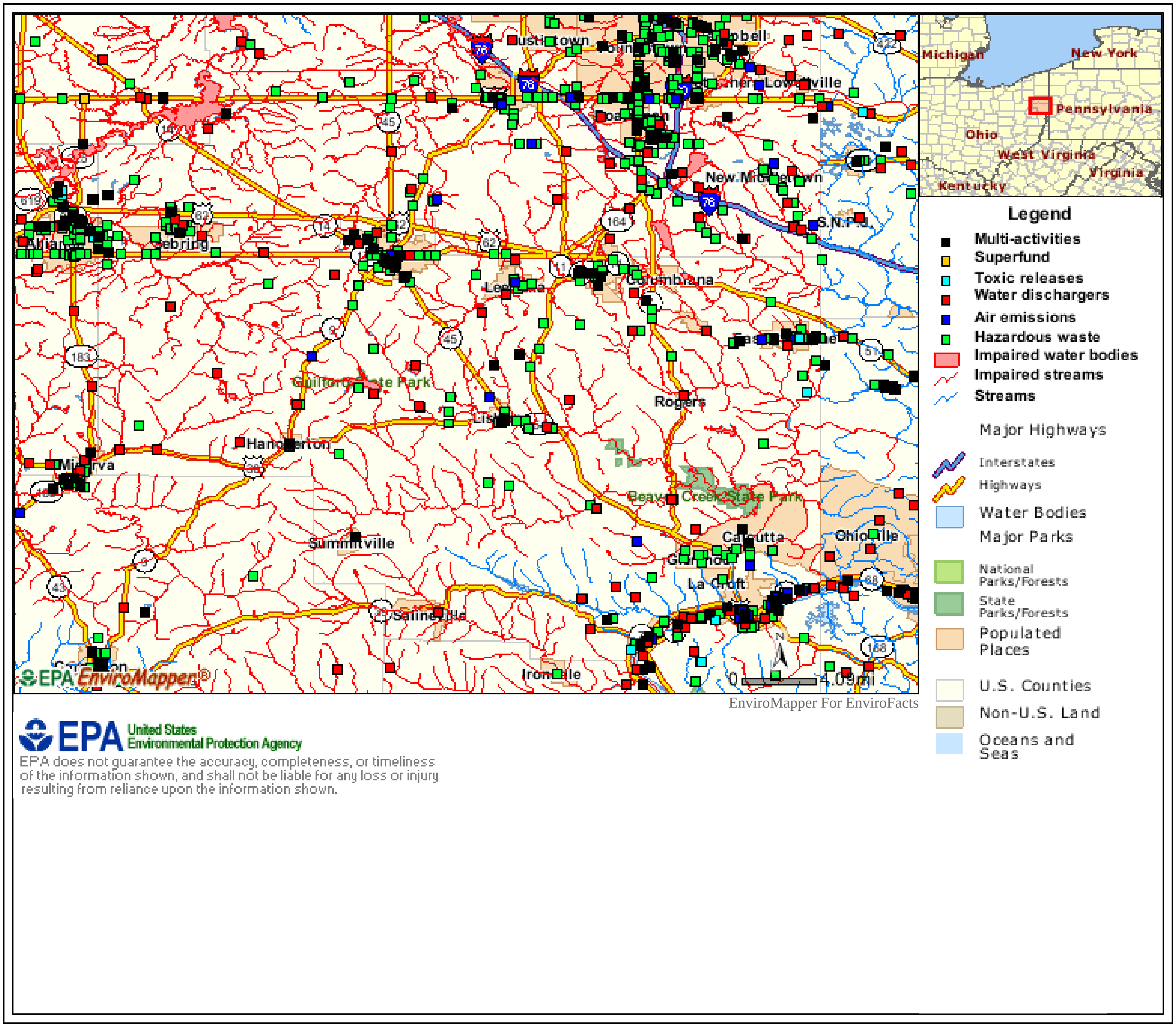
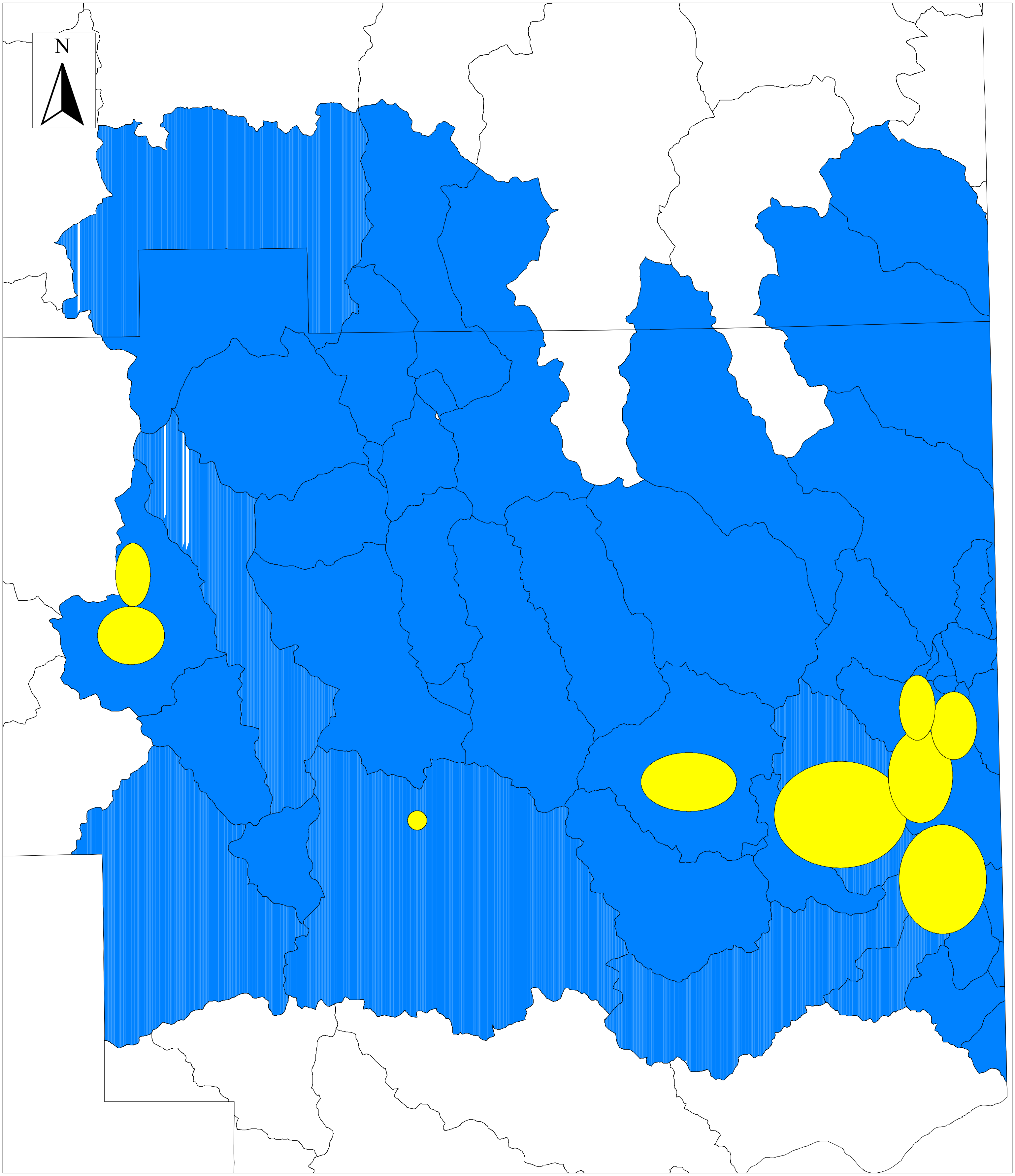
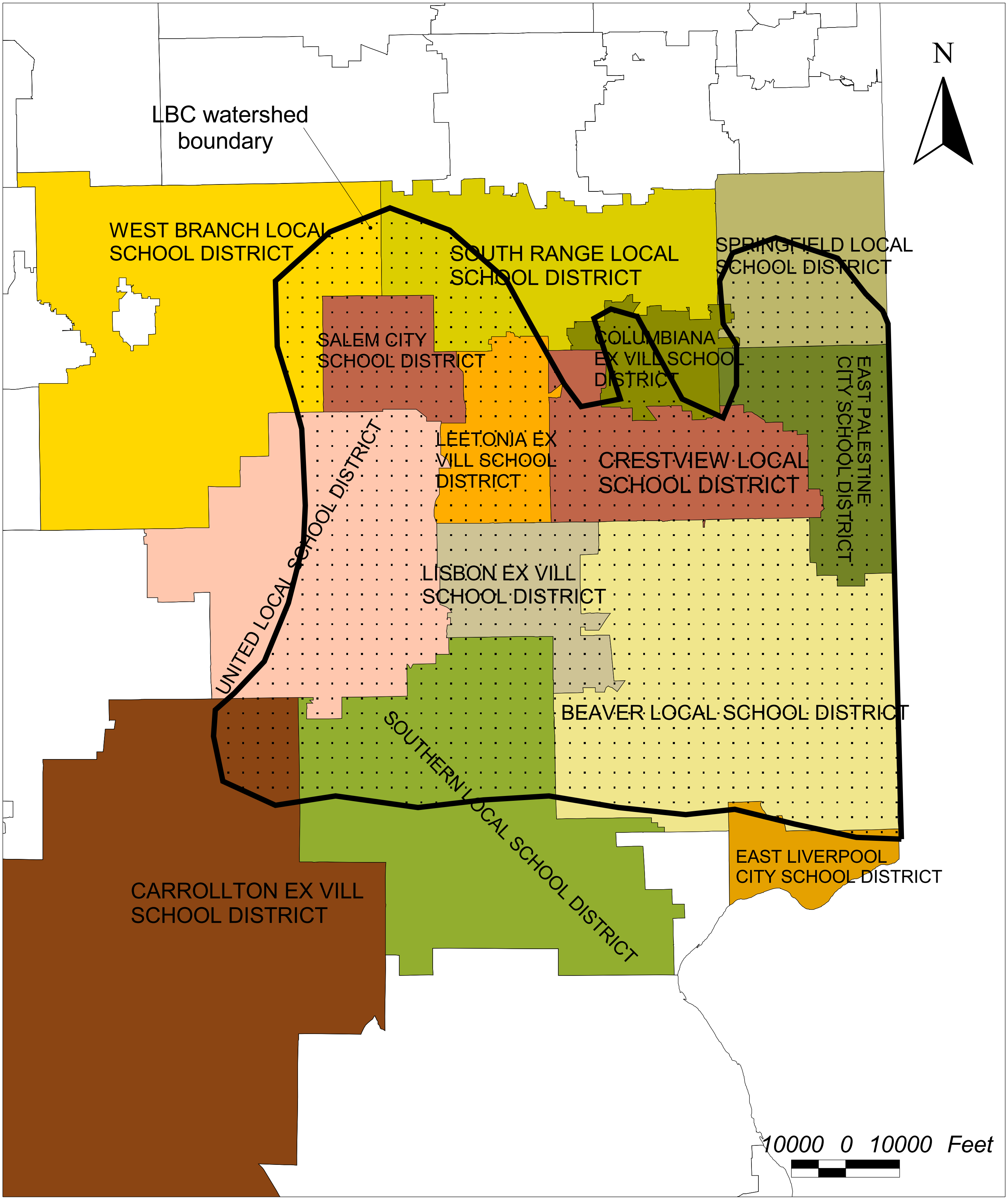
George V. Voinovich
Governor
Frances S. Buchholzer
Director

Map 16: USEPA Enviromapper for the LBC watershed.





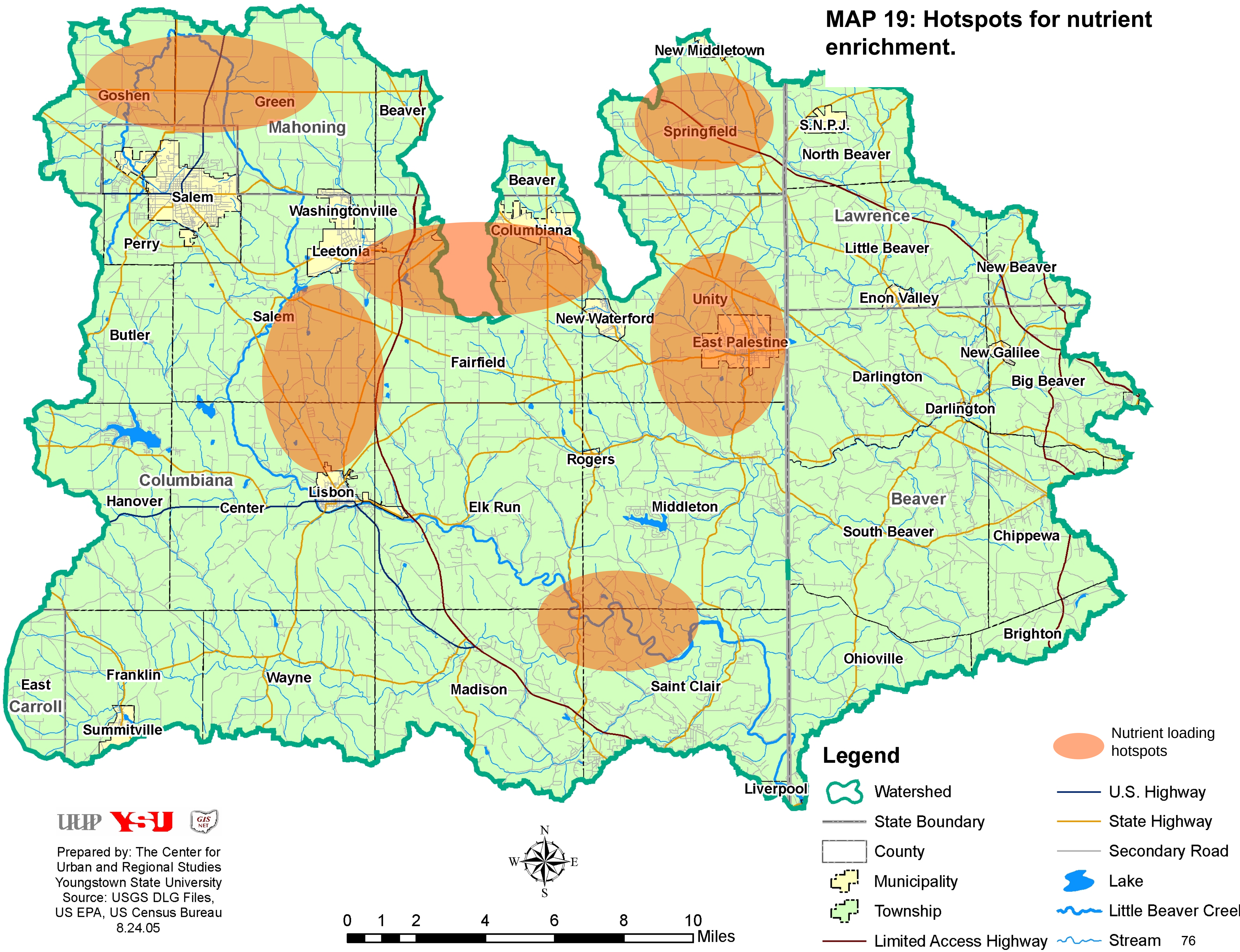

**Map 17:** **LBC Watershed Easements and Protected Lands.**
Areas under easements or managed by state/local park districts.



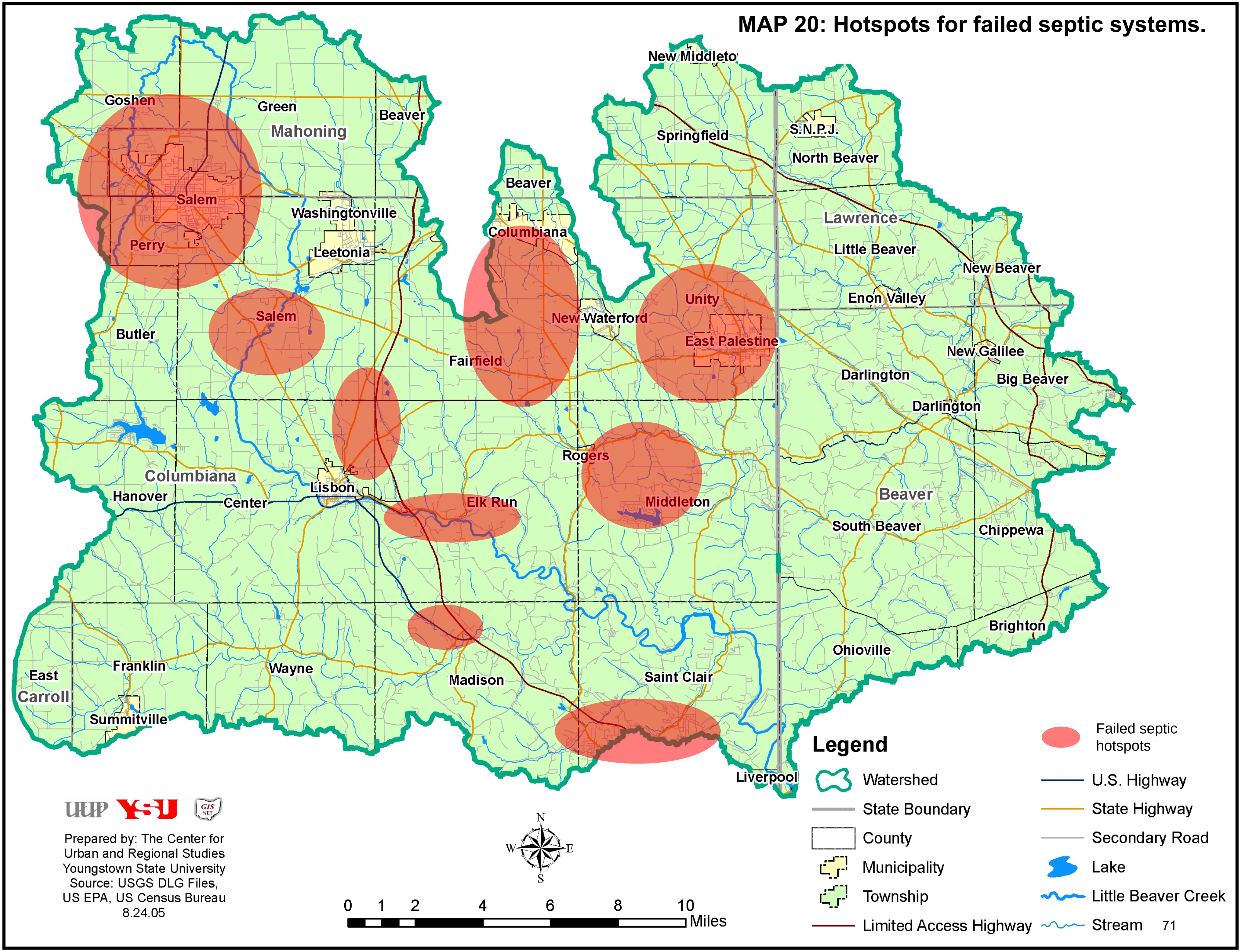

**Map 18:** **School Districts within the LBC Watershed.**

*Source: Ohio Department of Education.*

# MAP 19: Hotspots for nutrient enrichment.

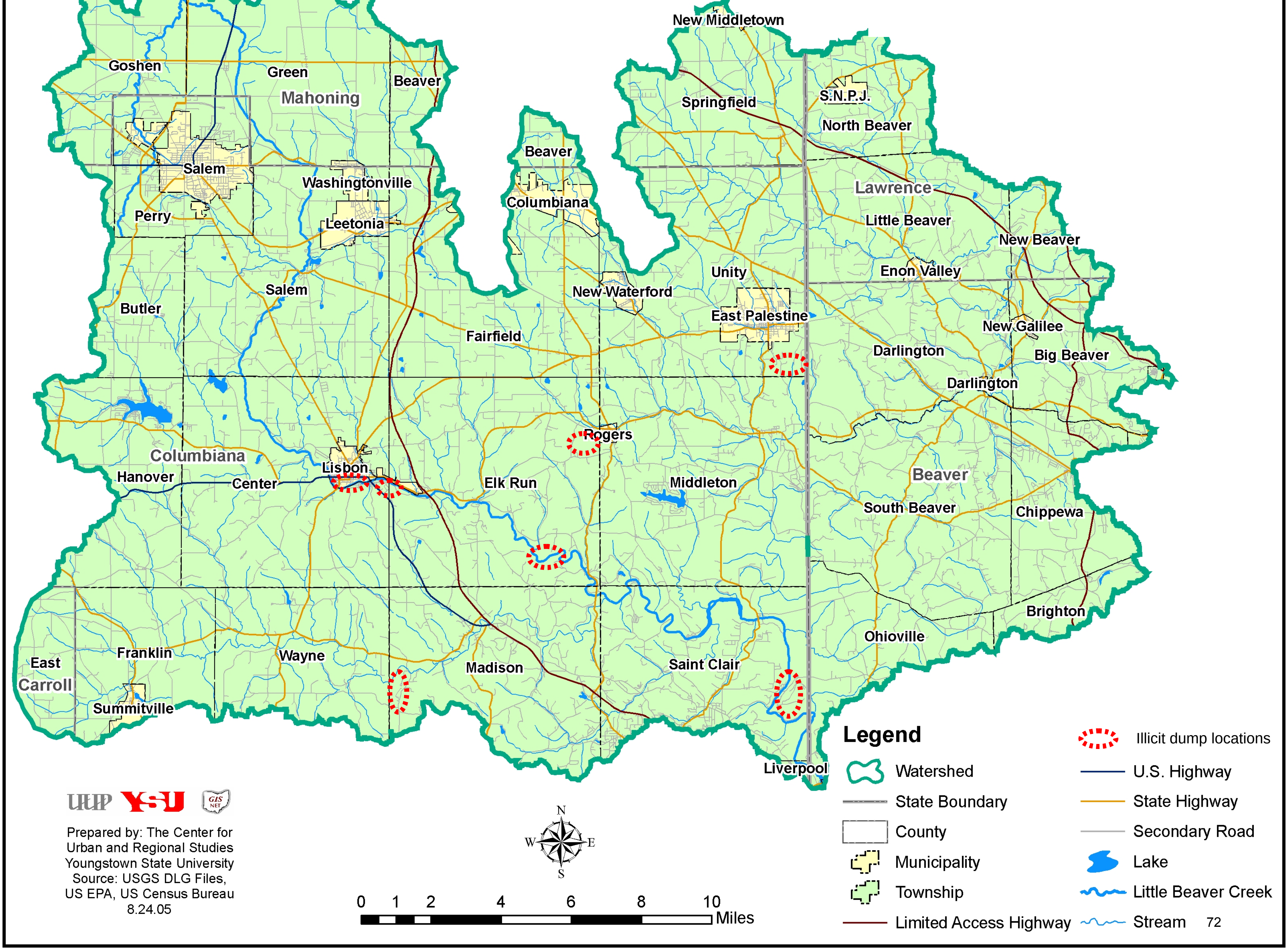



Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: USGS DLG Files, US EPA, US Census Bureau
8.24.05

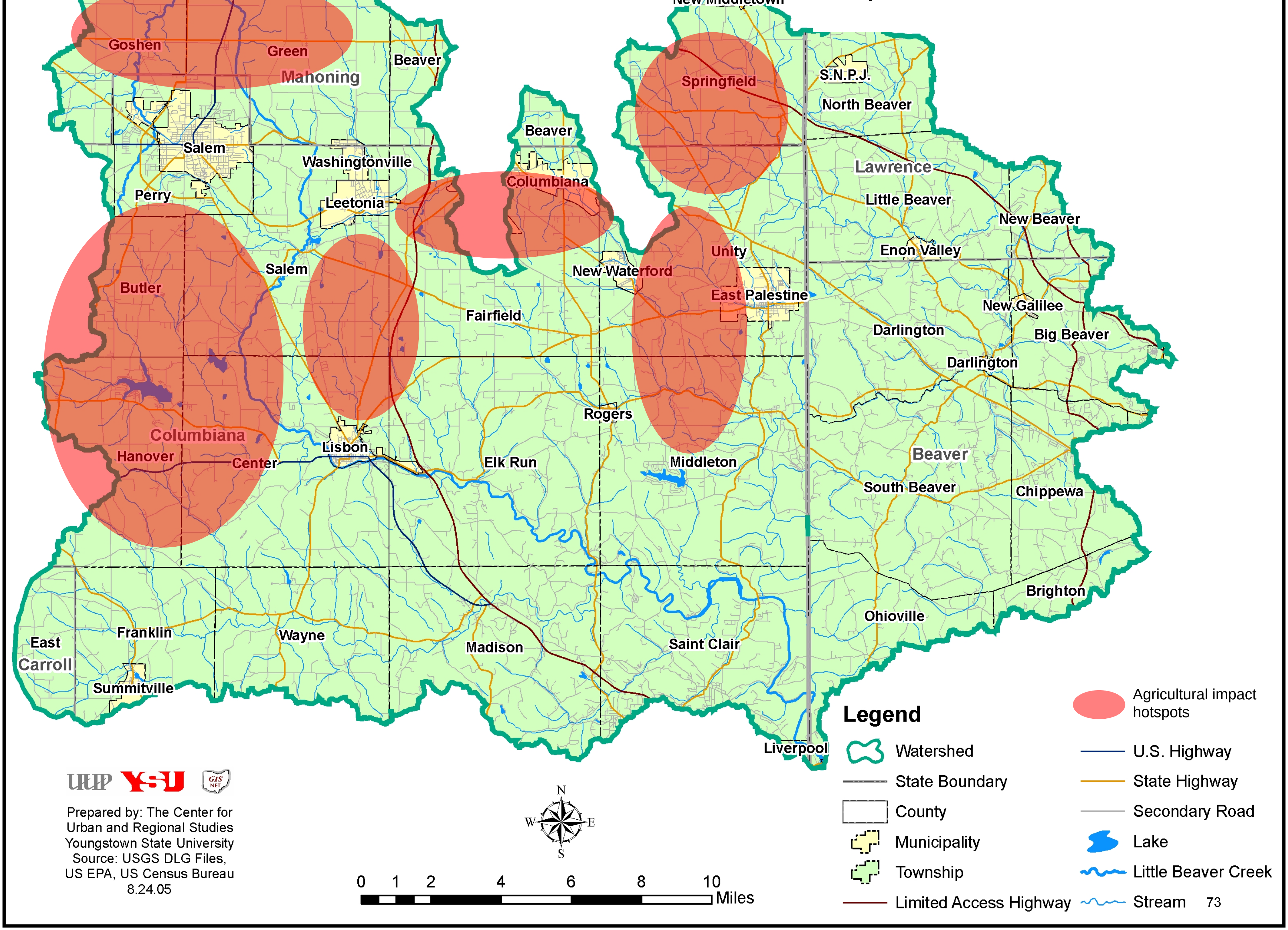


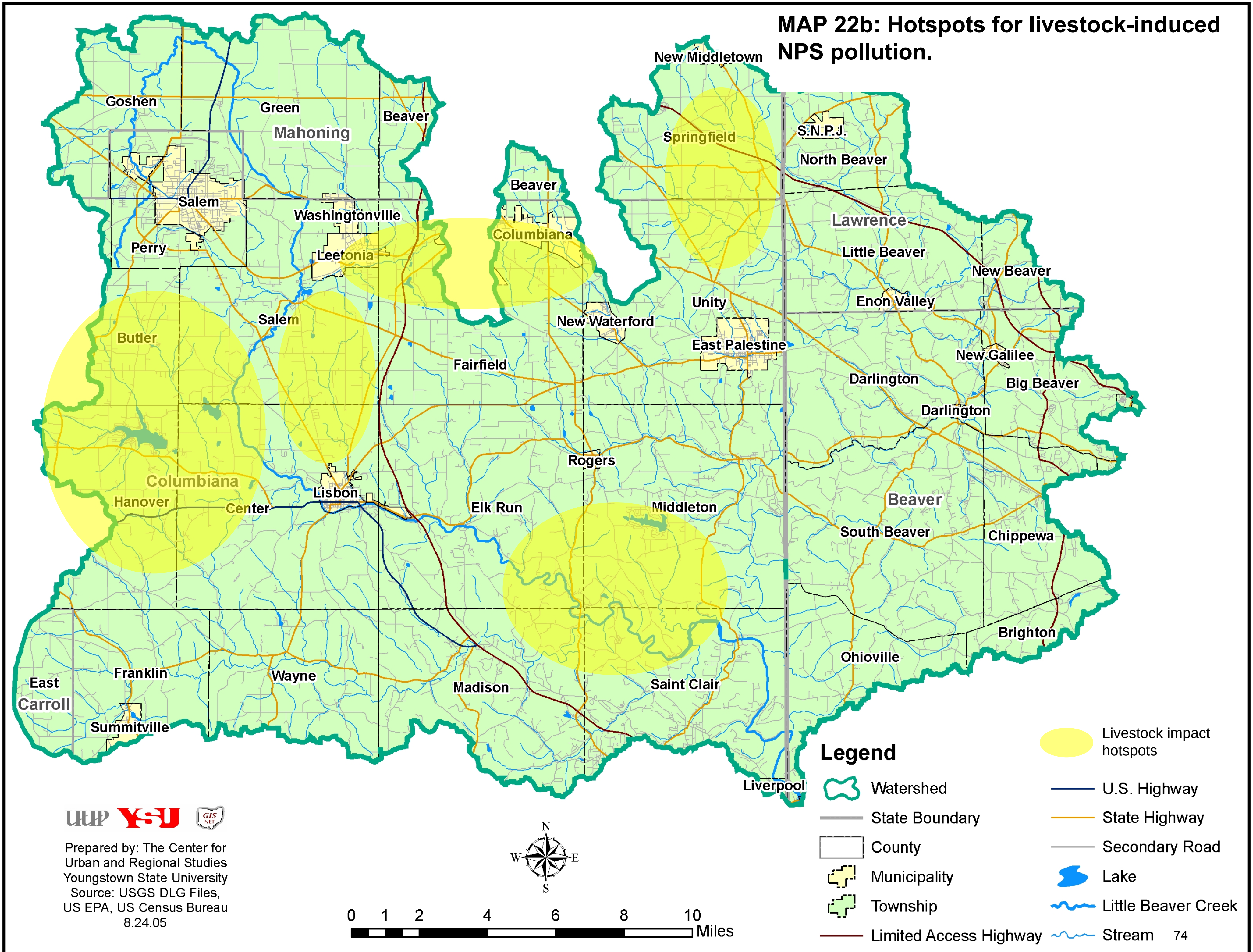

MAP 20: Hotspots for failed septic systems.

# MAP 21: Hotspots for illicit dumps.



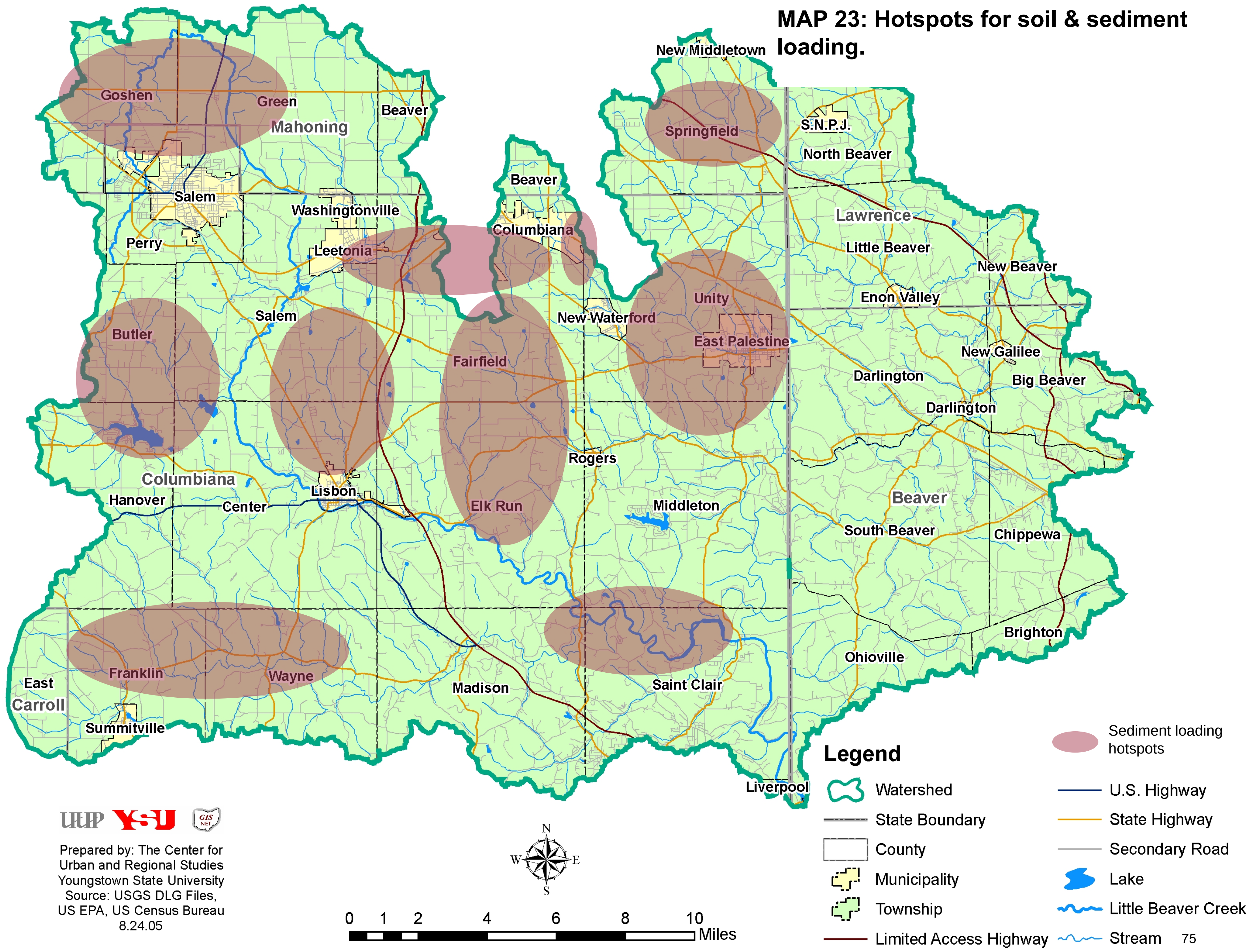
## MAP 22a: Hotspots for crop production NPS pollution.



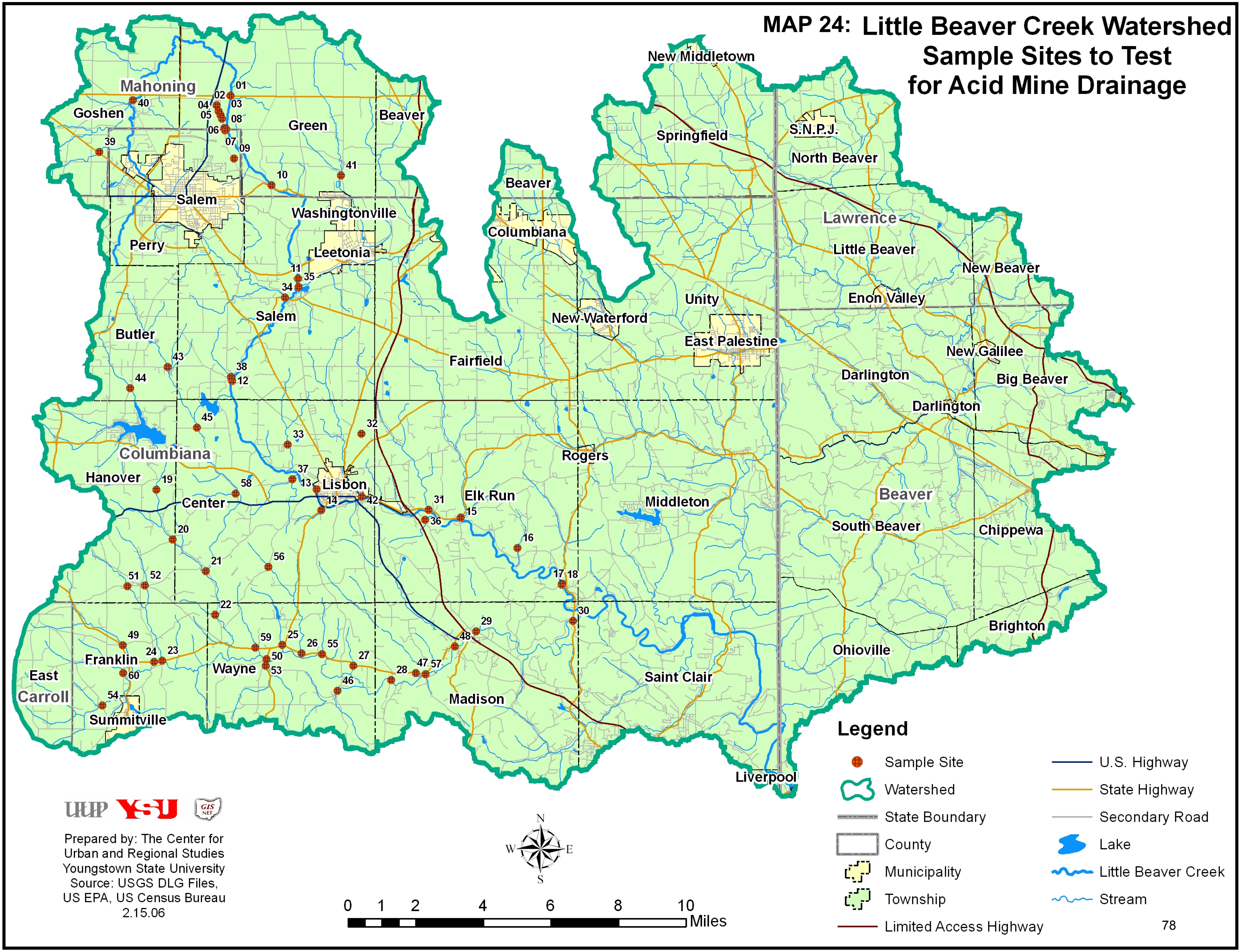


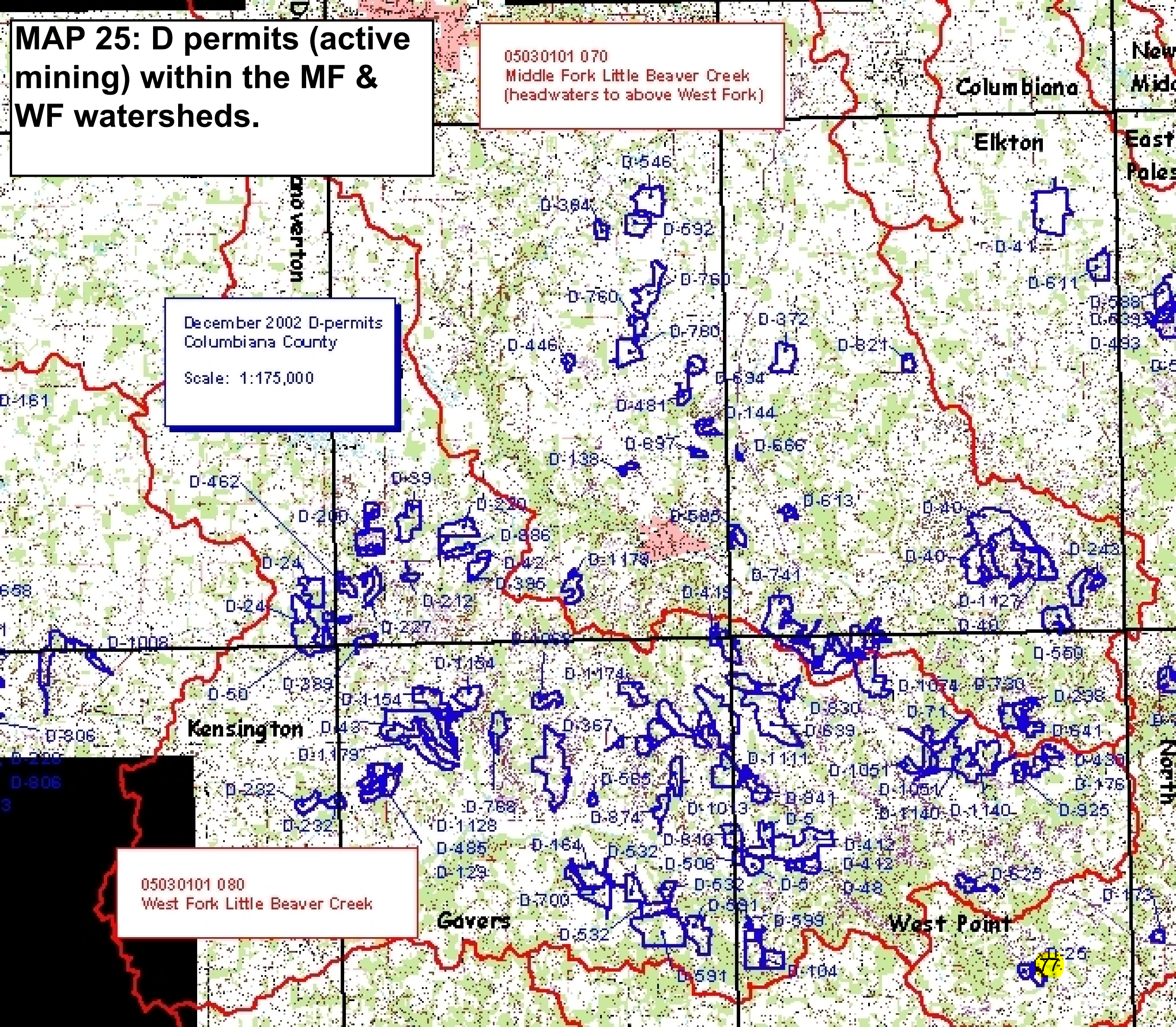
MAP 22b: Hotspots for livestock-induced NPS pollution.
Goshen
Green
Mahoning
Beaver
Salem
Perry
Washingtonville
Leetonia
Beaver
Columbiana
New Middletown
Springfield
S.N.P.J.
North Beaver
Lawrence
Little Beaver
New Beaver
Enon Valley
Unity
New Waterford
East Palestine
Salem
Butler
Fairfield
New Galilee
Big Beaver
Darlington
Darlington
Rogers
Columbiana
Hanover
Center
Lisbon
Elk Run
Middleton
Beaver
South Beaver
Chippewa
Brighton
Ohioville
East
Carroll
Franklin
Wayne
Madison
Saint Clair
Summitville
Liverpool
Legend
Watershed
State Boundary
County
Municipality
Township
Limited Access Highway
Livestock impact hotspots
U.S. Highway
State Highway
Secondary Road
Lake
Little Beaver Creek
Stream
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: USGS DLG Files, US EPA, US Census Bureau
8.24.05
0 1 2 4 6 8 10 Miles
N S E W

# MAP 23: Hotspots for soil & sediment loading.



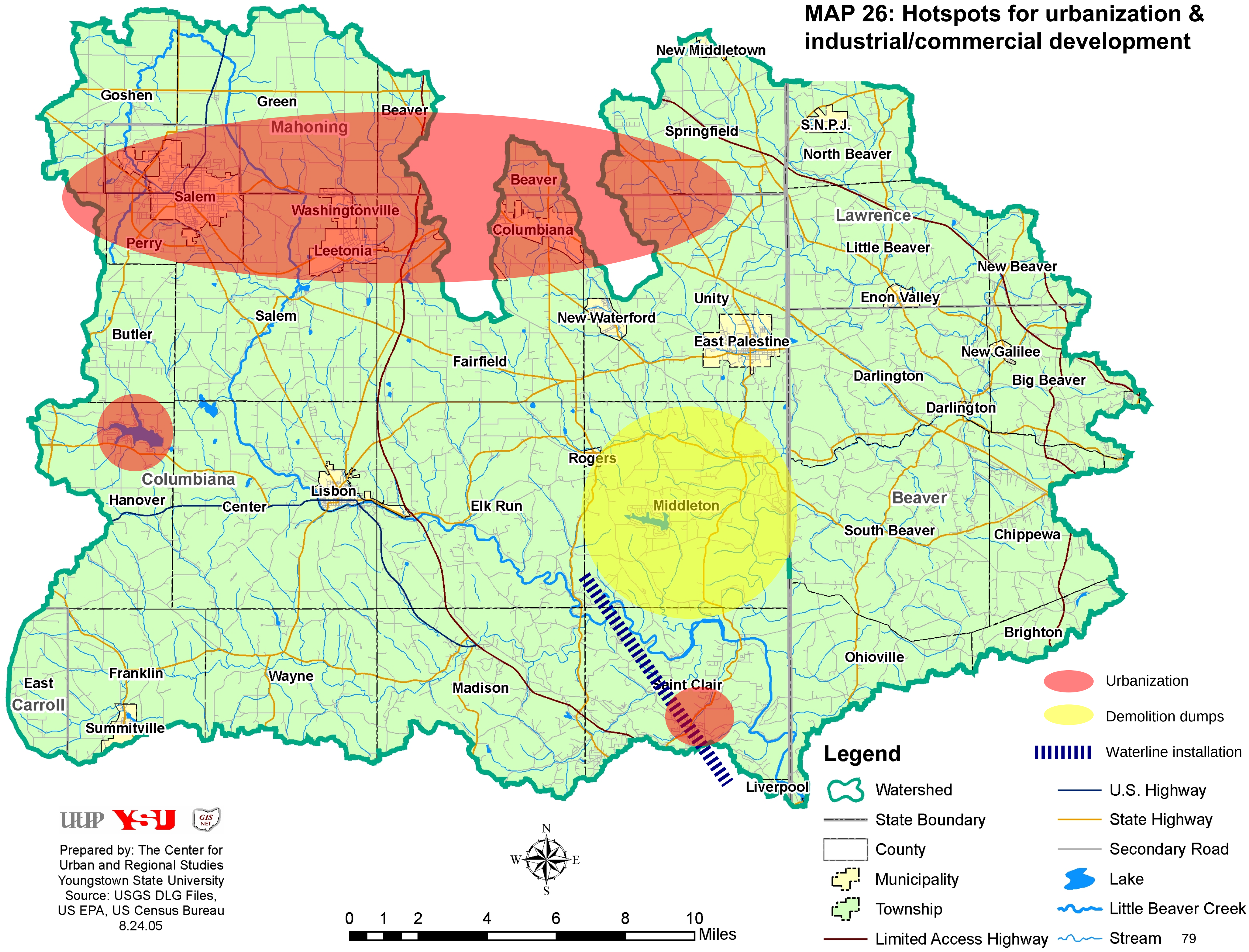
# MAP 24: Little Beaver Creek Watershed Sample Sites to Test for Acid Mine Drainage

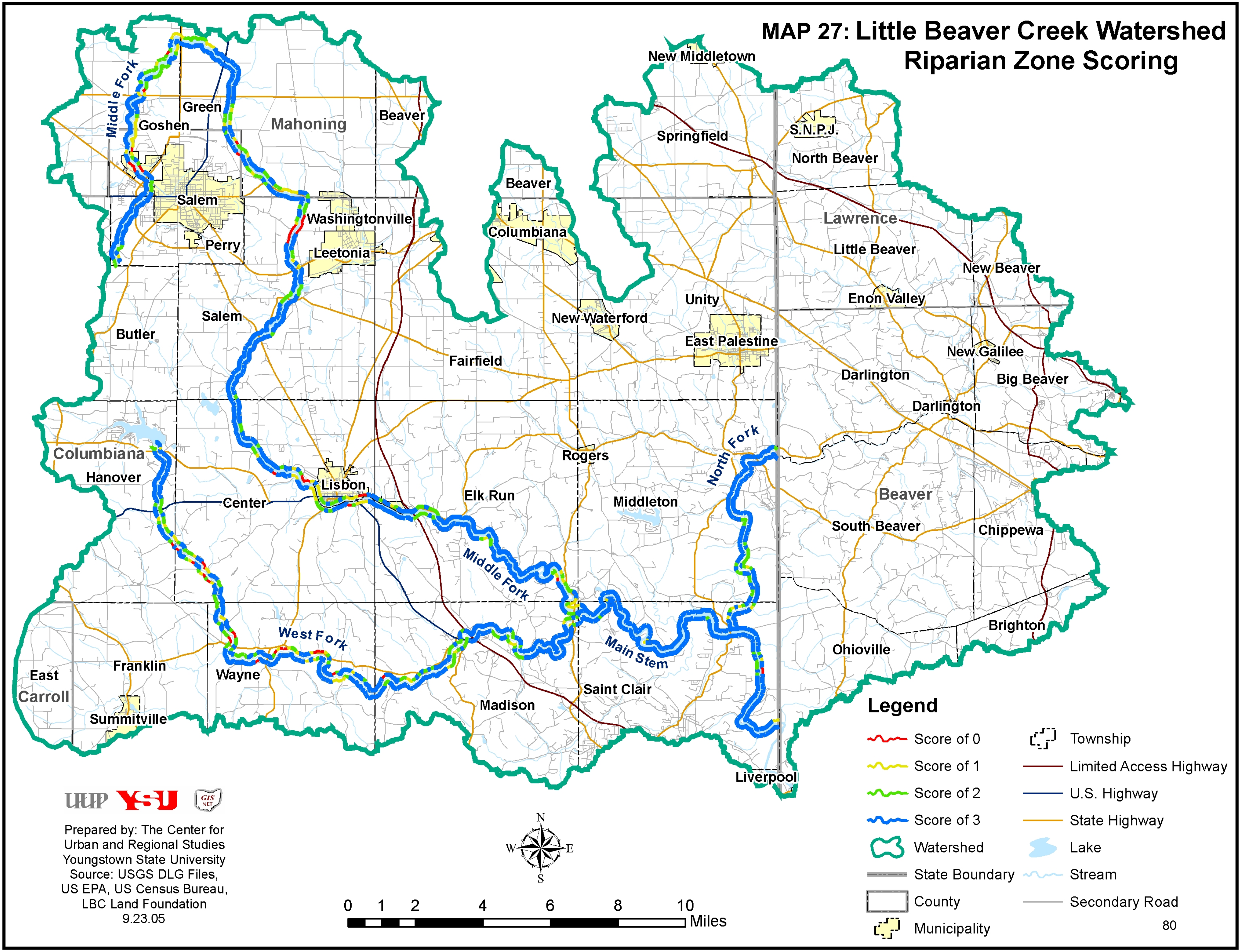





MAP 25: D permits (active mining) within the MF & WF watersheds.

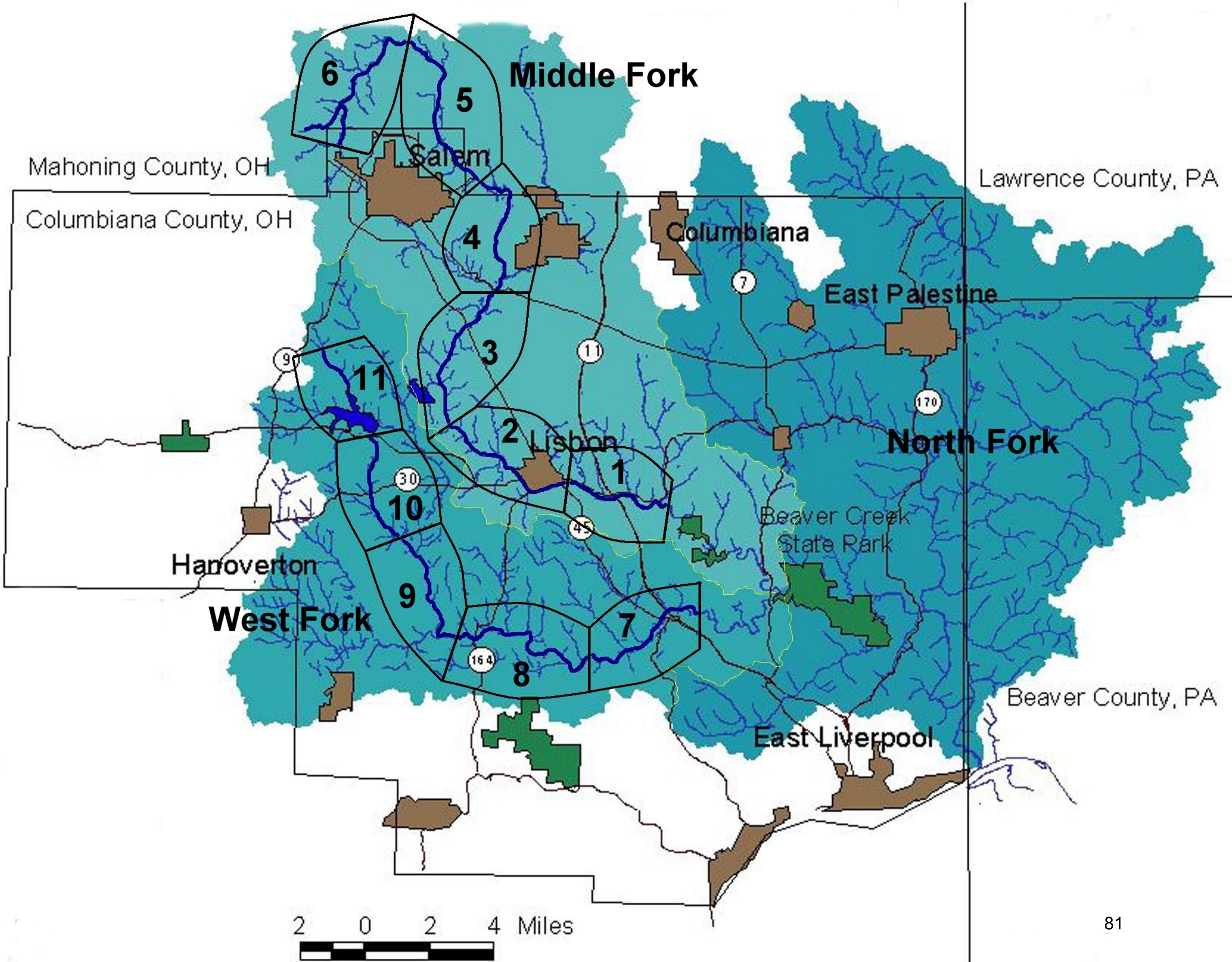
# MAP 26: Hotspots for urbanization & industrial/commercial development



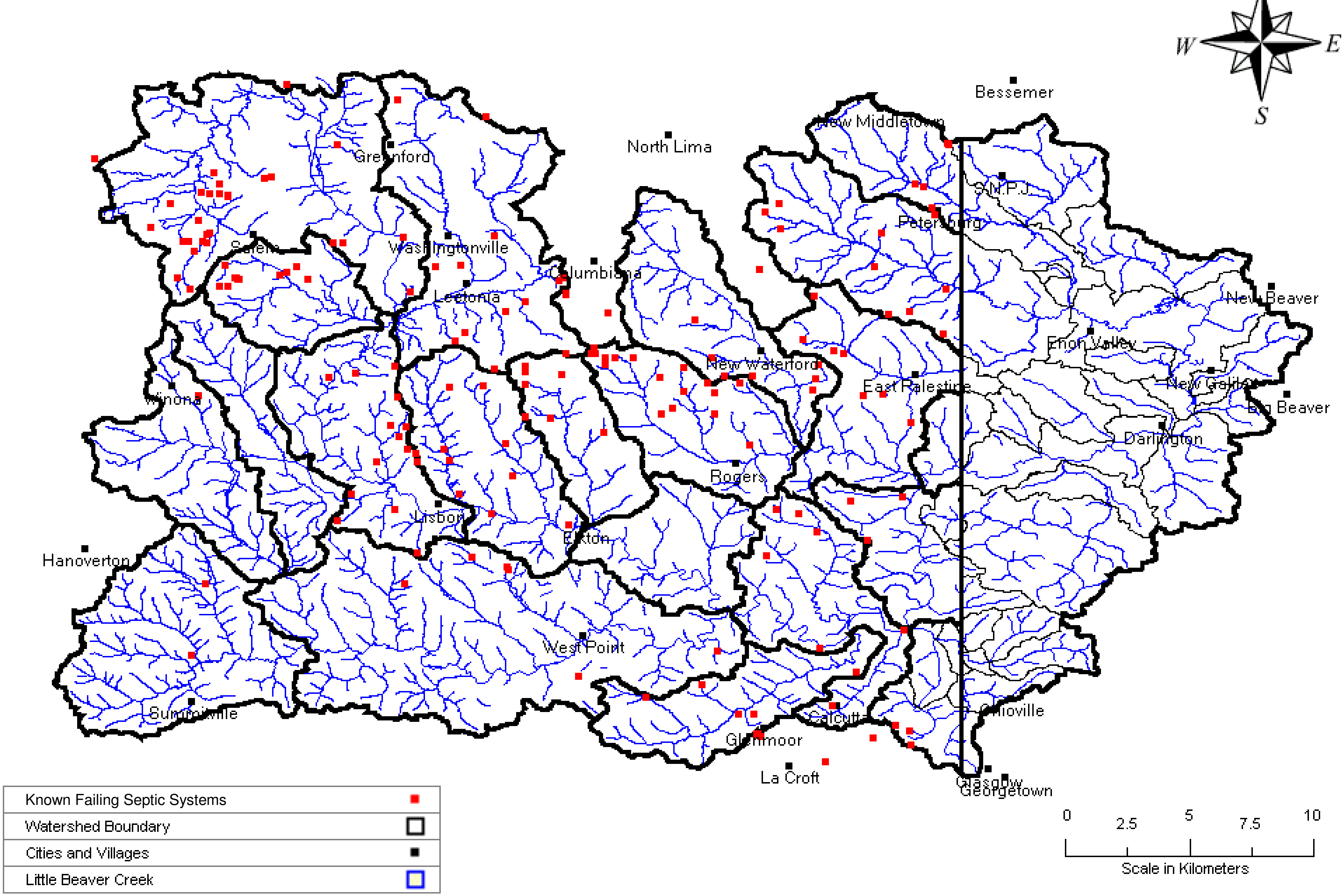


MAP 27: Little Beaver Creek Watershed
Riparian Zone Scoring
Middle Fork
Goshen
Green
Mahoning
Beaver
Salem
Perry
Washingtonville
Leetonia
Beaver
Columbiana
New Middletown
Springfield
S.N.P.J.
North Beaver
Lawrence
Little Beaver
New Beaver
Enon Valley
Unity
New Waterford
East Palestine
New Galilee
Darlington
Big Beaver
Darlington
Salem
Butler
Fairfield
Columbiana
Hanover
Center
Lisbon
Elk Run
Rogers
Middleton
North Fork
Beaver
South Beaver
Chippewa
Middle Fork
Main Stem
West Fork
Franklin
Wayne
East
Carroll
Summitville
Madison
Saint Clair
Ohioville
Brighton
Liverpool
Legend
Score of 0
Score of 1
Score of 2
Score of 3
Watershed
State Boundary
County
Municipality
Township
Limited Access Highway
U.S. Highway
State Highway
Lake
Stream
Secondary Road
Prepared by: The Center for Urban and Regional Studies Youngstown State University
Source: USGS DLG Files, US EPA, US Census Bureau, LBC Land Foundation
9.23.05
0 1 2 4 6 8 10 Miles
N S W E

# MAP 28: Little Beaver Creek 319 Stream Watch Zones

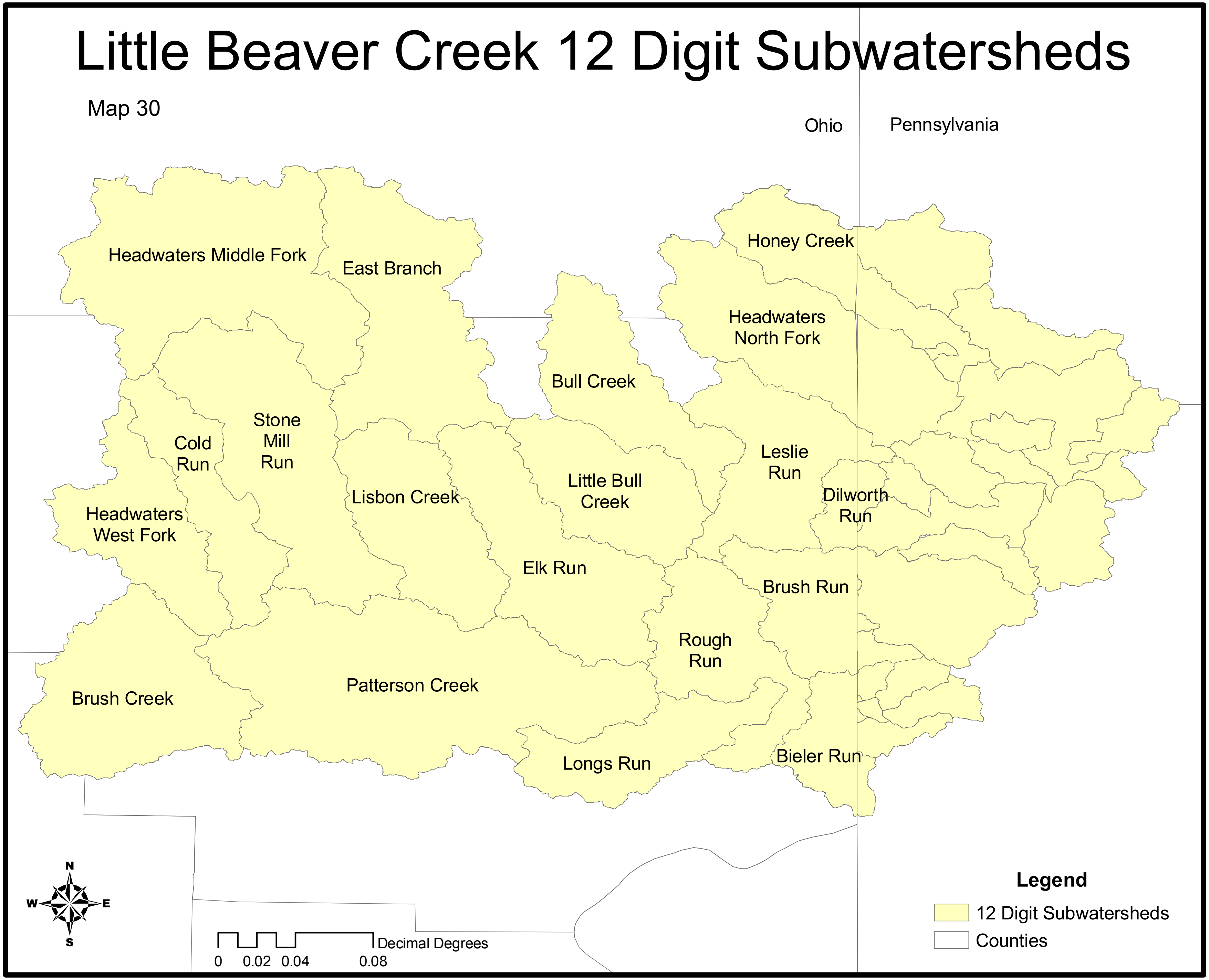


# Map 29: Known Failing Septic Systems in the Little Beaver Creek Watershed



# Little Beaver Creek 12 Digit Subwatersheds

Map 30



**Ohio EPA 2006 Integrated Report Appendix E.2**
**Watershed Assessment Unit (WAU)**
**Results**

| **HUC11** | **WAU Description** | **WAU Size (mi ):2** | 140.1 |
|---|---|---|---|
| 05030101 090 | Little Beaver Creek (downstream Middle and West Forks to mouth) | | |

**Integrated Report Assessment Category:** **5** **Priority Points:** **2**
**Next Scheduled Monitoring:** **2018**

**Aquatic Life Use Assessment**

Subcategories of ALU: EWH,WWH,LRW Sampling Year(s): 1999

Impairment: Yes (4A)

Raw Data — % Attainment — WAU Score

| Stream Size Category | Data Available | | No. Attaining | | Full | Partial | Non | Full | Partial | Non |
|---|---|---|---|---|---|---|---|---|---|---|
| Secondary Tributaries < 5 mi2 | 9 | Sites | 5 | Sites | | | | | | |
| Primary Tributaries | | | | | 79.9 | 5.4 | 14.7 | | | |
| 5-20 mi2 | 14 | Sites | 9 | Sites | | | | | | |
| 20-50 mi2 | 1 | Sites | 1 | Sites | | | | 90 | 3 | 7 |
| Principal Streams | 8 | Sites | | | | | | | | |
| 50-500 mi2 | 24.7 | Miles | 24.7 | Miles | 100 | 0.00 | 0.00 | | | |

| High Magnitude Causes | High Magnitude Sources |
|---|---|
| Unionized Ammonia | Major Industrial Point Source |
| Nutrients | Combined Sewer Overflows |
| Siltation | Pasture Land |
| Organic Enrichment/DO | Surface Mining |
| Flow Alteration | Subsurface Mining |
| Direct Habitat Alterations | Channelization - Development |
| Pathogens | Removal of Riparian Vegetation - Development |
| Natural Limits (Wetlands) | Natural |

**Recreation Use Assessment**

Subcategory of Use: Primary Contact

| | | | | | |
|---|---|---|---|---|---|
| Impairment: | No (1) | | | Geometric Mean: | 201 |
| No. Ambient Sites: | 4 | No. Ambient Sampling Records: | 24 | 75th %ile: | 476 |
| No. of NPDES MOR Sites: | 3 | No. of NPDES MOR Records: | 56 | 90th %ile: | 702 |
| Other: | | | | | |

**Fish Tissue Assessment**

| | | | | | |
|---|---|---|---|---|---|
| Waters Sampled: | Yes | Impairment: | Yes (5) | | |
| Stream Miles Monitored: | 18.10 | Stream Miles Impaired: | 10.80 | Pollutants (Waterbody): | PCBs (Little Beaver Creek) |
| Lake Acres Monitored: | 0.0 | Lake Acres Impaired: | 0.0 | | |

**WAU Comments**

A report developing TMDLs for pollutants impairing beneficial uses (aquatic life and recreation) in the Little Beaver Creek basin was approved by U.S. EPA on September 28, 2005. The TMDL report is available at http://www.epa.state.oh.us/dsw/tmdl/index.html. Monitoring in support of the TMDLs was conducted in the watershed in 1999. As this assessment unit continues to have a fish consumption impairment, it will remain Category 5 until TMDLs are developed for all pollutants impairing all beneficial uses.

**Ohio EPA 2006 Integrated Report Appendix E.2**
**Watershed Assessment Unit (WAU)**
**Results**

| **HUC11** | **WAU Description** | **WAU Size (mi ):2** | 111.2 |
|---|---|---|---|
| 05030101 080 | West Fork Little Beaver Creek | | |

**Integrated Report Assessment Category:** **4A**
**Next Scheduled Monitoring:** **2018**

**Priority Points:**

**Aquatic Life Use Assessment**

Subcategories of ALU: EWH,WWH

Sampling Year(s): 1999

Impairment: Yes (4A)

Raw Data | % Attainment | WAU Score

| Stream Size Category | Data Available | | No. Attaining | | % Attainment Full | Partial | Non | WAU Score Full | Partial | Non |
|---|---|---|---|---|---|---|---|---|---|---|
| Secondary Tributaries < 5 mi2 | 4 | Sites | 3 | Sites | | | | | | |
| Primary Tributaries | | | 53.8 | | | 25.0 | 21.2 | | | |
| 5-20 mi2 | 5 | Sites | 2 | Sites | | | | | | |
| 20-50 mi2 | 2 | Sites | 1 | Sites | | | | 50 | 39 | 11 |
| Principal Streams | 3 | Sites | | | | | | | | |
| 50-500 mi2 | 15.6 Miles | | 7.2 Miles | | 46.0 | 54.0 | 0.00 | | | |

High Magnitude Causes

Cause Unknown
Siltation
Flow Alteration
Natural Limits (Wetlands)
Nutrients
Organic Enrichment/DO
Unionized Ammonia
Pathogens

High Magnitude Sources

Pasture Land
Channelization - Agriculture
Channelization - Development
Upstream Impoundment
Removal of Riparian Vegetation - Ag.
Natural
Source Unknown

**Recreation Use Assessment**

Subcategory of Use: Primary Contact

Impairment: No (1-Historical)

Geometric Mean:

No. Ambient Sites: No. Ambient Sampling Records:

75th %ile:

No. of NPDES MOR Sites: No. of NPDES MOR Records:

90th %ile:

Other:

**Fish Tissue Assessment**

Waters Sampled: Yes Impairment: Unknown (3-Indeterminate Data)

Stream Miles Monitored: 4.10 Stream Miles Impaired: 0.00 Pollutants (Waterbody):

Lake Acres Monitored: 0.0 Lake Acres Impaired: 0.0

**WAU Comments**

Development of TMDLs for pollutants impairing the aquatic life beneficial use in the Little Beaver Creek basin is in progress. Intensive monitoring in support of the TMDLs was conducted in the watershed in 1999.

**Ohio EPA 2006 Integrated Report Appendix E.2**
**Watershed Assessment Unit (WAU)**
**Results**

| **HUC11** | **WAU Description** | **WAU Size (mi ): 149.12** |
|---|---|---|
| 05030101 070 | Middle Fork Little Beaver Creek | |

**5Integrated Report Assessment Category:** **Priority Points:** **2**
**2018Next Scheduled Monitoring:**

**Aquatic Life Use Assessment**

EWH,WWHSubcategories of ALU: Sampling Year(s): 1999

Impairment: Yes (4A)

Raw Data % Attainment WAU Score
Stream Size Category Data Available No. Attaining Full Partial Non Full Partial Non

| Stream Size Category | Data Available | | No. Attaining | | Full | Partial | Non | Full | Partial | Non |
|---|---|---|---|---|---|---|---|---|---|---|
| Secondary Tributaries < 5 mi2 | 7 | Sites | 3 | Sites | | | | | | |
| Primary Tributaries | | | | | 36.1 | 23.8 | 40.1 | | | |
| 5-20 mi2 | 13 | Sites | 8 | Sites | | | | | | |
| 20-50 mi2 | 5 | Sites | 1 | Sites | | | | 46 | 34 | 20 |
| Principal Streams 8 Sites 50-500 mi2 | 21.5 Miles | | 12.2 Miles | | 56.7 | 43.3 | 0.00 | | | |

High Magnitude Causes

Cause Unknown Oil and Grease
Pesticides Natural Limits (Wetlands)
Unionized Ammonia
Nutrients
Siltation
Organic Enrichment/DO
Salinity/TDS/Chlorides

High Magnitude Sources

Source Unknown Nonirrigated Crop Production
Contaminated Sediments Surface Mining
Major Municipal Point Source Channelization - Ag.
Removal of Riparian Veg. - Ag. Channelization - Devel.
Confined Animal Feeding Operations (NPS)Spills
Pasture Land
Onsite Wastewater Systems (Septic Tanks)

| | |
|---|---|
| Direct Habitat Alterations | Urban Runoff/Storm Sewers (NPS) |

**Recreation Use Assessment**

Subcategory of Use: Primary Contact

| | | | |
|---|---|---|---|
| No (1)Impairment: | | Geometric Mean: | 111 |
| No. Ambient Sites: 0 | No. Ambient Sampling Records: 0 | 75th %ile: | 502 |
| No. of NPDES MOR Sites: 4 | No. of NPDES MOR Records: 185 | 90th %ile: | 1653 |

Other: A "Dermal Contact Advisory" is in effect for Middle Fork Little Beaver Creek due to Mirex contamination. The area under the advisory is from Alternate St. Rt. 14 at Allen Rd. near Salem to St. Rt. 11 south of Lisbon.

**Fish Tissue Assessment**

Waters Sampled: Yes    Yes (5)Impairment:

| | | | | |
|---|---|---|---|---|
| Stream Miles Monitored: | Stream Miles Impaired:38.40 | 38.40 | Pollutants (Waterbody): | PCBs, Mirex (Middle Fork Little Beaver Creek) |
| Lake Acres Monitored: | Lake Acres Impaired:0.0 | 0.0 | | |

**WAU Comments**

A report developing TMDLs for pollutants impairing beneficial uses (aquatic life and recreation) in the Little Beaver Creek basin was approved by U.S. EPA on September 28, 2005. The TMDL report is available at http://www.epa.state.oh.us/dsw/tmdl/index.html. Monitoring in support of the TMDLs was conducted in the watershed in 1999. Recent bacteria data indicated no impairment of the recreation use. As this assessment unit continues to have a fish consumption impairment, it will remain Category 5 until TMDLs are developed for all pollutants impairing all beneficial uses.

# Map Unit Description (Brief)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the selected area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit. A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

The "Map Unit Description (Brief)" report gives a brief, general description of the major soils that occur in a map unit. Descriptions of nonsoil (miscellaneous areas) and minor map unit components may or may not be included. This description is written by the local soil scientists responsible for the respective soil survey area data. A more detailed description can be generated by the "Map Unit Description" report.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

## Report—Map Unit Description (Brief)

## Carroll County, Ohio

**Description Category:** SOI

**Map Unit:** AoC2—Aaron silty clay loam, 6 to 15 percent slopes, eroded

Aaron is a sloping to strongly sloping, deep, moderately well drained soil. Typically the surface layer is silty clay loam about 9 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** BkB—Berks shaly silt loam, 3 to 8 percent slopes

Berks is a gently sloping, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 3 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** BkC—Berks shaly silt loam, 8 to 15 percent slopes

Berks is a strongly sloping, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 3 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** BkD—Berks shaly silt loam, 15 to 25 percent slopes

Berks is a moderately steep, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 3 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** BkE—Berks shaly silt loam, 25 to 40 percent slopes

Berks is a steep, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 3 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is F-2. This soil is not hydric.

**Map Unit:** BkF—Berks shaly silt loam, 40 to 70 percent slopes

Berks is a very steep, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 3 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** BnD—Bethesda channery clay loam, 8 to 25 percent slopes

Bethesda is a strongly sloping to moderately steep, very deep, well drained soil. Typically the surface layer is channery clay loam about 4 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6s. The pasture and hayland suitability group is E-3. This soil is not hydric.

**Map Unit:** BnF—Bethesda channery clay loam, 25 to 70 percent slopes

Bethesda is a steep to very steep, very deep, well drained soil. Typically the surface layer is channery clay loam about 4 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** BoF—Bethesda channery silty clay loam, 25 to 70 percent slopes

Bethesda is a steep to very steep, very deep, well drained soil. Typically the surface layer is channery silty clay loam about 4 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** BrA—Boyer loam, 0 to 4 percent slopes

Boyer is a nearly level to gently sloping, very deep, well drained soil. Typically the surface layer is loam about 10 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 45 percent calcium carbonate. The land capability classification is 3s. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** BsB—Berks channery silt loam, 2 to 6 percent slopes

Berks is a gently sloping, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** BsC—Berks channery silt loam, 6 to 15 percent slopes

Berks is a sloping to strongly sloping, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** BsD—Berks channery silt loam, 15 to 25 percent slopes

Berks is a moderately steep, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** BsE—Berks channery silt loam, 25 to 40 percent slopes

Berks is a steep, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 3 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is F-2. This soil is not hydric.

**Map Unit:** CeA—Chili loam, 0 to 2 percent slopes

Chili is a nearly level, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2s. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** CeB—Chili loam, 2 to 6 percent slopes

Chili is a gently sloping, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** CfB—Chili gravelly loam, 3 to 8 percent slopes

Chili is a gently sloping, very deep, well drained soil. Typically the surface layer is gravelly loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** CgC2—Chili gravelly loam, 6 to 12 percent slopes, moderately eroded

Chili is a sloping, very deep, well drained soil. Typically the surface layer is gravelly loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** ChA—Chili silt loam, 0 to 3 percent slopes

Chili is a nearly level, very deep, well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2s. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** ChB—Chili silt loam, 3 to 8 percent slopes

Chili is a gently sloping, very deep, well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** ChC—Chili silt loam, 8 to 15 percent slopes

Chili is a strongly sloping, very deep, well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** CkA—Chili silt loam, 0 to 2 percent slopes

Chili is a nearly level, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2s. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** CkB—Chili silt loam, 2 to 6 percent slopes

Chili is a gently sloping, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** CkC—Chili silt loam, 6 to 12 percent slopes

Chili is a sloping, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** CmB—Chili-Urban land complex, undulating

Chili is a sloping, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is Not rated. This soil is not hydric. No description available for Urban Land.

**Map Unit:** CnB—Coshocton silt loam, 3 to 8 percent slopes

Coshocton is a gently sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 30 inches. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** CoB—Coshocton-Keene silt loams, 3 to 8 percent slopes

Coshocton is a gently sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 30 inches. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric. Keene is a gently sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** CpB—Coshocton silt loam, 2 to 6 percent slopes

Coshocton is a gently sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** CpC—Coshocton silt loam, 6 to 15 percent slopes

Coshocton is a sloping to strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** CpD—Coshocton silt loam, 15 to 25 percent slopes

Coshocton is a moderately steep, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** CsC—Coshocton-Guernsey silt loams, 8 to 15 percent slopes

Coshocton is a strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric. Guernsey is a strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 33 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** CsD—Coshocton-Guernsey silt loams, 15 to 25 percent slopes

Coshocton is a moderately steep, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric. Guernsey is a moderately steep, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 33 inches. The land capability classification is 4e. The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** CtD—Coshocton-Guernsey very stony silt loams, 15 to 25 percent slopes

Coshocton is a moderately steep, deep or very deep, moderately well drained soil. Typically the surface layer is very stony silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The land capability classification is 6s. The pasture and hayland suitability group is A-2. This soil is not hydric. Guernsey is a moderately steep, deep or very deep, moderately well drained soil. Typically the surface layer is very stony silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 33 inches. The land capability classification is 6s. The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** CuB—Culleoka silt loam, 3 to 8 percent slopes

Culleoka is a gently sloping, moderately deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** DkB—Dekalb sandy loam, 2 to 6 percent slopes

Dekalb is a gently sloping, very deep, well drained soil. Typically the surface layer is sandy loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** DkC—Dekalb sandy loam, 6 to 12 percent slopes

Dekalb is a sloping, very deep, well drained soil. Typically the surface layer is sandy loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** EbB—Elba silty clay loam, 3 to 8 percent slopes

Elba is a gently sloping, deep or very deep, well drained soil. Typically the surface layer is silty clay loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 50 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is F-5. This soil is not hydric.

**Map Unit:** EbC2—Elba silty clay loam, 8 to 15 percent slopes, eroded

Elba is a strongly sloping, deep or very deep, well drained soil. Typically the surface layer is silty clay loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 50 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is F-5. This soil is not hydric.

**Map Unit:** EcD2—Elba-Upshur silty clay loams, 15 to 25 percent slopes, eroded

Elba is a moderately steep, deep or very deep, well drained soil. Typically the surface layer is silty clay loam about 3 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 50 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is F-6. This soil is not hydric. Upshur is a moderately steep, deep or very deep, well drained soil. Typically the surface layer is silty clay loam about 4 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 30 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** Ek—Elkinsville silt loam, rarely flooded

Elkinsville is a nearly level, very deep, well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderate. It has a very high available water capacity and a moderate shrink swell potential. This soil is rarely flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 1. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** FaD—Fairpoint channery clay loam, 8 to 25 percent slopes

Fairpoint is a strongly sloping to moderately steep, very deep, well drained soil. Typically the surface layer is channery clay loam about 3 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6s. The pasture and hayland suitability group is E-3. This soil is not hydric.

**Map Unit:** FaF—Fairpoint channery clay loam, 25 to 70 percent slopes

Fairpoint is a steep to very steep, very deep, well drained soil. Typically the surface layer is channery clay loam about 3 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** FbA—Fitchville silt loam, 0 to 2 percent slopes

Fitchville is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 21 inches. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** FbB—Fitchville silt loam, 2 to 6 percent slopes

Fitchville is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** FbC—Fitchville silt loam, 6 to 12 percent slopes

Fitchville is a sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The land capability classification is 3e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** FcA—Fitchville silt loam, 0 to 3 percent slopes

Fitchville is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 21 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** FcB—Fitchville silt loam, 3 to 8 percent slopes

Fitchville is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 21 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** FpB—Fairpoint silty clay loam, 0 to 8 percent slopes

Fairpoint is a nearly level to gently sloping, very deep, well drained soil. Typically the surface layer is silty clay loam about 8 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3s. The pasture and hayland suitability group is B-4. This soil is not hydric.

**Map Unit:** FrD—Fairpoint very channery silt loam, 8 to 25 percent slopes

Fairpoint is a strongly sloping to moderately steep, very deep, well drained soil. Typically the surface layer is very channery silt loam about 4 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6s. The pasture and hayland suitability group is E-3. This soil is not hydric.

**Map Unit:** FrF—Fairpoint very channery silt loam, 25 to 70 percent slopes

Fairpoint is a steep to very steep, very deep, well drained soil. Typically the surface layer is very channery silt loam about 4 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** GbC—Germano fine sandy loam, 6 to 15 percent slopes

Germano is a sloping to strongly sloping, moderately deep, well drained soil. Typically the surface layer is fine sandy loam about 10 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** GdB—Gilpin silt loam, 2 to 6 percent slopes

Gilpin is a gently sloping, moderately deep, well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** GdC—Gilpin silt loam, 6 to 12 percent slopes

Gilpin is a sloping, moderately deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** GeB—Glenford silt loam, 2 to 6 percent slopes

Glenford is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 33 inches. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GeC—Glenford silt loam, 6 to 12 percent slopes

Glenford is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GfB—Glenford silt loam, 3 to 8 percent slopes

Glenford is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 33 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GfC—Glenford silt loam, 8 to 15 percent slopes

Glenford is a strongly sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 33 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GhC—Glenford silt loam, 6 to 15 percent slopes

Glenford is a sloping to strongly sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 33 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GkC—Gilpin-Coshocton complex, 6 to 15 percent slopes

Gilpin is a sloping to strongly sloping, moderately deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric. Coshocton is a sloping to strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GkD—Gilpin-Coshocton complex, 15 to 25 percent slopes

Gilpin is a moderately steep, moderately deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is F-1. This soil is not hydric. Coshocton is a moderately steep, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** GnC—Guernsey silt loam, 6 to 15 percent slopes

Guernsey is a sloping to strongly sloping, moderately deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 16 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** GuB—Guernsey silty clay loam, 3 to 8 percent slopes

Guernsey is a gently sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silty clay loam about 6 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 33 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GuC2—Guernsey silty clay loam, 8 to 15 percent slopes, eroded

Guernsey is a strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silty clay loam about 6 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 33 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** HaC—Hazleton channery loam, 8 to 15 percent slopes

Hazleton is a strongly sloping, moderately deep, well drained soil. Typically the surface layer is channery loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** HaD—Hazleton channery loam, 15 to 25 percent slopes

Hazleton is a moderately steep, moderately deep, well drained soil. Typically the surface layer is channery loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** HaE—Hazleton channery loam, 25 to 40 percent slopes

Hazleton is a steep, moderately deep, well drained soil. Typically the surface layer is channery loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is B-2. This soil is not hydric.

**Map Unit:** HeB—Hazleton loam, 3 to 8 percent slopes

Hazleton is a gently sloping, deep or very deep, well drained soil. Typically the surface layer is loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** HeC—Hazleton loam, 8 to 15 percent slopes

Hazleton is a strongly sloping, deep or very deep, well drained soil. Typically the surface layer is loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** HeD—Hazleton loam, 15 to 25 percent slopes

Hazleton is a moderately steep, deep or very deep, well drained soil. Typically the surface layer is loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** HeE—Hazleton loam, 25 to 40 percent slopes

Hazleton is a steep, deep or very deep, well drained soil. Typically the surface layer is loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is B-2. This soil is not hydric.

**Map Unit:** HkA—Holly silt loam, 0 to 2 percent slopes, frequently flooded

Holly is a nearly level, moderately deep, poorly drained soil. Typically the surface layer is silt loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a low shrink swell potential. This soil is frequently flooded and is not ponded. The top of the seasonal high water table is at 4 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-3. This soil is hydric.

**Map Unit:** Ho—Holly silt loam, ponded

Holly is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a low shrink swell potential. This soil is frequently flooded and is ponded for very long duration. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 5w. The pasture and hayland suitability group is C-3. This soil is hydric.

**Map Unit:** HzB—Hazleton channery loam, 2 to 6 percent slopes

Hazleton is a gently sloping, deep or very deep, well drained soil. Typically the surface layer is channery loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** HzC—Hazleton channery loam, 6 to 15 percent slopes

Hazleton is a sloping to strongly sloping, deep or very deep, well drained soil. Typically the surface layer is channery loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** JwA—Jimtown silt loam, 0 to 3 percent slopes

Jimtown is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 21 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** KeB—Keene silt loam, 2 to 6 percent slopes

Keene is a gently sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** LbB—Library Variant silt loam, 3 to 8 percent slopes

Library Variant is a gently sloping, deep or very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 21 inches. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** Lo—Lorain silty clay loam, silty substratum

Lorain is a level, very deep, very poorly drained soil. Typically the surface layer is silty clay loam about 9 inches thick. The surface layer has a high content of organic matter. The slowest permeability is slow. It has a high available water capacity and a high shrink swell potential. This soil is not flooded and is ponded for very long duration. The top of the seasonal high water table is at 6 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 5w. The pasture and hayland suitability group is C-2. This soil is hydric.

**Map Unit:** MrD—Morristown shaly silty clay loam, 8 to 25 percent slopes

Morristown is a strongly sloping to moderately steep, very deep, well drained soil. Typically the surface layer is channery silty clay loam about 3 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 20 percent calcium carbonate. The land capability classification is 6s. The pasture and hayland suitability group is E-3. This soil is not hydric.

**Map Unit:** OmB—Omulga silt loam, 2 to 6 percent slopes

Omulga is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 19 inches. Depth to a root restrictive fragipan is at a depth of 18 to 36 inches. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** OmC—Omulga silt loam, 6 to 12 percent slopes

Omulga is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. Depth to a root restrictive fragipan is at a depth of 18 to 36 inches. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** Or—Orrville silt loam, occasionally flooded

Orrville is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 21 inches. The land capability classification is 2w. The pasture and hayland suitability group is C-3. This soil is not hydric.

**Map Unit:** OsB—Oshtemo sandy loam, 3 to 8 percent slopes

Oshtemo is a gently sloping, very deep, well drained soil. Typically the surface layer is sandy loam about 9 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 25 percent calcium carbonate. The land capability classification is 3s. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** OtB—Oshtemo sandy loam, loamy substratum, 3 to 8 percent slopes

Oshtemo is a gently sloping, very deep, well drained soil. Typically the surface layer is sandy loam about 8 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 54 inches. The land capability classification is 3s. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** OvA—Orrville silt loam, 0 to 2 percent slopes, occasionally flooded

Orrville is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a low shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 10 inches. The land capability classification is 2w. The pasture and hayland suitability group is C-3. This soil is not hydric.

**Map Unit:** Pe—Peoga silt loam, rarely flooded

Peoga is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is rarely flooded and is not ponded. The top of the seasonal high water table is at 6 inches. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** Pg—Pits, gravel

No description available for Pits.

**Map Unit:** ReD—Rigley loam, 15 to 25 percent slopes

Rigley is a moderately steep, very deep, well drained soil. Typically the surface layer is loam about 4 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** ReE—Rigley loam, 25 to 40 percent slopes

Rigley is a steep, very deep, well drained soil. Typically the surface layer is loam about 4 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is A-3. This soil is not hydric.

**Map Unit:** RgB—Rigley sandy loam, 3 to 8 percent slopes

Rigley is a gently sloping, very deep, well drained soil. Typically the surface layer is sandy loam about 6 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** RgC—Rigley sandy loam, 8 to 15 percent slopes

Rigley is a strongly sloping, very deep, well drained soil. Typically the surface layer is sandy loam about 6 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** RgD—Rigley sandy loam, 15 to 25 percent slopes

Rigley is a moderately steep, very deep, well drained soil. Typically the surface layer is sandy loam about 6 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** RgE—Rigley sandy loam, 25 to 40 percent slopes

Rigley is a steep, very deep, well drained soil. Typically the surface layer is sandy loam about 6 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is A-3. This soil is not hydric.

**Map Unit:** Sb—Sebring silt loam

Sebring is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for very long duration. The top of the seasonal high water table is at 6 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** Sg—Sebring-Urban land complex

Sebring is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 16 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 3 inches. The land capability classification is 3w. The pasture and hayland suitability group is Not rated. This soil is hydric. No description available for Urban Land.

**Map Unit:** Ta—Tioga loam, occasionally flooded

Tioga is a nearly level, very deep, well drained soil. Typically the surface layer is loam about 10 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 54 inches. The land capability classification is 1. The pasture and hayland suitability group is A-5. This soil is not hydric.

**Map Unit:** Tg—Tioga silt loam, occasionally flooded

Tioga is a nearly level, very deep, well drained soil. Typically the surface layer is silt loam about 12 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 54 inches. The land capability classification is 2w. The pasture and hayland suitability group is A-5. This soil is not hydric.

**Map Unit:** Uc—Udorthents-Pits complex, 0 to 70 percent slopes

These Udorthents are unconsolidated soil materials that have been excavated, mixed and redeposited as spoil in active or recent surface mining operations. They commonly are composed of a high content of rock fragments poorly mixed with weathered and non-weathered fine-earth materials. The spoil is dumped in cone-shaped or ridged piles 10 to 70 feet high to the side of the mining pit being dug. Pits are the nearly level areas between Udorthents and the vertical high walls created during surface mining operations.

**Map Unit:** Ud—Udorthents

No description available for Udorthents.

**Map Unit:** UpC2—Upshur silty clay loam, 8 to 15 percent slopes, eroded

Upshur is a strongly sloping, deep or very deep, well drained soil. Typically the surface layer is silty clay loam about 8 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 30 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** W—Water

No description available for Water.

**Map Unit:** WhB—Wellston silt loam, 3 to 8 percent slopes

Wellston is a gently sloping, deep or very deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** WkC—Westmoreland silt loam, 8 to 15 percent slopes

Westmoreland is a strongly sloping, deep or very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** WkD—Westmoreland silt loam, 15 to 25 percent slopes

Westmoreland is a moderately steep, deep or very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** WkE—Westmoreland silt loam, 25 to 40 percent slopes

Westmoreland is a steep, deep or very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is A-3. This soil is not hydric.

**Map Unit:** WlA—Wheeling loam, 0 to 2 percent slopes

Wheeling is a nearly level, very deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 1. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** WmC—Westmoreland-Coshocton silt loams, 8 to 15 percent slopes

Westmoreland is a strongly sloping, deep or very deep, well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric. Coshocton is a strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 30 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** WmD—Westmoreland-Coshocton silt loams, 15 to 25 percent slopes

Westmoreland is a moderately steep, deep or very deep, well drained soil. Typically the surface layer is silt loam about 5 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric. Coshocton is a moderately steep, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 3 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 30 inches. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** WpA—Wheeling silt loam, 0 to 2 percent slopes

Wheeling is a nearly level, very deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 1. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** WpB—Wheeling silt loam, 2 to 6 percent slopes

Wheeling is a gently sloping, very deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** WrC—Westmoreland silt loam, 6 to 15 percent slopes

Westmoreland is a sloping to strongly sloping, moderately deep, well drained soil. Typically the surface layer is silt loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

## Data Source Information

Soil Survey Area: Carroll County, Ohio
Survey Area Data: Version 7, Sep 11, 2007

# Map Unit Description (Brief)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the selected area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit. A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

The "Map Unit Description (Brief)" report gives a brief, general description of the major soils that occur in a map unit. Descriptions of nonsoil (miscellaneous areas) and minor map unit components may or may not be included. This description is written by the local soil scientists responsible for the respective soil survey area data. A more detailed description can be generated by the "Map Unit Description" report.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

## Report—Map Unit Description (Brief)

### Columbiana County, Ohio

**Description Category:** SOI

**Map Unit:** AmF—Amanda loam, 35 to 70 percent slopes

Amanda is a steep to very steep, very deep, well drained soil. Typically the surface layer is loam about 5 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 80 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** BkB—Berks channery silt loam, 2 to 6 percent slopes

Berks is a gently sloping, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** BkC—Berks channery silt loam, 6 to 15 percent slopes

Berks is a sloping to strongly sloping, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** BkD—Berks channery silt loam, 15 to 25 percent slopes

Berks is a moderately steep, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** BkE—Berks channery silt loam, 25 to 40 percent slopes

Berks is a steep, moderately deep, well drained soil. Typically the surface layer is slightly decomposed plant material about 1 inches thick. The surface layer has a very high content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is F-2. This soil is not hydric.

**Map Unit:** BmB—Berks-Urban land complex, 2 to 6 percent slopes

Berks is a gently sloping, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is . The pasture and hayland suitability group is Not rated. This soil is not hydric. Urban land is a miscellaneous area where the original soils have been removed or altered during excavation and construction activities, often resulting in random soil mixing. The soil surface is largely covered by streets, structures and other engineered installations. Generally the infiltration of precipitation on urban land is very limited.

**Map Unit:** BmC—Berks-Urban land complex, 6 to 15 percent slopes

Berks is a sloping to strongly sloping, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is . The pasture and hayland suitability group is Not rated. This soil is not hydric. Urban land is a miscellaneous area where the original soils have been removed or altered during excavation and construction activities, often resulting in random soil mixing. The soil surface is largely covered by streets, structures and other engineered installations. Generally the infiltration of precipitation on urban land is very limited.

**Map Unit:** BmD—Berks-Urban land complex, 15 to 25 percent slopes

Berks is a moderately steep, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is . The pasture and hayland suitability group is Not rated. This soil is not hydric. Urban land is a miscellaneous area where the original soils have been removed or altered during excavation and construction activities, often resulting in random soil mixing. The soil surface is largely covered by streets, structures and other engineered installations. Generally the infiltration of precipitation on urban land is very limited.

**Map Unit:** BpF—Bethesda very channery silt loam, 25 to 70 percent slopes

Bethesda is a steep to very steep, very deep, well drained soil. Typically the surface layer is very channery silt loam about 2 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** BsC2—Bogart loam, 6 to 12 percent slopes, eroded

Bogart is a sloping, very deep, moderately well drained soil. Typically the surface layer is loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** BtA—Bogart silt loam, 0 to 2 percent slopes

Bogart is a nearly level, very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 17 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 1. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** BtB—Bogart silt loam, 2 to 6 percent slopes

Bogart is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 16 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** BtC—Bogart silt loam, 6 to 12 percent slopes

Bogart is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** CaA—Calcutta silt loam, 0 to 3 percent slopes

Calcutta is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is slightly decomposed plant material about 1 inches thick. The surface layer has a very high content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 9 inches. Depth to a root restrictive fragipan is at a depth of 20 to 30 inches. The land capability classification is 2w. The pasture and hayland suitability group is D-1. This soil is not hydric.

**Map Unit:** CcB—Canfield silt loam, 2 to 6 percent slopes

Canfield is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 17 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** CcC—Canfield silt loam, 6 to 12 percent slopes

Canfield is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** CcD—Canfield silt loam, 12 to 20 percent slopes

Canfield is a moderately steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 17 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** CcE—Canfield silt loam, 20 to 35 percent slopes

Canfield is a steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 20 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is F-4. This soil is not hydric.

**Map Unit:** CeA—Carlisle muck, 0 to 1 percent slopes

Carlisle is a level, very deep, very poorly drained soil. Typically the surface layer is muck about 80 inches thick. The surface layer has a very high content of organic matter. It has a very high available water capacity and a low shrink swell potential. This soil is not flooded and is ponded for very long duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 5w. The pasture and hayland suitability group is D-1. This soil is hydric.

**Map Unit:** CfD2—Chili loam, 12 to 20 percent slopes, eroded

Chili is a moderately steep, very deep, well drained soil. Typically the surface layer is loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** ChA—Chili silt loam, 0 to 2 percent slopes

Chili is a nearly level, very deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2s. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** ChB—Chili silt loam, 2 to 6 percent slopes

Chili is a gently sloping, very deep, well drained soil. Typically the surface layer is silt loam about 13 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** ChC—Chili silt loam, 6 to 12 percent slopes

Chili is a sloping, very deep, well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** CmB—Conotton gravelly loam, 2 to 6 percent slopes

Conotton is a gently sloping, very deep, well drained soil. Typically the surface layer is gravelly loam about 10 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3s. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** CmC—Conotton gravelly loam, 6 to 12 percent slopes

Conotton is a sloping, very deep, well drained soil. Typically the surface layer is gravelly loam about 10 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** CoB—Coshocton silt loam, 2 to 6 percent slopes

Coshocton is a gently sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** CoC—Coshocton silt loam, 6 to 15 percent slopes

Coshocton is a sloping to strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** CoD—Coshocton silt loam, 15 to 25 percent slopes

Coshocton is a moderately steep, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** DAM—Dam

An earthen barrier constructed across a valley to check the flow of a stream and create a small lake or reservoir. Spillways or other components of the dam may be hardened by concrete or other engineered materials.

**Map Unit:** DgA—Doles silt loam, 0 to 3 percent slopes

Doles is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 15 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 6 inches. Depth to a root restrictive fragipan is at a depth of 20 to 30 inches. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** ErC—Ernest silt loam, 6 to 15 percent slopes

Ernest is a sloping to strongly sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 17 inches. Depth to a root restrictive fragipan is at a depth of 20 to 36 inches. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** ErD—Ernest silt loam, 15 to 25 percent slopes

Ernest is a moderately steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 14 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 20 inches. Depth to a root restrictive fragipan is at a depth of 20 to 36 inches. The land capability classification is 4e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** FbB—Fairpoint very channery silt loam, 0 to 8 percent slopes

Fairpoint is a nearly level to gently sloping, very deep, well drained soil. Typically the surface layer is very channery silt loam about 5 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4s. The pasture and hayland suitability group is E-3. This soil is not hydric.

**Map Unit:** FbD—Fairpoint very channery silt loam, 8 to 25 percent slopes

Fairpoint is a strongly sloping to moderately steep, very deep, well drained soil. Typically the surface layer is very channery silt loam about 4 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6s. The pasture and hayland suitability group is E-3. This soil is not hydric.

**Map Unit:** FbF—Fairpoint very channery silt loam, 25 to 70 percent slopes

Fairpoint is a steep to very steep, very deep, well drained soil. Typically the surface layer is very channery silt loam about 4 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** FcB—Fairpoint silty clay loam, 0 to 8 percent slopes

Fairpoint is a nearly level to gently sloping, very deep, well drained soil. Typically the surface layer is silty clay loam about 8 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3s. The pasture and hayland suitability group is B-4. This soil is not hydric.

**Map Unit:** FcD—Fairpoint silty clay loam, 8 to 25 percent slopes

Fairpoint is a strongly sloping to moderately steep, very deep, well drained soil. Typically the surface layer is silty clay loam about 8 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4s. The pasture and hayland suitability group is B-4. This soil is not hydric.

**Map Unit:** FdA—Fitchville silt loam, 0 to 2 percent slopes

Fitchville is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 10 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** FdB—Fitchville silt loam, 2 to 6 percent slopes

Fitchville is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 8 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** FeA—Fluvaquents, silty, 0 to 1 percent slopes, frequently flooded

Fluvaquents is a level, very deep, very poorly drained soil. Typically the surface layer is stratified variable about 80 inches thick. The surface layer has a content of organic matter. It has a very high available water capacity and a low shrink swell potential. This soil is frequently flooded and is ponded for very long duration. The seasonal high water table is at or near the surface of the soil. The land capability classification is 5w. The pasture and hayland suitability group is Not rated. This soil is hydric.

**Map Unit:** FnC2—Fredericktown gravelly loam, 6 to 15 percent slopes, eroded

Fredericktown is a sloping to strongly sloping, very deep, well drained soil. Typically the surface layer is gravelly loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** FnD2—Fredericktown gravelly loam, 15 to 25 percent slopes, eroded

Fredericktown is a moderately steep, very deep, well drained soil. Typically the surface layer is gravelly loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** FoB—Fredericktown silt loam, 2 to 6 percent slopes

Fredericktown is a gently sloping, very deep, well drained soil. Typically the surface layer is silt loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** FrA—Frenchtown silt loam, 0 to 2 percent slopes

Frenchtown is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is ponded for brief duration. The seasonal high water table is at or near the surface of the soil. Depth to a root restrictive fragipan is at a depth of 18 to 38 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** GaB—Gavers silt loam, 2 to 6 percent slopes

Gavers is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 8 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** GeC—Germano fine sandy loam, 6 to 15 percent slopes

Germano is a sloping to strongly sloping, moderately deep, well drained soil. Typically the surface layer is fine sandy loam about 10 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** GeD—Germano fine sandy loam, 15 to 25 percent slopes

Germano is a moderately steep, moderately deep, well drained soil. Typically the surface layer is fine sandy loam about 4 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** GnB—Gilpin silt loam, 2 to 6 percent slopes

Gilpin is a gently sloping, moderately deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** GnC—Gilpin silt loam, 6 to 15 percent slopes

Gilpin is a sloping to strongly sloping, moderately deep, well drained soil. Typically the surface layer is silt loam about 3 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** GnD—Gilpin silt loam, 15 to 25 percent slopes

Gilpin is a moderately steep, moderately deep, well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** GoC—Gilpin-Coshocton silt loams, 6 to 15 percent slopes

Gilpin is a sloping to strongly sloping, moderately deep, well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric. Coshocton is a sloping to strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GoD—Gilpin-Coshocton silt loams, 15 to 25 percent slopes

Gilpin is a moderately steep, moderately deep, well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is F-1. This soil is not hydric. Coshocton is a moderately steep, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** GpC—Gilpin-Coshocton-Urban land complex, 6 to 15 percent slopes

Gilpin is a sloping to strongly sloping, moderately deep, well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is . The pasture and hayland suitability group is Not rated. This soil is not hydric. Coshocton is a sloping to strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is . The pasture and hayland suitability group is Not rated. This soil is not hydric. Urban land is a miscellaneous area where the original soils have been removed or altered during excavation and construction activities, often resulting in random soil mixing. The soil surface is largely covered by streets, structures and other engineered installations. Generally the infiltration of precipitation on urban land is very limited.

**Map Unit:** GrB—Glenford silt loam, 2 to 6 percent slopes

Glenford is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GrC—Glenford silt loam, 6 to 12 percent slopes

Glenford is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 14 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GuC—Guernsey silt loam, 6 to 15 percent slopes

Guernsey is a sloping to strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 16 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GuC2—Guernsey silt loam, 6 to 15 percent slopes, eroded

Guernsey is a sloping to strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GuD—Guernsey silt loam, 15 to 25 percent slopes

Guernsey is a moderately steep, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 13 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** HeB—Hazleton channery loam, 2 to 6 percent slopes

Hazleton is a gently sloping, deep or very deep, well drained soil. Typically the surface layer is channery loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** HeC—Hazleton channery loam, 6 to 15 percent slopes

Hazleton is a sloping to strongly sloping, deep or very deep, well drained soil. Typically the surface layer is channery loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** HeD—Hazleton channery loam, 15 to 25 percent slopes

Hazleton is a moderately steep, deep or very deep, well drained soil. Typically the surface layer is channery loam about 3 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** HeE—Hazleton channery loam, 25 to 40 percent slopes

Hazleton is a steep, deep or very deep, well drained soil. Typically the surface layer is channery loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is B-2. This soil is not hydric.

**Map Unit:** HfF—Hazleton-Rock outcrop complex, 40 to 70 percent slopes

Hazleton is a very steep, deep or very deep, well drained soil. Typically the surface layer is channery loam about 3 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric. Rock outcrop is exposed bedrock escarpments, consisting mostly of sandstone, on vertical cliffs and ledges on upper side slopes. Large boulders and smaller fragments that have broken off the exposed bedrock accumulate below the outcrop.

**Map Unit:** HgF—Hazleton-Westmoreland channery loams, 40 to 70 percent slopes

Hazleton is a very steep, deep or very deep, well drained soil. Typically the surface layer is slightly decomposed plant material about 2 inches thick. The surface layer has a very high content of organic matter. The slowest permeability is moderately rapid. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric. Westmoreland is a very steep, deep or very deep, well drained soil. Typically the surface layer is channery loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** HkA—Holly silt loam, 0 to 2 percent slopes, frequently flooded

Holly is a nearly level, deep or very deep, poorly drained soil. Typically the surface layer is silt loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a low shrink swell potential. This soil is frequently flooded and is not ponded. The top of the seasonal high water table is at 4 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-3. This soil is hydric.

**Map Unit:** HlB—Homewood silt loam, 2 to 6 percent slopes

Homewood is a gently sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 22 inches. Depth to a root restrictive fragipan is at a depth of 20 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** HmA—Homeworth loam, 0 to 2 percent slopes

Homeworth is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 9 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** HmB—Homeworth loam, 2 to 6 percent slopes

Homeworth is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is loam about 13 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-2. This soil is not hydric.

**Map Unit:** HoA—Homeworth silt loam, 0 to 2 percent slopes

Homeworth is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 9 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** HoB—Homeworth silt loam, 2 to 6 percent slopes

Homeworth is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 13 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-2. This soil is not hydric.

**Map Unit:** JwA—Jimtown silt loam, 0 to 2 percent slopes

Jimtown is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 8 inches. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** JwB—Jimtown silt loam, 2 to 6 percent slopes

Jimtown is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 11 inches. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** KeB—Keene silt loam, 2 to 6 percent slopes

Keene is a gently sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** KnB—Kensington silt loam, 2 to 6 percent slopes

Kensington is a gently sloping, deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is 2e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** KnC—Kensington silt loam, 6 to 15 percent slopes

Kensington is a sloping to strongly sloping, deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 24 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** KnD—Kensington silt loam, 15 to 25 percent slopes

Kensington is a moderately steep, deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 24 inches. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** LbA—Lobdell silt loam, 0 to 2 percent slopes, occasionally flooded

Lobdell is a nearly level, very deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a low shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 16 inches. The land capability classification is 1. The pasture and hayland suitability group is A-5. This soil is not hydric.

**Map Unit:** LnA—Lorain silt loam, 0 to 2 percent slopes

Lorain is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is ponded for long duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is hydric.

**Map Unit:** McB—Mechanicsburg silt loam, 2 to 6 percent slopes

Mechanicsburg is a gently sloping, deep or very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** McC—Mechanicsburg silt loam, 6 to 15 percent slopes

Mechanicsburg is a sloping to strongly sloping, deep or very deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** MnB—Morristown silty clay loam, 0 to 8 percent slopes

Morristown is a nearly level to gently sloping, very deep, well drained soil. Typically the surface layer is silty clay loam about 8 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 20 percent calcium carbonate. The land capability classification is 3s. The pasture and hayland suitability group is B-4. This soil is not hydric.

**Map Unit:** MnD—Morristown silty clay loam, 8 to 25 percent slopes

Morristown is a strongly sloping to moderately steep, very deep, well drained soil. Typically the surface layer is silty clay loam about 5 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 20 percent calcium carbonate. The land capability classification

**Map Unit:** MoB—Morristown channery silty clay loam, 0 to 8 percent slopes

Morristown is a nearly level to gently sloping, very deep, well drained soil. Typically the surface layer is channery silty clay loam about 4 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 20 percent calcium carbonate. The land capability classification is 4s. The pasture and hayland suitability group is E-3. This soil is not hydric.

**Map Unit:** MoD—Morristown channery silty clay loam, 8 to 25 percent slopes

Morristown is a strongly sloping to moderately steep, very deep, well drained soil. Typically the surface layer is channery silty clay loam about 3 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 20 percent calcium carbonate. The land capability classification is 6s. The pasture and hayland suitability group is E-3. This soil is not hydric.

**Map Unit:** OdA—Olmsted and Valley soils, 0 to 2 percent slopes

Olmsted is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is ponded for long duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is hydric. Valley is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is hydric.

**Map Unit:** OmB—Omulga silt loam, 2 to 6 percent slopes

Omulga is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 19 inches. Depth to a root restrictive fragipan is at a depth of 18 to 36 inches. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** OmC—Omulga silt loam, 6 to 12 percent slopes

Omulga is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. Depth to a root restrictive fragipan is at a depth of 18 to 36 inches. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** OrA—Orrville silt loam, 0 to 2 percent slopes, occasionally flooded

Orrville is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a low shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 10 inches. The land capability classification is 2w. The pasture and hayland suitability group is C-3. This soil is not hydric.

**Map Unit:** Pg—Pits, gravel

Open excavations from which soil, sand or gravel are being removed, exposing the underlying substratum material. Also includes spoil from grading and washing processes, and inactive pits that are not reclaimed.

**Map Unit:** RaB—Rainsboro silt loam, 2 to 6 percent slopes

Rainsboro is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 20 inches. Depth to a root restrictive fragipan is at a depth of 20 to 30 inches. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** RaC2—Rainsboro silt loam, 6 to 12 percent slopes, eroded

Rainsboro is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. Depth to a root restrictive fragipan is at a depth of 20 to 30 inches. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** RbC—Rainsboro silt loam, 6 to 12 percent slopes, stony

Rainsboro is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 21 inches. Depth to a root restrictive fragipan is at a depth of 20 to 30 inches. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** ReA—Ravenna silt loam, 0 to 2 percent slopes

Ravenna is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 10 inches. Depth to a root restrictive fragipan is at a depth of 14 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** ReB—Ravenna silt loam, 2 to 6 percent slopes

Ravenna is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 13 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 10 inches. Depth to a root restrictive fragipan is at a depth of 14 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** RhD—Richland silt loam, 15 to 25 percent slopes, stony

Richland is a moderately steep, very deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 36 inches. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** RhE—Richland silt loam, 25 to 40 percent slopes, stony

Richland is a steep, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 25 inches. The land capability classification is 6e. The pasture and hayland suitability group is A-3. This soil is not hydric.

**Map Unit:** RsB—Rittman silt loam, 2 to 6 percent slopes

Rittman is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 13 inches. Depth to a root restrictive fragipan is at a depth of 18 to 36 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** RsC—Rittman silt loam, 6 to 12 percent slopes

Rittman is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 14 inches. Depth to a root restrictive fragipan is at a depth of 18 to 36 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** RsD2—Rittman silt loam, 12 to 20 percent slopes, eroded

Rittman is a moderately steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. Depth to a root restrictive fragipan is at a depth of 18 to 36 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** TeB—Teegarden silt loam, 2 to 6 percent slopes

Teegarden is a gently sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** TeC—Teegarden silt loam, 6 to 15 percent slopes

Teegarden is a sloping to strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 14 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** TeC2—Teegarden silt loam, 6 to 15 percent slopes, eroded

Teegarden is a sloping to strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 14 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** ToA—Tioga loam, 0 to 2 percent slopes, occasionally flooded

Tioga is a nearly level, very deep, well drained soil. Typically the surface layer is loam about 9 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is occasionally flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 1. The pasture and hayland suitability group is A-5. This soil is not hydric.

**Map Unit:** Ua—Udorthents, loamy, 2 to 25 percent slopes

No description available for Udorthents.

**Map Unit:** Ub—Udorthents, refuse substratum, 2 to 25 percent slopes

No description available for Udorthents.

**Map Unit:** Uc—Udorthents-Pits complex, 0 to 70 percent slopes

No description available for Udorthents. Pits are the nearly level areas between Udorthents and the vertical high walls created during surface mining operations.

**Map Unit:** UkC2—Upshur-Berks complex, 6 to 15 percent slopes, eroded

Upshur is a sloping to strongly sloping, deep or very deep, well drained soil. Typically the surface layer is silty clay loam about 4 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a low available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is A-6. This soil is not hydric. Berks is a sloping to strongly sloping, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** UkD2—Upshur-Berks complex, 15 to 25 percent slopes, eroded

Upshur is a moderately steep, deep or very deep, well drained soil. Typically the surface layer is silty clay loam about 8 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is A-2. This soil is not hydric. Berks is a moderately steep, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 5 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** UkE2—Upshur-Berks complex, 25 to 40 percent slopes, eroded

Upshur is a steep, deep or very deep, well drained soil. Typically the surface layer is silty clay loam about 3 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is slow. It has a low available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 7e. The pasture and hayland suitability group is B-2. This soil is not hydric. Berks is a steep, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is F-2. This soil is not hydric.

**Map Unit:** Ur—Urban land, 0 to 15 percent slopes

Urban land is a miscellaneous area where the original soils have been removed or altered during excavation and construction activities, often resulting in random soil mixing. The soil surface is largely covered by streets, structures and other engineered installations. Generally the infiltration of precipitation on urban land is very limited.

**Map Unit:** UtB—Urban land-Canfield complex, 2 to 6 percent slopes

Urban land is a miscellaneous area where the original soils have been removed or altered during excavation and construction activities, often resulting in random soil mixing. The soil surface is largely covered by streets, structures and other engineered installations. Generally the infiltration of precipitation on urban land is very limited. Canfield is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 24 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is . The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** UtC—Urban land-Canfield complex, 6 to 12 percent slopes

Urban land is a miscellaneous area where the original soils have been removed or altered during excavation and construction activities, often resulting in random soil mixing. The soil surface is largely covered by streets, structures and other engineered installations. Generally the infiltration of precipitation on urban land is very limited. Canfield is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 20 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is . The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** UvB—Urban land-Chili complex, 2 to 6 percent slopes

Urban land is a miscellaneous area where the original soils have been removed or altered during excavation and construction activities, often resulting in random soil mixing. The soil surface is largely covered by streets, structures and other engineered installations. Generally the infiltration of precipitation on urban land is very limited. Chili is a gently sloping, very deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is . The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** VaA—Valley silt loam, 0 to 2 percent slopes

Valley is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is hydric.

**Map Unit:** VbA—Valley silty clay loam, 0 to 2 percent slopes

Valley is a nearly level, very deep, poorly drained soil. Typically the surface layer is silty clay loam about 11 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is hydric.

**Map Unit:** VcA—Valley-Lorain silt loams, 0 to 2 percent slopes

Valley is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is hydric. Lorain is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is ponded for long duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is hydric.

**Map Unit:** VnB—Vandergrift silt loam, 2 to 6 percent slopes

Vandergrift is a gently sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 15 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** VnC—Vandergrift silt loam, 6 to 15 percent slopes

Vandergrift is a sloping to strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 15 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** W—Water

Water includes creeks, rivers, lakes, and ponds that are water bodies in most years at least during the period warm enough for plants to grow; most areas persist throughout the year.

**Map Unit:** WaA—Wadsworth silt loam, 0 to 2 percent slopes

Wadsworth is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 10 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** WaB—Wadsworth silt loam, 2 to 6 percent slopes

Wadsworth is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 8 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** WkE—Westmoreland-Berks complex, 25 to 40 percent slopes

Westmoreland is a steep, deep or very deep, well drained soil. Typically the surface layer is silt loam about 3 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is A-3. This soil is not hydric. Berks is a steep, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 4 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is F-2. This soil is not hydric.

**Map Unit:** WkF—Westmoreland-Berks complex, 40 to 70 percent slopes

Westmoreland is a very steep, deep or very deep, well drained soil. Typically the surface layer is slightly decomposed plant material about 1 inches thick. The surface layer has a very high content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric. Berks is a very steep, moderately deep, well drained soil. Typically the surface layer is channery silt loam about 3 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** WmC—Westmoreland-Coshocton silt loams, 8 to 15 percent slopes

Westmoreland is a strongly sloping, deep or very deep, well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric. Coshocton is a strongly sloping, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** WmD—Westmoreland-Coshocton silt loams, 15 to 25 percent slopes

Westmoreland is a moderately steep, deep or very deep, well drained soil. Typically the surface layer is silt loam about 5 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric. Coshocton is a moderately steep, deep or very deep, moderately well drained soil. Typically the surface layer is silt loam about 3 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** WoA—Wick silt loam, 0 to 2 percent slopes, frequently flooded

Wick is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silt loam about 5 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is frequently flooded and is not ponded. The seasonal high water table is at or near the surface of the soil. The land capability classification is 5w. The pasture and hayland suitability group is C-3. This soil is hydric.

**Map Unit:** ZeA—Zepernick silt loam, 0 to 2 percent slopes, occasionally flooded

Zepernick is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a very high available water capacity and a moderate shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 10 inches. The land capability classification is 2w. The pasture and hayland suitability group is C-3. This soil is not hydric.

## Data Source Information

Soil Survey Area: Columbiana County, Ohio
Survey Area Data: Version 6, Sep 11, 2007

# Map Unit Description (Brief)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the selected area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit. A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

The "Map Unit Description (Brief)" report gives a brief, general description of the major soils that occur in a map unit. Descriptions of nonsoil (miscellaneous areas) and minor map unit components may or may not be included. This description is written by the local soil scientists responsible for the respective soil survey area data. A more detailed description can be generated by the "Map Unit Description" report.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

## Report—Map Unit Description (Brief)

## Mahoning County, Ohio

**Description Category:** SOI

**Map Unit:** AmF—Amanda loam, 35 to 70 percent slopes

Amanda is a steep to very steep, very deep, well drained soil. Typically the surface layer is loam about 5 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** BeB—Bennington silt loam, 2 to 6 percent slopes

Bennington is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 22 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** BgB—Bogart loam, 2 to 6 percent slopes

Bogart is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is loam about 14 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** BgC—Bogart loam, 6 to 12 percent slopes

Bogart is a sloping, very deep, moderately well drained soil. Typically the surface layer is loam about 14 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** BrB—Bogart silt loam, 2 to 6 percent slopes

Bogart is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 16 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** BrC—Bogart silt loam, 6 to 12 percent slopes

Bogart is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 18 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** BtB—Bogart loam, till substratum, 2 to 6 percent slopes

Bogart is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is loam about 14 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** BtC2—Bogart loam, till substratum, 6 to 12 percent slopes, moderately eroded

Bogart is a sloping, very deep, moderately well drained soil. Typically the surface layer is loam about 14 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** Ca—Canadice silty clay loam

Canadice is a nearly level, very deep, poorly drained soil. Typically the surface layer is silty clay loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is impermeable. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 4w. The pasture and hayland suitability group is C-2. This soil is hydric.

**Map Unit:** CdB—Canfield silt loam, 2 to 6 percent slopes

Canfield is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. Depth to a root restrictive fragipan is at a depth of 46 to 61 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** CdC—Canfield silt loam, 6 to 12 percent slopes

Canfield is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. Depth to a root restrictive fragipan is at a depth of 41 to 61 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** CdC2—Canfield silt loam, 6 to 12 percent slopes, moderately eroded

Canfield is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. Depth to a root restrictive fragipan is at a depth of 41 to 61 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** CdD—Canfield silt loam, 12 to 20 percent slopes

Canfield is a moderately steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 17 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** CdE—Canfield silt loam, 20 to 35 percent slopes

Canfield is a steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 20 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is F-4. This soil is not hydric.

**Map Unit:** CeB—Canfield-Urban land complex

Canfield is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. Depth to a root restrictive fragipan is at a depth of 41 to 61 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric. No description available for Urban Land.

**Map Unit:** CgB—Cardington silt loam, 2 to 6 percent slopes

Cardington is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 14 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 20 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** CgC2—Cardington silt loam, 6 to 12 percent slopes, moderately eroded

Cardington is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 14 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 20 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** Ch—Carlisle muck

Carlisle is a nearly level, very deep, very poorly drained soil. Typically the surface layer is muck about 60 inches thick. The surface layer has a very high content of organic matter. It has a very high available water capacity and a low shrink swell potential. This soil is not flooded and is ponded for long duration. The top of the seasonal high water table is at 3 inches. The land capability classification is 3w. The pasture and hayland suitability group is D-1. This soil is hydric.

**Map Unit:** Ck—Chagrin loam

Chagrin is a nearly level, very deep, well drained soil. Typically the surface layer is loam about 18 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 60 inches. The land capability classification is 2w. The pasture and hayland suitability group is B-3. This soil is not hydric.

**Map Unit:** ClB—Chili gravelly loam, 2 to 6 percent slopes

Chili is a gently sloping, very deep, well drained soil. Typically the surface layer is loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** ClC—Chili gravelly loam, 6 to 12 percent slopes

Chili is a sloping, very deep, well drained soil. Typically the surface layer is loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** ClD—Chili gravelly loam, 12 to 18 percent slopes

Chili is a moderately steep, very deep, well drained soil. Typically the surface layer is loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** CmB—Chili loam, 2 to 6 percent slopes

Chili is a gently sloping, very deep, well drained soil. Typically the surface layer is loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** CmC—Chili loam, 6 to 12 percent slopes

Chili is a sloping, very deep, well drained soil. Typically the surface layer is loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** CnE—Chili and Conotton gravelly soils, 18 to 25 percent slopes

Chili is a moderately steep, very deep, well drained soil. Typically the surface layer is loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is B-1. This soil is not hydric. Conotton is a moderately steep, very deep, well drained soil. Typically the surface layer is gravelly loam about 6 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 7e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** CnF—Chili and Conotton gravelly soils, 25 to 50 percent slopes

Chili is a steep to very steep, very deep, well drained soil. Typically the surface layer is loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 7e. The pasture and hayland suitability group is B-2. This soil is not hydric. Conotton is a steep to very steep, very deep, well drained soil. Typically the surface layer is gravelly loam about 6 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately rapid. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 7e. The pasture and hayland suitability group is B-2. This soil is not hydric.

**Map Unit:** CoB—Chili-Urban land complex, undulating

Chili is a gently sloping, very deep, well drained soil. Typically the surface layer is loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is B-1. This soil is not hydric. No description available for Urban Land.

**Map Unit:** CoC—Chili-Urban land complex, rolling

Chili is a sloping, very deep, well drained soil. Typically the surface layer is loam about 12 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is B-1. This soil is not hydric. No description available for Urban Land.

**Map Unit:** CsA—Chili silt loam, 0 to 2 percent slopes

Chili is a nearly level, very deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2s. The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** CsB—Chili silt loam, 2 to 6 percent slopes

Chili is a gently sloping, very deep, well drained soil. Typically the surface layer is silt loam about 13 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** CsC—Chili silt loam, 6 to 12 percent slopes

Chili is a sloping, very deep, well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** Ct—Condit silt loam

Condit is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is impermeable. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 20 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is hydric.

**Map Unit:** Da—Damascus loam

Damascus is a nearly level, very deep, poorly drained soil. Typically the surface layer is loam about 9 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** Dc—Damascus loam, till substratum

Damascus is a nearly level, very deep, poorly drained soil. Typically the surface layer is loam about 9 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 30 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** DkC—Dekalb very stony loam, 2 to 12 percent slopes

Dekalb is a gently sloping to sloping, deep or very deep, well drained soil. Typically the surface layer is very stony loam about 24 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6s. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** DkE—Dekalb very stony loam, 12 to 25 percent slopes

Dekalb is a moderately steep, deep or very deep, well drained soil. Typically the surface layer is very stony loam about 24 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6s. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** DkF—Dekalb very stony loam, 25 to 50 percent slopes

Dekalb is a steep to very steep, deep or very deep, well drained soil. Typically the surface layer is very stony loam about 24 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7s. The pasture and hayland suitability group is B-2. This soil is not hydric.

**Map Unit:** ElB—Ellsworth silt loam, 2 to 6 percent slopes

Ellsworth is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** ElC—Ellsworth silt loam, 6 to 12 percent slopes

Ellsworth is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** ElC2—Ellsworth silt loam, 6 to 12 percent slopes, moderately eroded

Ellsworth is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** ElD2—Ellsworth silt loam, 12 to 18 percent slopes, moderately eroded

Ellsworth is a moderately steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** ElE2—Ellsworth silt loam, 18 to 25 percent slopes, moderately eroded

Ellsworth is a moderately steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** ElF—Ellsworth silt loam, 25 to 50 percent slopes

Ellsworth is a steep to very steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 7e. The pasture and hayland suitability group is A-3. This soil is not hydric.

**Map Unit:** EsF3—Ellsworth silty clay loam, 25 to 50 percent slopes, severely eroded

Ellsworth is a steep to very steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 7e. The pasture and hayland suitability group is A-3. This soil is not hydric.

**Map Unit:** EuB—Ellsworth-Urban land complex

Ellsworth is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric. No description available for Urban Land.

**Map Unit:** FaB—Fairpoint silty clay loam, 0 to 8 percent slopes

Fairpoint is a nearly level to gently sloping, very deep, well drained soil. Typically the surface layer is silty clay loam about 8 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3s. The pasture and hayland suitability group is B-4. This soil is not hydric.

**Map Unit:** FbD—Fairpoint very channery silt loam, 8 to 25 percent slopes

Fairpoint is a strongly sloping to moderately steep, very deep, well drained soil. Typically the surface layer is very channery silt loam about 4 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6s. The pasture and hayland suitability group is E-3. This soil is not hydric.

**Map Unit:** FbF—Fairpoint very channery silt loam, 25 to 70 percent slopes

Fairpoint is a steep to very steep, very deep, well drained soil. Typically the surface layer is very channery silt loam about 4 inches thick. The surface layer has a very low content of organic matter. The slowest permeability is moderately slow. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** FcA—Fitchville silt loam, 0 to 2 percent slopes

Fitchville is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 25 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a very high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** FcB—Fitchville silt loam, 2 to 6 percent slopes

Fitchville is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 25 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a very high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** FeA—Fluvaquents, silty, 0 to 1 percent slopes, frequently flooded

Fluvaquents is a level, very deep, very poorly drained soil. Typically the surface layer is stratified variable about 80 inches thick. The surface layer has a content of organic matter. It has a very low available water capacity and a low shrink swell potential. This soil is frequently flooded and is ponded for very long duration. The seasonal high water table is at or near the surface of the soil. The land capability classification is . The pasture and hayland suitability group is B-3. This soil is hydric.

**Map Unit:** FhB—Fitchville silt loam, till substratum, 2 to 6 percent slopes

Fitchville is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 25 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** FlB—Fitchville-Urban land complex

Fitchville is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 25 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a very high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric. No description available for Urban Land.

**Map Unit:** Fr—Frenchtown silt loam

Frenchtown is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. Depth to a root restrictive fragipan is at a depth of 46 to 61 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** GbB—Geeburg silt loam, 2 to 6 percent slopes

Geeburg is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is F-5. This soil is not hydric.

**Map Unit:** GbB2—Geeburg silt loam, 2 to 6 percent slopes, moderately eroded

Geeburg is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is F-5. This soil is not hydric.

**Map Unit:** GbC—Geeburg silt loam, 6 to 12 percent slopes

Geeburg is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is F-5. This soil is not hydric.

**Map Unit:** GbD—Geeburg silt loam, 12 to 18 percent slopes

Geeburg is a moderately steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is F-5. This soil is not hydric.

**Map Unit:** GeC2—Geeburg silty clay loam, 6 to 12 percent slopes, moderately eroded

Geeburg is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderately low content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is F-5. This soil is not hydric.

**Map Unit:** GeC3—Geeburg silty clay loam, 6 to 12 percent slopes, severely eroded

Geeburg is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is F-5. This soil is not hydric.

**Map Unit:** GeD2—Geeburg silty clay loam, 12 to 18 percent slopes, moderately eroded

Geeburg is a moderately steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is F-5. This soil is not hydric.

**Map Unit:** GeE2—Geeburg silty clay loam, 18 to 25 percent slopes, moderately eroded

Geeburg is a moderately steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 7e. The pasture and hayland suitability group is F-6. This soil is not hydric.

**Map Unit:** GfB—Glenford silt loam, 2 to 6 percent slopes

Glenford is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GfC2—Glenford silt loam, 6 to 12 percent slopes, moderately eroded

Glenford is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is A-6. This soil is not hydric.

**Map Unit:** GsF—Gilpin-Weikert complex, 25 to 70 percent slopes

Gilpin is a steep to very steep, moderately deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric. Weikert is a steep to very steep, shallow, somewhat excessively drained soil. Typically the surface layer is channery silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is H-1. This soil is not hydric.

**Map Unit:** HeD—Hazleton channery loam, 15 to 25 percent slopes

Hazleton is a moderately steep, deep or very deep, well drained soil. Typically the surface layer is channery loam about 3 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is B-1. This soil is not hydric.

**Map Unit:** HeE—Hazleton channery loam, 25 to 40 percent slopes

Hazleton is a steep, deep or very deep, well drained soil. Typically the surface layer is channery loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately rapid. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is B-2. This soil is not hydric.

**Map Unit:** Hl—Holly silt loam

Holly is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a low shrink swell potential. This soil is frequently flooded and is not ponded. The top of the seasonal high water table is at 3 inches. The land capability classification is 3w. The pasture and hayland suitability group is C-3. This soil is hydric.

**Map Unit:** HoB—Hornell silt loam, 2 to 6 percent slopes

Hornell is a gently sloping, deep or very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a high content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is not hydric.

**Map Unit:** JmB—Jimtown silt loam, 2 to 6 percent slopes

Jimtown is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 11 inches. The land capability classification is 2e. The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** JtA—Jimtown loam, 0 to 2 percent slopes

Jimtown is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** JtB—Jimtown loam, 2 to 6 percent slopes

Jimtown is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** JuB—Jimtown loam, till substratum, 2 to 6 percent slopes

Jimtown is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** JwB—Jimtown-Urban land complex

Jimtown is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric. No description available for Urban Land.

**Map Unit:** Km—Kerston muck

Kerston is a nearly level, very deep, very poorly drained soil. Typically the surface layer is muck about 55 inches thick. The surface layer has a very high content of organic matter. It has a very high available water capacity and a high shrink swell potential. This soil is frequently flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. The land capability classification is 3w. The pasture and hayland suitability group is D-1. This soil is hydric.

**Map Unit:** KnD—Kensington silt loam, 15 to 25 percent slopes

Kensington is a moderately steep, deep, moderately well drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 24 inches. The land capability classification is 4e. The pasture and hayland suitability group is A-2. This soil is not hydric.

**Map Unit:** Lb—Lobdell loam

Lobdell is a nearly level, very deep, moderately well drained soil. Typically the surface layer is silt loam about 15 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 30 inches. The land capability classification is 2w. The pasture and hayland suitability group is A-5. This soil is not hydric.

**Map Unit:** Lc—Lorain silty clay loam

Lorain is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silty clay loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a high available water capacity and a high shrink swell potential. This soil is not flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is hydric.

**Map Unit:** LdB—Loudonville loam, 2 to 6 percent slopes

Loudonville is a gently sloping, very deep, well drained soil. Typically the surface layer is loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** LdC2—Loudonville loam, 6 to 12 percent slopes, moderately eroded

Loudonville is a sloping, very deep, well drained soil. Typically the surface layer is loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** LdD2—Loudonville loam, 12 to 18 percent slopes, moderately eroded

Loudonville is a moderately steep, very deep, well drained soil. Typically the surface layer is loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** LdE2—Loudonville loam, 18 to 25 percent slopes, moderately eroded

Loudonville is a moderately steep, very deep, well drained soil. Typically the surface layer is loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** LnA—Lorain silt loam, 0 to 2 percent slopes

Lorain is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is ponded for brief duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is Not rated. This soil is hydric.

**Map Unit:** LoF—Loudonville gravelly silt loam, 25 to 50 percent slopes

Loudonville is a steep to very steep, moderately deep, well drained soil. Typically the surface layer is gravelly silt loam about 6 inches thick. The surface layer has a content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 6e. The pasture and hayland suitability group is F-2. This soil is not hydric.

**Map Unit:** LrB—Loudonville-Urban land complex, undulating

Loudonville is a gently sloping, very deep, well drained soil. Typically the surface layer is loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is F-1. This soil is not hydric. No description available for Urban Land.

**Map Unit:** LrC—Loudonville-Urban land complex, rolling

Loudonville is a sloping, very deep, well drained soil. Typically the surface layer is loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric. No description available for Urban Land.

**Map Unit:** Ls—Luray silt loam

Luray is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silty clay loam about 11 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** Ly—Luray silty clay loam

Luray is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silty clay loam about 11 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** McC—Mechanicsburg silt loam, 6 to 15 percent slopes

Mechanicsburg is a sloping to strongly sloping, deep or very deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is A-1. This soil is not hydric.

**Map Unit:** MgA—Mahoning silt loam, 0 to 2 percent slopes

Mahoning is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is not hydric.

**Map Unit:** MgB—Mahoning silt loam, 2 to 6 percent slopes

Mahoning is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is C-2. This soil is not hydric.

**Map Unit:** MhB—Mahoning-Urban land complex

Mahoning is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is very slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The soil contains a maximum amount of 15 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is C-2. This soil is not hydric. No description available for Urban Land.

**Map Unit:** Mn—Marengo silty clay loam

Marengo is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silty clay loam about 13 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** MsB—Muskingum channery silt loam, 2 to 6 percent slopes

Muskingum is a gently sloping, very deep, well drained soil. Typically the surface layer is channery silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 2e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** MsC2—Muskingum channery silt loam, 6 to 12 percent slopes, moderately eroded

Muskingum is a sloping, very deep, well drained soil. Typically the surface layer is channery silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 3e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** MsD2—Muskingum channery silt loam, 12 to 18 percent slopes, moderately eroded

Muskingum is a moderately steep, very deep, well drained soil. Typically the surface layer is channery silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** MsE2—Muskingum channery silt loam, 18 to 25 percent slopes, moderately eroded

Muskingum is a moderately steep, very deep, well drained soil. Typically the surface layer is channery silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 4e. The pasture and hayland suitability group is F-1. This soil is not hydric.

**Map Unit:** MsF2—Muskingum channery silt loam, 25 to 50 percent slopes, moderately eroded

Muskingum is a steep to very steep, very deep, well drained soil. Typically the surface layer is channery silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a very low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The land capability classification is 7e. The pasture and hayland suitability group is F-2. This soil is not hydric.

**Map Unit:** Od—Olmsted loam

Olmsted is a nearly level, very deep, very poorly drained soil. Typically the surface layer is loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderate. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** Ov—Orrville silt loam

Orrville is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a low shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The land capability classification is 2w. The pasture and hayland suitability group is C-3. This soil is not hydric.

**Map Unit:** Pa—Papakating silt loam

Papakating is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silty clay loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is frequently flooded and is not ponded. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 3 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-3. This soil is hydric.

**Map Unit:** Pc—Papakating silty clay loam

Papakating is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silty clay loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is frequently flooded and is not ponded. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 3 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-3. This soil is hydric.

**Map Unit:** Pg—Pits, gravel

No description available for Gravel Pits.

**Map Unit:** Pu—Pits, quarry

No description available for Quarries.

**Map Unit:** RaA—Ravenna silt loam, 0 to 2 percent slopes

Ravenna is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. Depth to a root restrictive fragipan is at a depth of 38 to 61 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** RaB—Ravenna silt loam, 2 to 6 percent slopes

Ravenna is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 11 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. Depth to a root restrictive fragipan is at a depth of 38 to 61 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** ReA—Remsen silt loam, 0 to 2 percent slopes

Remsen is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a high available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is not hydric.

**Map Unit:** ReB—Remsen silt loam, 2 to 6 percent slopes

Remsen is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a high available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is not hydric.

**Map Unit:** RmB—Remsen-Urban land complex

Remsen is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a high available water capacity and a high shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. The land capability classification is 3w. The pasture and hayland suitability group is C-2. This soil is not hydric. No description available for Urban Land.

**Map Unit:** RsB—Rittman silt loam, 2 to 6 percent slopes

Rittman is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. Depth to a root restrictive fragipan is at a depth of 38 to 71 inches. The soil contains a maximum amount of 8 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** RsC—Rittman silt loam, 6 to 12 percent slopes

Rittman is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. Depth to a root restrictive fragipan is at a depth of 38 to 71 inches. The soil contains a maximum amount of 8 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** RsC2—Rittman silt loam, 6 to 12 percent slopes, moderately eroded

Rittman is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. Depth to a root restrictive fragipan is at a depth of 38 to 71 inches. The soil contains a maximum amount of 8 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** RsD2—Rittman silt loam, 12 to 18 percent slopes, moderately eroded

Rittman is a moderately steep, very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. Depth to a root restrictive fragipan is at a depth of 38 to 71 inches. The soil contains a maximum amount of 8 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** RuB—Rittman-Urban land complex

Rittman is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 27 inches. Depth to a root restrictive fragipan is at a depth of 38 to 71 inches. The soil contains a maximum amount of 8 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric. No description available for Urban Land.

**Map Unit:** Sb—Sebring silt loam

Sebring is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** Se—Sebring silt loam, till substratum

Sebring is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is hydric.

**Map Unit:** Sg—Sebring-Urban land complex

Sebring is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is hydric. No description available for Urban Land.

**Map Unit:** Sn—Sloan silt loam

Sloan is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silt loam about 18 inches thick. The surface layer has a content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 3 inches. The land capability classification is 3w. The pasture and hayland suitability group is C-3. This soil is hydric.

**Map Unit:** TrA—Trumbull silt loam, 0 to 2 percent slopes

Trumbull is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 4w. The pasture and hayland suitability group is C-2. This soil is hydric.

**Map Unit:** TrB—Trumbull silt loam, 2 to 6 percent slopes

Trumbull is a gently sloping, very deep, poorly drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 3 inches. The land capability classification is 4e. The pasture and hayland suitability group is C-2. This soil is hydric.

**Map Unit:** Tu—Trumbull-Urban land complex

Trumbull is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a high available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 5 percent calcium carbonate. The land capability classification is 4w. The pasture and hayland suitability group is C-2. This soil is hydric. No description available for Urban Land.

**Map Unit:** Ua—Udorthents, loamy, 2 to 25 percent slopes

No description available for Udorthents.

**Map Unit:** Uc—Udorthents-Pits complex, 0 to 70 percent slopes

These Udorthents are unconsolidated soil materials that have been excavated, mixed and redeposited as spoil in active or recent surface mining operations. They commonly are composed of a high content of rock fragments poorly mixed with weathered and non-weathered fine-earth materials. The spoil is dumped in cone-shaped or ridged piles 10 to 70 feet high to the side of the mining pit being dug. Pits are the nearly level areas between Udorthents and the vertical high walls created during surface mining operations.

**Map Unit:** UdB—Urban land-Canfield complex, 2 to 6 percent slopes

Urban land is a miscellaneous area where the original soils have been removed or altered during excavation and construction activities, often resulting in random soil mixing. The soil surface is largely covered by streets, structures and other engineered installations. Generally the infiltration of precipitation on urban land is very limited. Canfield is a gently sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 24 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is . The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** UdC—Urban land-Canfield complex, 6 to 12 percent slopes

Urban land is a miscellaneous area where the original soils have been removed or altered during excavation and construction activities, often resulting in random soil mixing. The soil surface is largely covered by streets, structures and other engineered installations. Generally the infiltration of precipitation on urban land is very limited. Canfield is a sloping, very deep, moderately well drained soil. Typically the surface layer is silt loam about 6 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a low available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 20 inches. Depth to a root restrictive fragipan is at a depth of 18 to 30 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is . The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** UsB—Udorthents, shale and sandstone materials, undulating

No description available for Udorthents.

**Map Unit:** UsC—Udorthents, shale and sandstone materials, rolling

No description available for Udorthents.

**Map Unit:** UsF—Udorthents, shale and sandstone materials, steep

No description available for Udorthents.

**Map Unit:** UtB—Udorthents, loamy till materials, undulating

No description available for Udorthents.

**Map Unit:** UtC—Udorthents, loamy till materials, rolling

No description available for Udorthents.

**Map Unit:** UtF—Udorthents, loamy till materials, steep

No description available for Udorthents.

**Map Unit:** UuB—Udorthents, clayey till materials, undulating

No description available for Udorthents.

**Map Unit:** UvB—Urban land-Chili complex, 2 to 6 percent slopes

Urban land is a miscellaneous area where the original soils have been removed or altered during excavation and construction activities, often resulting in random soil mixing. The soil surface is largely covered by streets, structures and other engineered installations. Generally the infiltration of precipitation on urban land is very limited. Chili is a gently sloping, very deep, well drained soil. Typically the surface layer is silt loam about 8 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a moderate available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The seasonal high water table is at a depth of more than 6 feet. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is . The pasture and hayland suitability group is Not rated. This soil is not hydric.

**Map Unit:** VaA—Valley silt loam, 0 to 2 percent slopes

Valley is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is Not rated. This soil is hydric.

**Map Unit:** VcA—Valley-Lorain silt loams, 0 to 2 percent slopes

Valley is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is ponded for brief duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is Not rated. This soil is hydric. Lorain is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silt loam about 7 inches thick. The surface layer has a high content of organic matter. The slowest permeability is very slow. It has a moderate available water capacity and a high shrink swell potential. This soil is not flooded and is ponded for brief duration. The seasonal high water table is at or near the surface of the soil. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is Not rated. This soil is hydric.

**Map Unit:** W—Water

No description available for Water.

**Map Unit:** WaA—Wadsworth silt loam, 0 to 2 percent slopes

Wadsworth is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. Depth to a root restrictive fragipan is at a depth of 36 to 71 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** WaB—Wadsworth silt loam, 2 to 6 percent slopes

Wadsworth is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. Depth to a root restrictive fragipan is at a depth of 36 to 71 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is C-1. This soil is not hydric.

**Map Unit:** WbB—Wadsworth-Urban land complex

Wadsworth is a gently sloping, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is slow. It has a moderate available water capacity and a moderate shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. Depth to a root restrictive fragipan is at a depth of 36 to 71 inches. The soil contains a maximum amount of 10 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is C-1. This soil is not hydric. No description available for Urban Land.

**Map Unit:** Wc—Wayland silt loam

Wayland is a nearly level, very deep, poorly drained soil. Typically the surface layer is silt loam about 17 inches thick. The surface layer has a high content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a low shrink swell potential. This soil is frequently flooded and is not ponded. The top of the seasonal high water table is at 3 inches. The soil contains a maximum amount of 1 percent calcium carbonate. The land capability classification is 3w. The pasture and hayland suitability group is C-3. This soil is hydric.

**Map Unit:** WoA—Wick silt loam, 0 to 2 percent slopes, frequently flooded

Wick is a nearly level, very deep, very poorly drained soil. Typically the surface layer is silt loam about 5 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a high available water capacity and a moderate shrink swell potential. This soil is frequently flooded and is not ponded. The seasonal high water table is at or near the surface of the soil. The land capability classification is 5w. The pasture and hayland suitability group is C-3. This soil is hydric.

**Map Unit:** WrF2—Wooster loam, 25 to 50 percent slopes, moderately eroded

Wooster is a steep to very steep, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 48 inches. Depth to a root restrictive fragipan is at a depth of 51 to 76 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 7e. The pasture and hayland suitability group is F-4. This soil is not hydric.

**Map Unit:** WsB—Wooster silt loam, 2 to 6 percent slopes

Wooster is a gently sloping, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 48 inches. Depth to a root restrictive fragipan is at a depth of 51 to 76 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 2e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** WsC2—Wooster silt loam, 6 to 12 percent slopes, moderately eroded

Wooster is a sloping, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 48 inches. Depth to a root restrictive fragipan is at a depth of 51 to 76 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 3e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** WsD2—Wooster silt loam, 12 to 18 percent slopes, moderately eroded

Wooster is a moderately steep, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 48 inches. Depth to a root restrictive fragipan is at a depth of 51 to 76 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 4e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** WsE2—Wooster silt loam, 18 to 25 percent slopes, moderately eroded

Wooster is a moderately steep, very deep, well drained soil. Typically the surface layer is silt loam about 9 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderate. It has a high available water capacity and a low shrink swell potential. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 48 inches. Depth to a root restrictive fragipan is at a depth of 51 to 76 inches. The soil contains a maximum amount of 6 percent calcium carbonate. The land capability classification is 6e. The pasture and hayland suitability group is F-3. This soil is not hydric.

**Map Unit:** ZeA—Zepernick silt loam, 0 to 2 percent slopes, occasionally flooded

Zepernick is a nearly level, very deep, somewhat poorly drained soil. Typically the surface layer is silt loam about 10 inches thick. The surface layer has a moderate content of organic matter. The slowest permeability is moderately slow. It has a very high available water capacity and a moderate shrink swell potential. This soil is occasionally flooded and is not ponded. The top of the seasonal high water table is at 10 inches. The land capability classification is 2w. The pasture and hayland suitability group is C-3. This soil is not hydric.

## Data Source Information

Soil Survey Area: Mahoning County, Ohio
Survey Area Data: Version 8, Sep 12, 2007

# Division of Natural Areas and Preserves

## OHIO'S INVASIVE NON-NATIVE PLANTS

Ohio's Top Ten

- Japanese Honeysuckle
- Japanese Knotweed
- Autumn Olive
- Buckthorns
- Purple Loosestrife
- Common Reed
- Reed Canary Grass
- Garlic Mustard
- Multiflora Rose
- Bush Honeysuckles

What You Can Do

Of the approximately 3,000 species of plants known to occur in the wild in Ohio, about 75 percent are native or have occurred in Ohio before the time of substantial European settlement, about 1750. The other 25 percent, around 700 to 800 species, are not native to Ohio, having been introduced from other states or countries.

Most of these species never stray far from where they are introduced (gardens, urban areas, agricultural fields), yet some become very invasive and displace native plants in woodlands, wetlands, prairies, and other natural areas. Non-native plants have been introduced for erosion control, horticulture, forage crops, medicinal use, and wildlife foods as well as simply by accident!

Amur honeysuckle

Sometimes we plant non-native plants for landscaping or wildlife habitat without realizing the problems they may cause when they escape into natural areas. Without natural predators or controls, invasive non-native plants are able to spread quickly and force out native plants. In Ohio, several non-native plants are invading woodlands and displacing native spring wildflowers. Other non-native plants are impacting our wetlands by creating monocultures. Native plant diversity is important for wildlife habitat as many animals depend on a variety of native plants for food and cover.

Autumn olive

This page describes ten of the most invasive non-native plant species in Ohio with information about their appearance, habitat, possible controls, and native species which can be used as alternatives in garden or wildlife plantings. Be aware that management of these invasive species is difficult and complex; obtain more detailed information before using controls such as herbicides.

JAPANESE HONEYSUCKLE

Lonicera japonica

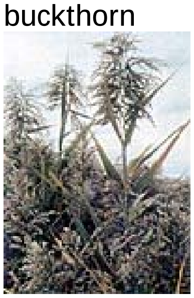
Description: Japanese honeysuckle is a woody semi-evergreen vine with opposite, oval leaves. The flowers grow in pairs, are white to yellow, and very fragrant. Fruits, also in pairs, are purple to black berries. This vine climbs and drapes over native vegetation, forming dense patches.

Common buckthorn

Habitat: Japanese honeysuckle thrives in disturbed habitats, such as roadsides, trails, fencerows, abandoned fields, and forest edges primarily in southern Ohio. Disturbances such as logging, road building, floods, and windstorms create an opportunity for this vine to invade native plant communities.

Management: Burning in combination with systemic herbicide application may be an effective control method. Herbicides can be applied to the leaves when native plants are dormant. Be aware there are native climbing honeysuckles in Ohio, such as Lonicera dioica.

Native Alternatives: Virginia creeper (Parthenocissus quinquefolia), wild honeysuckle (Lonicera dioica), and virgin's bower (Clematis virginiana)



Common reed

JAPANESE KNOTWEED

Polygonum cuspidatum

Description: This shrub-like herb grows up to 10 feet tall. Stems are smooth and the pointed leaves vary from broadly oval to almost triangular. Flowers are greenish-white and very small. The seeds are dispersed by wind. Once established, the plants spread by a system of underground stems reaching 60 feet.

Garlic mustard

Habitat: Japanese knotweed can grow in a wide variety of habitats. It is found in open areas, such as roadsides, streambanks, and woodland edges, primarily in eastern Ohio. It spreads quickly and forms dense thickets.

Management: Knotweed is very difficult to control. Leaves may be sprayed or stems cut and treated with systemic herbicide.

Native Alternatives: Japanese knotweed is not generally planted, however consider using northern arrowwood (Viburnum dentatum), black haw (Viburnum prunifolium), dogwoods (Cornus racemosa, C, amomum and C. sericea), and chokeberry (Aronia prunifolia, A. melanocarpa)

Glossy buckthorn

AUTUMN-OLIVE

Elaeagnus umbellata

Description: Autumn-olive is a fast-growing shrub or small tree reaching up to 20 feet tall. Its leaves are small and oval, dark green on the upper surface and silvery below. Small coppery dots occur on stems and leaves. This shrub has light yellow, aromatic flowers and produces large quantities of small, round red fruits that are readily eaten and spread by birds.

Japanese honeysuckle

Habitat: Autumn-olive can survive in very poor soils because of its nitrogen-fixing root nodules. It grows in disturbed areas, roadsides, pastures, and fields throughout Ohio.

Management: Stems may be cut and treated with systemic herbicide. Resprouting will occur, so follow-up control is necessary. A combination of hand-pulling, digging and herbicide treatments is usually necessary.

Native Alternatives: black haw (Viburnum prunifolium), dogwoods (Cornus racemosa, C, amomum and C sericea), and serviceberry (Amelanchier arborea and A. Irons)

Japanese Knotweed

BUCKTHORNS

Rhamnus frangula, R. cathartica
Glossy (or Shining), Common (or European) buckthorn

Description: Buckthorns are tall shrubs or small trees that grow up to 20 feet tall. The smooth, gray to brown bark is distinctively spotted. Glossy buckthorn has shiny leaves with smooth edges. It has solitary red to purple berry-like fruits. Common buckthorn has black fruits and dull green smooth leaves. Both species are abundant seed producers.

Morrow honeysuckle

Habitat: Glossy buckthorn usually occurs in wetlands, such as fens or bogs, but it is also found in forests, fencerows, edges, prairies, and old fields. Common buckthorn occurs in a range of upland habitats, such as forests, woodland edges, fencerows, prairies, and old fields. Both species are most prevalent in central and northern Ohio.

Management: Cutting and treating stumps with systemic herbicide is the best method of control. Buckthorns are very difficult to control due to vigorous resprouting and a large seedbank.

Multiflora rose

Native Alternatives: lance-leaved buckthorn (Rhamnus lanceolata), winterberry (Ilex verticillata), dogwoods (Cornus racemosa, C. amomum and C. sericea), and white cedar (Thuja occidentalis)

PURPLE LOOSESTRIFE

Lythrum salicaria

Description: This popular garden flower grows 3-7 feet tall and has a dense bushy growth of 1-50 stems. Long spikes of flowers are purple to magenta; linear-shaped leaves grow opposite along the square stems. Purple loosestrife spreads aggressively by underground stems (rhizomes) and can produce as many as a million seeds per plant. Supposedly sterile strains of L. virgatum will outcross with this plant and produce seeds.

Purple loosestrife

Habitat: Purple loosestrife grows in a variety of wetland habitats including marshes, river banks, ditches, wet meadows, and edges of water bodies, primarily in northern Ohio. Loosestrife can invade both natural and disturbed wetlands, replacing native vegetation with nearly pure stands of loosestrife.

Management: Small stands of purple loosestrife can be controlled by hand-pulling, digging, or applying systemic herbicides to the foliage. Herbicides may be used to control large populations. Biological controls using insects are being researched in Ohio and other states and may be helpful in reducing infestations.

Native Alternatives: spiked blazing-star (Liatris spicata), blue lobelia (Lobelia siphilitica), cardinal flower (Lobelia cardinalis), rose mallow (Hibiscus moscheutos), and blue flag iris (Iris versicolor)

COMMON REED OR PHRAGMITES

Reed canary grass

Tatarian Honeysuckle

Phragmites australis

Description: Common reed, or Phragmites, is a grass that reaches up to 15 feet in height. The leaves are smooth, stiff and wide with coarse hollow stems. The big, plume-like flower head is grayish-purple when in fruit. Common reed spreads mostly vegetatively forming huge colonies by sprouting new shoots through underground stems (rhizomes).

Habitat: Common reed grows in open wetland habitats and ditches primarily in northern Ohio. It occurs in still water areas of marshes, lake shores, riverbanks, and disturbed or polluted soils, often creating pure stands. Some populations are not invasive and may be native, however there is no reliable method to tell the two apart.

Management: Long-term management is necessary for control of this persistent plant. Cutting and/or treating stems with systemic herbicides is generally the most effective, grass-specific herbicides are recommended in areas where native plants occur.

Native Alternatives: Indian grass (Sorghastrum nutans), big bluestem (Andropogon gerardii), prairie cord grass (Spartina pectinata), and Canada bluejoint (Calamagrostis canadensis)

REED CANARY GRASS

Phalaris arundinacea

Description: This large, coarse grass reaches 2-5 feet tall. The hairless stems gradually taper to flat and rough leaf blades 3-10 inches long. The flowers occur in dense clusters and are green to purple, changing to beige and becoming more open over time. The plant spreads aggressively both by seed and by forming a thick system of underground stems (rhizomes).

Habitat: This grass occurs in wetlands, such as marshes, wet prairies, meadows, fens, stream banks, and seasonally wet areas throughout Ohio. Reed canary grass has been planted widely for forage and erosion control. Native strains possibly occur, however introduced strains are thought to be more invasive. There is no reliable method to tell the two strains apart.

Management: A combination of burning or mowing with systemic herbicides is the best method of control; grass-specific herbicides applied with wick applicators are recommended in areas where native plants occur.

Native Alternatives: Reed canary grass is not generally planted, however consider using prairie cord grass (Spartina pectinata) and Canada bluejoint (Calamagrostis canadensis).

GARLIC MUSTARD

Alliaria petiolata

Description: Garlic mustard is a biennial herb. It begins as a rosette of leaves in the first year, overwinters as a green rosette of leaves, flowers and fruits in the second year, and then dies. First-year rosettes consist of kidney-shaped, garlic-smelling leaves, the second-year plant grows a stem up to 4 feet tall with triangular, sharply-toothed leaves. The small, four-petaled flowers are white and grow in clusters at the top of the stem. Garlic mustard produces large quantities of seeds which can remain viable for seven years or more.

Habitat: This woodland plant prefers some shade but is occasionally found in full sun. It invades upland and floodplain forests, savannas, yards, streams, trails, and roadsides throughout Ohio.

Management: Repeated prescribed burns in oak forests may be effective. Light infestations of garlic mustard can be hand pulled before or at flowering time. Plants should be removed from the site after pulling as the seeds may continue to mature. Systemic herbicides can be applied to the rosettes in early spring or late fall.

Native Alternatives: Garlic mustard is not generally planted, however consider using white baneberry (Actaea pachypoda), columbine (Aquilegia canadensis), blue phlox (Phlox divaricata), and black cohosh (Cimicifuga racemosa)

MULTIFLORA ROSE

Rosa multiflora

Description: Multiflora rose is a dense spreading shrub with widely arching canes and stiff, curved thorns. This shrub grows up to 15 feet tall with alternate, compound leaves of seven to nine oval leaflets. Multiflora rose has numerous white flowers that produce clusters of small, red fruits. The fruits (called hips) are eaten by birds and mammals which help disperse the seeds. An individual plant can produce up to 500,000 seeds per year!

Habitat: Multiflora rose was formerly planted as a "living fence" to control livestock, stabilize soil and create barriers for roadways. It has also been planted as a wildlife cover and food source. This rose occurs in a wide range of habitats throughout Ohio but prefers sunny areas with well-drained soils.

Management: A long-term management program of mowing or cutting and treating stems with systemic herbicide several times during the growing season is recommended. Digging or hand-pulling small shrubs may also be effective.

Native Alternatives: Carolina rose (Rosa carolina), black haw (Viburnum prunifolium), swamp rose (Rosa palustris), fragrant sumac (Rhus aromatica), and smooth rose (Rosa blanda)

BUSH HONEYSUCKLES

Lonicera maackii, L tatarica, L. morrowii
Amur, Tatarian, Morrow honeysuckle

Description: These upright shrubs can grow 6-15 feet in height. Each have dark green, egg-shaped leaves. The tubular flowers are white on the Amur and the Morrow (changing to yellow with age), and pink on the Tatarian. Berries range from red to orange, occasionally yellow, and are eaten and dispersed by birds.

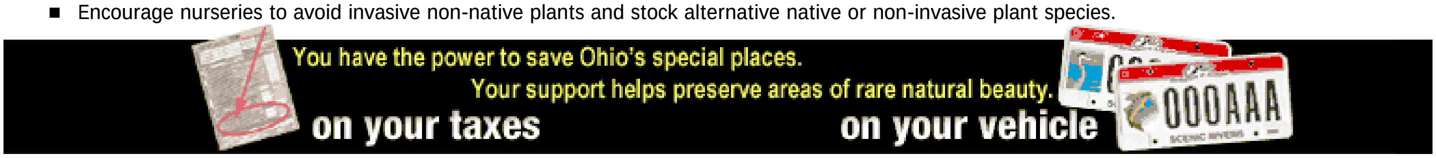
Habitat: The bush honeysuckles inhabit abandoned fields, roadsides, woodlands, and edges of marshes. Morrow is currently a problem in northern Ohio; Amur is found mostly in southwestern Ohio; and Tatarian is widespread in Ohio.

Management: The best control method is to cut and treat stumps with systemic herbicide. Sprouts from cut stems may be treated with a foliar application of systemic herbicide. Young shrubs are easy to pull or dig up. Be aware there is a native bush honeysuckle in Ohio (Diervilla lonicera).

Native Alternatives: nine-bark (Physocarpus opulifolius), dogwoods (Cornus racemosa, C. amomum and C. sericea), northern arrowwood (Viburnum dentatum), winterberry (Ilex verticillata), and chokeberry (Aronia prunifolia, A. melanocarpa)

WHAT YOU CAN DO TO HELP:

- Spread the word about the threats of invasive plants in Ohio and the benefits provided by native plant communities.
- Familiarize yourself with the invasive plants in your area and report infestations to the nearest land-managing agency or extension service.
- Be careful not to gather and transport unidentified seeds which may spread invasive plants.
- Volunteer with your local land-managing agency (parks, nature preserves, hiking trails) to help control invasive plants.
- Plant native or non-invasive plants in your yard and garden; eradicate invasive plants on your property.
- Encourage nurseries to avoid invasive non-native plants and stock alternative native or non-invasive plant species.



LITTLE BEAVER CREEK LAND FOUNDATION

(the "Foundation")

Code of Regulations

Adopted: April 5, 1993

Officer's Certificate

The undersigned officer of the Foundation hereby certifies that this is a true and complete copy of the Code of Regulations duly adopted under section 1702.11(A), Ohio Revised Code, effective the date set forth above.

CAROL F. BRETZ, PRESIDENT

CODE OF REGULATIONS

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## STATEMENT OF PURPOSES

We, the concerned citizens of Columbiana County, Ohio, determined to

improve and revitalize our area, and

promote the preservation, renewal and restoration of the natural areas around and along Little Beaver Creek, and

improve the quality of life of all area residents,

do hereby establish a charitable organization which shall be known as the LITTLE BEAVER CREEK LAND FOUNDATION, and do hereby adopt a Code of Regulations for its operation.

**[NOW SEE PAGES 4-21]**

CODE OF REGULATIONS

ARTICLE I

MEETINGS OF VOTING MEMBERS

§1.01 Annual Meeting. The annual meeting of the voting members, for the purpose of electing Trustees and transacting such other business as may come before the meeting, shall be held on such date and at such time as the Board of Trustees may fix from year to year, or if the Board of Trustees fails so to fix a date and time for the meeting in any year, on the first Tuesday of the fifth calendar month following the end of the last fiscal year of the Foundation, if not a legal holiday, but if that day is a legal holiday under Ohio law, the annual meeting shall be held on the first succeeding day which is not a Saturday, Sunday or legal holiday. If for any reason the election of Trustees is not held at the annual meeting or any adjournment thereof, the officers or trustees may cause the election to be held at a special voting members' meeting.

§1.02 Special Meetings. A special meeting of the voting members may be called by the President, or by a majority of the Trustees acting with or without a meeting, or by action adopted or taken by the vote or consent of not less then 33-1/3% of all of the voting members.

Upon delivery in person or by certified mail to the President or Secretary of a written request for a voting members' meeting (which request shall specify the purposes of such meeting) by any persons entitled to call such a meeting, it shall be the duty of the officer to whom the request is delivered to give to the voting members entitled thereto notice of a meeting to be held not less than seven nor more than 65 days after delivery of such request, as such officer shall fix. If, upon such a request, such officer does not within ten days call the meeting, the persons making such request may call it by giving notice as provided in §1.04, or by causing it to be given by any designated representative.

§1.03 Place of Meetings. All voting members' meetings shall be held at such place or places, within Columbiana County, Ohio, as may from time to time be fixed by the trustees, or if not so fixed, then as shall be specified in the respective notices or waivers of notices thereof.

§1.04 Notices of Meetings. Except as otherwise expressly required by law, notice of each voting members' meeting, whether annual or special, shall be given not more than 60 days and not less than two days before the date specified for the meeting by the President or Secretary, or, in case of their refusal or failure to do so, by the person or persons entitled to call such meeting, to each voting member entitled to notice of the meeting, by delivering a written notice thereof to him personally or by posting it in a postage-prepaid envelope addressed to him at his address as it appears on the records of the Foundation, or, if he shall not have furnished his address to the Foundation, then at his most recent post office address known to the sender.

Except when expressly required by law, no publication of any notice of a voting members' meeting shall be required. Every notice of a voting members' meeting, besides stating the time and place of the meeting, shall state briefly the purposes thereof as may be specified by the person or persons requesting or calling the meeting. Notice of the adjournment of a meeting need not be given if the time and place to which it is adjourned are fixed and announced at such meeting.

§1.05 Waiver of Notice. Any voting member, either before or after any meeting, may waive in writing any notice thereof required by law, the Articles of Incorporation, or these Regulations. Such written waivers shall be filed with or entered upon the records of the meeting. Notice of a meeting shall be deemed to be waived by any voting member who attends such meeting either in person or by proxy and who does not, before or at the commencement of the meeting, protest the lack of proper notice.

§1.06 Quorum and Vote Requirement. At any voting members' meeting, three (3) members present in person or by proxy and entitled to vote thereat, shall constitute a quorum for the transaction of business, unless a different number is required by law, the Articles of Incorporation, or these Regulations.

Votes by proxy may be cast provided the proxies have been filed with the Secretary of the Board of Trustees at least ten (10) days before the date of the members' meeting.

In the absence of a quorum at any meeting or any adjournment thereof, a majority in voting power of the voting members present in person or by proxy and entitled to vote or, in the absence of all of the voting members, any officer entitled to preside or act as Secretary of the meting, may adjourn the meeting from time to time. At any adjourned meeting at which a quorum is present, any business may be transacted which might have been transacted at the meeting as originally called.

Except where the Ohio Non-profit Corporation Law or other applicable law, or the Articles of Incorporation, or other provisions of these Regulations designate or require a different proportion of the voting power of the Foundation with respect to any matter to be acted upon by voting members, a majority of the voting members present in person or by proxy and entitled to vote at any voting members' meeting at which a quorum is present may authorize or take action with respect to each matter properly submitted to the voting members at such meeting.

§1.07 Organization. At each voting members' meeting the presiding officer of the meeting shall be the President, or, in his absence, the Vice President; or in the absence of both of the foregoing, a presiding officer chosen by a majority in voting power of the voting members present in person or by proxy and entitled to vote thereat. The Secretary of the Foundation, or, in his absence, any Assistant Secretary, or, in the absence of all of them, any person whom the presiding officer of the meeting appoints for such meeting, shall act as Secretary of each voting members' meeting.

§1.08 Order of Business. The order of business at each voting members' meeting shall be as determined by the President, except that the order of business at any meeting may be changed by the vote of a majority in voting power of those voting members present in person or by proxy and entitled to vote thereat. Unless otherwise fixed by the President or the voting members as provided above, the order of business at each such voting members' meeting shall be as follows:

1. Roll call;

2. Proof of notice of meeting or waiver thereof;

   A QUORUM BEING PRESENT:

3. Reading of minutes of preceding meeting, unless dispensed with by the vote of a majority in voting power of those voting members present in person or by proxy and entitled to vote thereat;

4. Reports of officers, if any;

5. Reports of committees, if any;

6. Election of Trustees, if any;

7. Unfinished business, if any; and

8. New business, if any.

§1.09 Voting. Each voting member shall be entitled to one vote in person or by proxy, regardless of the dollar amounts contributed to the Foundation by said voting member.

§1.10 Proxies. Each voting member who is entitled to attend a meeting of voting members, to vote thereat, or to execute consents, waivers or releases, may be represented at such meeting, vote thereat, execute and deliver such consents, waivers or releases, and exercise any of his other rights as a voting member, by proxy or proxies appointed by a writing signed by such voting member, which need not be sealed, witnessed or acknowledged. Except as herein otherwise specifically provided, actions taken by proxy or proxies shall be governed by the provisions of the Ohio Non-profit Corporation Law.

§1.11 List of Voting Members at Meetings. Upon request of any voting member at any meeting of voting members, there shall be produced at such meeting an alphabetically arranged list, or classified lists, of the voting members of record as of the applicable record date, who are entitled to vote at such meeting, showing their respective addresses.

§1.12 Action in Writing in Lieu of Meeting. Any action which may be taken at a meeting of the voting members, may be taken without a meeting if authorized by a writing or writings signed by each of the voting members who would be entitled to notice of a meeting called for the purpose of taking such action, or such lesser proportion of voting members that may now or hereafter be permitted by the Ohio Non-profit Corporation Law, the Articles of Incorporation or these Regulations.

## ARTICLE II

### Board of Trustees

§2.01 General Powers. The powers of the Foundation shall be exercised and its business and affairs and its property shall be controlled by the Board of Trustees, except as may otherwise be provided by applicable law, the Articles of Incorporation, or these Regulations.

§2.02 Number. The number of Trustees constituting the full Board of Trustees shall be as fixed from time to time at not more than eleven as hereinafter provided. Such number shall be (i) that number fixed from time to time by resolution or other action adopted or taken by the vote or consent of not less than a majority of the voting members entitled to vote for the election of Trustees present in person or by proxy at any annual meeting of voting members or any special meeting thereof called for that purpose, or (ii) if the number is not so fixed, the total number of persons elected and remaining as Trustees in office immediately after (and giving effect to) any election of what purports to be a full Board of Trustees, or any election of additional Trustees, by the unanimous vote or consent of all voting members entitled to vote for the election of Trustees (whether at a meeting of all such voting members or by their unanimous written consent in lieu of a meeting); provided, however, that no reduction in the number of Trustees in and of itself shall have the effect of removing any Trustee from office prior to the expiration of his term of office. The last number of Trustees fixed as provided herein shall constitute the number of Trustees unless and until subsequently so fixed at a different number. Unless and until first so fixed by resolution of the voting members, the number of Trustees shall be three.

§2.03 Compensation and Expenses. The trustees shall not be entitled to compensation. Trustees may be reimbursed for their reasonable expenses incurred in the performance of their duties, including the expense of traveling to and from meetings of the board, if such reimbursement is authorized by a majority of them.

§2.04 Election. The initial three Trustees named in the Articles of Incorporation shall hold office until their successors are elected. At each meeting of the voting members for the election of Trustees at which a quorum is present, the persons receiving the greatest number of votes in each of the eleven categories listed hereafter shall be deemed elected the Trustees. No one shall be eligible to the office of Trustee or Officer who is not a voting member.

The Board of Trustees shall form a nominating committee comprised of three of their members. The committee shall nominate five individual members, all of whom are residents of Columbiana County, Ohio, and at least two of whom shall be owners of land adjacent to Beaver Creek.

§2.05 Term of Office. Unless he earlier resigns, is removed as hereinafter provided, dies, or is adjudged mentally incompetent, each Trustee shall hold office for three years, or until the sine die adjournment of the special meeting of the voting members for the election of Trustees held thereafter as provided for in §1.02, or the taking by the voting members of action in writing in lieu of such a meeting and until his successor is elected and qualified.

Of the initial five elected Trustees, two shall serve one-year terms; two shall serve two-year terms; and one shall serve a three-year term. The length of the initial five Trustees' terms shall be determined by lottery, as administered by the President. Thereafter, every Trustee shall be elected to serve a three-year term.

§2.06 Trustee Term Limits. No elected Trustee (or person filling, by appointment, an elected Trustee's vacancy) shall serve more than three consecutive full terms. A part-term of eighteen months or more shall be considered a "full" term for purposes of the preceding sentence. However, the preceding limitation of serving more than three consecutive full terms may be waived if the following procedures are observed:

1. The Trustee requesting the waiver must give notice in writing to the Secretary not later than September 1 of the last year of the third full term.

2. The question of said waiver request shall be placed on the Agenda for discussion at the next meeting of the Board of Trustees following receipt of said request. The matter shall then be voted upon at the second Trustees meeting following receipt of said request. The Trustee requesting the waiver shall be excused from the meeting during any discussion of the waiver request.

3. Approval of said request shall be by secret ballot at said second meeting, and require the consent of at least two-thirds of the Trustees present and voting at said meeting.

4. Approval shall constitute a waiver for one additional three year term of the aforementioned three year term limit.

5. Additional waivers beyond the first additional term may also be requested and granted by the same process set forth above.

§2.07 Removal. Any Trustee or Trustees may be removed, either with or without cause, at any time, by the affirmative vote of a majority of the voting members. The vacancy in the Board of Trustees caused by any such removal may be filled by the voting members at such meeting.

§2.08 Vacancies. A vacancy in the Board of Trustees may be filled by a majority vote of the remaining Trustees until the voting members hold an election to fill the vacancy. Voting members entitled to elect Trustees may elect a Trustee to fill any vacancy in the board (whether or not the vacancy has previously been temporarily filled by the remaining Trustees) at any voting members' meeting called for that purpose.

§2.09 Action in Writing in Lieu of Meeting. Any action which may be taken by the Board of Trustees, or any committee of Trustees, at any meeting thereof may be taken without a meeting if authorized by a writing or writings signed by each of the Trustees, or by each member of such committee, as the case may be.

§2.10 Resignations. Any Trustee may resign by giving written notice to the President, or to the Secretary of the Foundation. Such resignation shall take effect upon receipt of such notice, or at any other time specified therein. Unless otherwise specified therein, the acceptance of a resignation shall not be necessary to make it effective.

§2.11 Quorum, Vote Requirement, and Manner of Acting. A majority of the Trustees serving as such as of the time of any meeting of Trustees (even though, because of one or more vacancies, less than a majority of the total number of Trustees fixed under §2.02) must be present in person at such meeting in order to constitute a quorum for the transaction of business. Except as is otherwise provided by law, the Articles of Incorporation, or these Regulations, the act of a majority of the Trustees present at any meeting at which a quorum is present shall be the act of the Board of Trustees. In the absence of a quorum, a majority of those present may adjourn a meeting from time to time until a quorum is obtained. Notice of an adjourned meeting need not be given. The Trustees shall act only as a board. Individual Trustees shall have no power as such.

§2.12 Executive and Other Committees. The Board of Trustees may create and from time to time abolish or reconstitute an Executive Committee and any other committee or committees of Trustees each to consist of not less than three Trustees, and may delegate to any such committee or committees any or all of the authority of the Trustees, however conferred, other than that of adopting Trustees' bylaws under §2.13 and that of filling vacancies in the Board of Trustees or in any committee of Trustees. Each such committee shall serve at the pleasure of the Trustees, shall act only in the intervals between meetings of the Board of Trustees, and shall be subject to the control and direction of the Board of Trustees.

The Trustees may adopt or authorize the committees to adopt provisions with respect to the government of any such committee or committees which are not inconsistent with applicable law, the Articles of Incorporation, these Regulations, or any Trustees' bylaws. An act or authorization of an act by any such committee within the authority properly delegated to it by the Trustees shall be as effective for all purposes as the act or authorization of the full Board of Trustees.

Except as otherwise expressly provided in these Regulations, each right, power, or authority conferred in these Regulations to the "Trustees" or to the "Board of Trustees" or to the "Board" shall also be deemed conferred to each committee or committees to which any such right, power, or authority is delegated (expressly or by necessary implication) by the Board of Trustees.

§2.13 Trustees' Bylaws. For purposes of their own government the Trustees, by vote of a majority of all Trustees then serving as such, may adopt, revoke and from time to time amend Trustees' bylaws not inconsistent with applicable law, the Articles of Incorporation, or these Regulations. Without limiting the generality of the foregoing, the Trustees' bylaws may contain provisions with respect to frequency, organization, place, time, notice, adjournment, and order of business of meetings of the Board of Trustees or committees of Trustees, and the establishment, membership, authority, and duties of committees of Trustees.

§2.14 Organization of Meetings. At each meeting of the Board of Trustees, the President, or, in his absence, the Vice President or a presiding officer chosen by a majority of the Trustees present, shall act as presiding officer. The Secretary of the Foundation, or, if the Secretary shall not be present, any person whom the President shall appoint, shall act as Secretary of the meeting.

§2.15 Place of Meetings. The meetings of the Board of Trustees shall be held at such place or places, within Columbiana County, Ohio, as may from time to time be fixed by the Board of Trustees, or as shall be specified or fixed in the respective notices or waivers of notice thereof. Unless the Bylaws or Articles otherwise provide, meetings of the Board of Trustees may be held through any communications equipment if all persons participating can hear each other, and participation by a Trustee in such a meeting shall constitute his attendance at such meeting.

§2.16 Regular Meetings. Regular meetings of the Board of Trustees will not be held unless the Board of Trustees otherwise determines.

§2.17 Special Meetings. Special meetings of the Board of Trustees shall be held whenever called by the President, or by any two Trustees.

§2.18 Notices of Meetings. Every Trustee shall furnish the Secretary of the Foundation with an address at which notices of meetings and all other corporate notices may be served on or mailed to him. Unless waived before, at, or after the meeting as hereinafter provided, notice of each board meeting shall be given by the President, the Secretary, an Assistant Secretary, or the persons calling such meeting to each Trustee in any of the following ways:

(1) By orally informing him of the meeting in person or by telephone not later than 48 hours before the time of the meeting.

(2) By personal delivery to him not later than 48 hours before the time of the meeting of written notice thereof.

(3) By mailing written notice to him, or by sending notice to him by telegram, cablegram, radiogram or other form of communication of written messages, postage or other costs prepaid, addressed to him at the address furnished by him to the Secretary of the Foundation, or to such other address as the person sending the notice shall know to be correct. Such notice shall be posted or dispatched a sufficient length of time before the meeting so that, in the ordinary course of the mails or other form of communication used, delivery thereof would normally be made to him not later than 48 hours before the time of the meeting.

Unless otherwise required by the Ohio Non-profit Corporation Law, the Articles of Incorporation, or these Regulations (e.g. §3.03 with respect to certain elections of officers), the notice of any meeting need not specify the purpose or purposes thereof. Notice of any meeting of the Board of Trustees may be waived by any Trustee, either before, at, or after the meeting, in writing, or by telegram, cablegram, radiogram or other form of communication of written messages. The attendance of any Trustee at any meeting of the Board of Trustees without protesting, prior to or at the commencement of the meeting, the lack of proper notice thereof shall constitute a waiver by him of notice of such meeting.

§2.19 Notice of Adjournment of Meeting. Notice of adjournment of a meeting need not be given if the time and place to which it is adjourned are fixed and announced at such meeting.

§2.20 Order of Business. The order of business at meetings of the Board of Trustees shall be such as the Trustees may set, by their By-laws, or as the President may prescribe or follow, subject, however, to his being overruled with respect thereto by a majority of the members of the Board of Trustees present.

## ARTICLE III

## Officers

§3.01 Number and Titles. The officers of the Foundation shall be a President, a Vice President, a Treasurer, and a Secretary. There shall be such one or more Assistant Treasurers and Assistant Secretaries, if any, as the Board of Trustees may from time to time determine and elect to office. Any person may hold two or more offices and perform the duties thereof, except that no officer shall execute, acknowledge, or verify any instrument in more than one capacity if such instrument is required by law, the Articles of Incorporation, these Regulations, or any Trustees' bylaws to be executed, acknowledged, or verified by two or more officers. No one shall be eligible to be an officer of the Foundation who is not a member.

§3.02 Additional Officers, Agents, Etc. In addition to the officers specified in §3.01, the Foundation shall have such other officers, agents, and committees as the Board of Trustees may deem advisable and may elect, each of whom or each member of which shall hold office for such period, have such authority, and perform such duties as may be provided in these Regulations or as may, from time to time, be determined by the Board of Trustees. The Board of Trustees may delegate to any officer or committee the power to appoint any subordinate officers, agents, or committees. In the absence of any officer, or for any other reason the Board of Trustees may deem appropriate, the Board of Trustees may delegate, for such time as the Trustees shall determine, the powers and duties, or any of them, of such officer to any other officer or officers, or to any Trustee or Trustees.

§3.03 Election, Terms of Office, Qualifications and Compensation. The officers shall be elected by the Board of Trustees by secret ballot. Each shall be elected for an indeterminate term and shall hold office during the pleasure of the Board of Trustees. At any time after one year following an election of a full slate of officers, an election of officers shall be held within 30 days after delivery to the President or the Secretary of a written request for such election by any Trustee. The notice of the meeting held in response to such request shall specify that an election of officers is one of the purposes thereof. The President shall be a Trustee of the Foundation; the qualifications, if any, of all other officers shall be such as the Board of Trustees may establish.

§3.04 Removal. Any officer may be removed, either with or without cause, at any time, by the Board of Trustees. Any officer appointed by an officer or committee to which the Board of Trustees shall have delegated the power of appointment may be removed, either with or without cause, by the committee or superior officer (including successors) who made the appointment, or by any committee or officer upon whom such power of removal may be conferred by the Board of Trustees.

§3.05 Resignations. Any officer may resign at any time by giving written notice to the Board of Trustees, the President, or the Secretary. Any such resignation shall take effect at the time specified therein. Unless otherwise specified therein, the acceptance of such resignation shall not be necessary to make it effective.

§3.06 Vacancies. A vacancy in any office because of death, resignation, removal, disqualification, or otherwise shall be filled in the manner prescribed for regular appointments or elections to such office.

§3.07 Powers, Authority and Duties. Officers of the Foundation shall have the powers and authority conferred and the duties prescribed by law, in addition to those specified or provided for in the other sections of this Article III. Such powers, authority and duties of any officer shall be subject to the limitations, modifications, definitions, conditions, or other terms, if any, contained in any express contract of employment between such officer and the Foundation, whether entered into or amended prior to, concurrently with, or after the adoption of these Regulations.

§3.08 The President. The President, if and while there be an incumbent of the office and if he be so directed by the Board of Trustees, shall preside at all meetings of the voting members and of the Trustees at which he is present. He shall have such other duties and authority as may be assigned or delegated to him from time to time by the Board of Trustees. He shall from time to time report to the Board of Trustees all matters within his knowledge which the interest of the Foundation may require to be brought to the notice of the Board of Trustees. Subject to the control of the Board of Trustees and unless as otherwise determined by the Board of Trustees, the President shall be the chief executive officer of the Foundation, shall superintend and manage the business of the Foundation and shall co-ordinate and supervise the work of its other officers.

Either personally or through other officers or employees of the Foundation, he shall employ, direct, fix the compensation of, discipline, and discharge its personnel; employ agents, professional advisers and consultants; and perform all functions of a general manager of the Foundation's business.

He may execute and deliver in the name of the Foundation all deeds, mortgages, bonds, contracts, and other instruments either when specially authorized by the Board of Trustees or when required or deemed necessary or advisable by him in the ordinary conduct of the Foundation's normal business, except in cases where the execution thereof shall be expressly delegated by these Regulations or by the Board of Trustees to some other officer or agent of the Foundation or shall be required by law or otherwise to be executed by some other officer or agent. He shall, in general, perform all duties and have all authority incident to the office of the President and such other duties as from time to time may be assigned to him by the Board of Trustees.

§3.09 The Vice President. The Vice President shall perform such duties as may be assigned to him by the Board of Trustees or by the President. In the absence or disability of the President, the Vice President shall preside at meetings of the Foundation, and may perform such duties of the president as the President or the Board of Trustees may designate.

§3.10 The Treasurer. If required by the Board of Trustees, the Treasurer shall give bond for the faithful discharge of his duties in such penal sum and with such sureties as the Board of Trustees shall determine. He shall:

(a) Have charge and custody of, and be responsible for, all funds, securities, notes, contracts, deeds, documents, and all other indicia of title in the Foundation and valuable effects of the Foundation; receive and give receipts for moneys payable to the Foundation from any sources whatsoever; deposit all moneys in the name of the Foundation in such banks, trust companies, or other depositories as shall be selected by or pursuant to the direction of the Board of Trustees; cause such funds to be disbursed by checks or drafts on the authorized depositories of the Foundation, signed as the Board of Trustees may require; and be responsible for the accuracy of the amounts of, and cause to be preserved proper vouchers for, all moneys disbursed;

(b) Have the right to require from time to time reports or statements giving such information as he may desire with respect to any and all financial transactions of the Foundation from the officers, employees, or agents transacting the same;

(c) Keep or cause to be kept, at the principal office or such other office or offices of the Foundation as the Board of Trustees shall from time to time designate, correct records of the moneys, business, and transactions of the Foundation, and exhibit those records to any Trustee of the Foundation upon application at such office;

(d) Render to the Board of Trustees or the President whenever requested an account of the financial condition of the Foundation and of all his transactions as Treasurer and, as soon as practicable after the close of each fiscal year, make and submit to the Board of Trustees a like report for such fiscal year;

(e) Lay before each annual meeting of the voting members, or the meeting held in lieu thereof, the financial statement required by the Ohio Non-profit Corporation Law, and furnish copies of such statement to voting members as required by said statute;

(f) Cause the books, reports, statements, certificates, and all other documents and records required by law to be properly kept and filed; and

(g) In general, perform all duties incident to the office of Treasurer and such other duties as from time to time may be assigned to him by the Board of Trustees, the President or the Vice President.

§3.11 The Assistant Treasurers. The Assistant Treasurers, if any, shall perform such duties as from time to time may be assigned to them, individually or collectively, by the Board of Trustees, by the President, the Vice President, or by the Treasurer. In the absence or disability of the Treasurer, one or more of the Assistant Treasurers may perform such duties of the Treasurer as the Treasurer, the President, or the Board of Trustees may designate.

§3.12 The Secretary. The Secretary shall:

(a) Keep the minutes of all meetings of the voting members and of the Board of Trustees in one or more books provided for that purpose;

(b) Cause all notices to the voting members and the Trustees of the Foundation to be duly given in accordance with these Regulations and the Ohio Non-profit Corporation Law;

(c) Be custodian of the corporate records and of the seal of the Foundation, if any;

(d) Have available at each voting members' meeting the list or lists required by §1.11, above;

(e) In general, perform all duties incident to the office of Secretary and such other duties as from time to time may be assigned to him by the Board of Trustees or the president or any Vice President.

§3.13 The Assistant Secretaries. The Assistant Secretaries, if any, shall perform such duties as from time to time may be assigned to them, individually or collectively, by the Board of Trustees, by the President, the Vice President, or by the Secretary. In the absence or disability of the Secretary, one or more of the Assistant Secretaries may perform such duties of the Secretary as the Secretary, the President, or the Board of Trustees may designate.

## ARTICLE IV

### Certain Transactions with Trustees and Officers

A Trustee or officer of the Foundation shall not be disqualified by his office from dealing with the Foundation as a vendor, purchaser, employee, agent, or otherwise, and no contract or transaction shall be void or voidable or in any way affected with respect to the Foundation for the reason that it is between the Foundation and one or more of its Trustees or officers, or between the Foundation and any other corporation, trust, partnership or other organization in which one or more of its Trustees or officers are directors, Trustees, partners, or officers, or have a financial or personal interest, or for the reason that one or more interested Trustees or officers participate in or vote at the meeting of Trustees or a committee thereof which authorizes such contract or transaction, if in any such case (a) the material facts as to his or their relationship or interest and as to the contract or transaction are disclosed or known to the Trustees or a committee thereof and the Trustees or a committee thereof, in good faith reasonably justified by such facts, authorize or ratify the contract or transaction by the affirmative vote of a majority of the disinterested Trustees, even though the disinterested Trustees constitute less than a quorum, or (b) the material facts as to his or their relationship or interest and as to the contract or transaction are disclosed or are known to the voting members entitled to vote thereon and the contract or transaction is specifically approved or ratified at a meeting of the voting members held for such purpose by the affirmative vote of a majority of the voting power of the Foundation held by persons not interested in the contract or transaction, or (c) the contract or transaction is fair as to the Foundation as of the time it is authorized or approved or ratified by the Trustees, or a committee thereof, or by the voting members; provided, however, that no such dealings between a Trustee or officer and the Foundation shall be authorized by this Article IV if such dealings would result in the Foundation's loss of its tax-exempt status under the Internal Revenue Code of 1986, as amended.

Without limiting or qualifying the foregoing, if in any judicial or other inquiry, suit, cause, or proceedings, the question of whether a Trustee or officer of the Foundation or the Foundation acting through its Trustees has acted in good faith is material, then notwithstanding any statute or rule of law or of equity to the contrary (if any there be), his or its good faith shall be presumed, in the absence of proof to the contrary by clear and convincing evidence.

For purposes of this Article IV, common or interested Trustees may be counted in determining the presence of a quorum at a meeting of the Trustees or committee thereof which authorizes or ratifies the contract or transaction.

## ARTICLE V

### Indemnification of Certain Persons

§5.01 Actions not by the Foundation. The Foundation shall indemnify any person who was or is a party, or is threatened to be made a party, to any threatened, pending, or completed action, suit, or proceedings, whether civil, criminal, administrative, or investigative, other than an action by or in the right of the Foundation, by reason of the fact that he is or was a Trustee or officer of the Foundation or is or was serving at the request of the Foundation as a director, officer, partner, or Trustee of another corporation, domestic or foreign, nonprofit or for profit, partnership, joint venture, trust or other enterprise, against expenses, including attorney's fees, judgments, fines and amounts paid in settlement actually and reasonably incurred by him in connection with such action, suit, or proceeding if he acted in good faith and in a manner he reasonably believed to be in or not opposed to the best interests of the Foundation, and with respect to any criminal action or proceeding, had no reasonable cause to believe his conduct was unlawful.

The termination of any action, suit or proceeding by judgment, order, settlement, conviction, or upon a plea of nolo contendere or its equivalent, shall not, of itself, create a presumption that the person did not act in good faith and in a manner which he reasonably believed to be in or not opposed to the best interests of the Foundation, and with respect to any criminal action or proceeding, he had reasonable cause to believe that his conduct was unlawful. Nothing in this §5.01 shall obligate the Foundation to indemnify hereunder, or prevent the Foundation in its discretion from so indemnifying, any person by reason of the fact that he is or was serving at the request of the Foundation as an employee or agent of another corporation, domestic or foreign, nonprofit or for profit, partnership, joint venture, Trustee or other enterprise.

§5.02 Actions by the Foundation. The Foundation shall indemnify any person who was or is a party or is threatened to be made a party to any threatened, pending, or completed action or suit by or in the right of the Foundation to procure a judgment in its favor by reason of the fact that he is or was a director or officer of the Foundation, or is or was serving at the request of the Foundation as a director, officer, partner, or Trustee of another corporation, domestic or foreign, nonprofit or for profit, partnership, joint venture, trust or other enterprise, against expenses, including attorneys' fees, actually and reasonably incurred by him in connection with the defense or settlement of such action or suit if he acted in good faith and in a manner he reasonably believed to be in or not opposed to the best interests of the Foundation, except that no indemnification shall be made in respect to any claim, issue, or matter as to which such person shall have been adjudged to be liable for negligence or misconduct in the performance of his duty to the Foundation unless, and only to the extent that, the Court of Common Pleas, or the court in which such action or suit was brought shall determine upon application that, despite the adjudication of liability, but in view of all the circumstances of the case, such person is fairly and reasonably entitled to indemnity for such expenses as the Court of Common Pleas or such other court shall deem proper. Nothing in this §5.02 shall obligate the Foundation to indemnify hereunder, or prevent the Foundation in its discretion from so indemnifying, any person by reason of the fact that he is or was an employee or agent of the Foundation or is or was serving at the request of the Foundation as an employee or agent of another corporation, domestic or foreign, nonprofit or for profit, partnership, joint venture, trust or other enterprise.

§5.03 Indemnification for Expenses. To the extent that a person indemnified by right or at the option of the Foundation under §5.01 or §5.02 has been successful on the merits or otherwise in defense of any action, suit or proceeding referred to in said sections, or in defense of any claim, issue or matter therein, he shall be indemnified against expenses, including attorneys' fees, actually and reasonably incurred by him in connection therewith.

§5.04 Determination of Indemnification. Any indemnification under §5.01 and §5.02, unless ordered by a court, shall be made by the Foundation only as authorized in the specific case upon a determination that indemnification of the indemnified person is proper in the circumstances because he has met the applicable standard of conduct set forth in §5.01 and §5.02. Such determination shall be made (a) by a majority vote of a quorum consisting of Trustees of the Foundation who were not and are not parties to or threatened with any such action, suit, or proceedings, or (b) if such a quorum is not obtainable or if a majority vote of a quorum of disinterested Trustees so directs, in a written opinion by independent legal counsel, other than an attorney or a firm having associated with it an attorney who has been retained by or who has performed services for the Foundation or any person to be indemnified, within the past five years, or (c) by the voting members, or (d) by the Court of Common Pleas or the court in which such action, suit, or proceeding was brought.

Any determination made by the disinterested Trustees under clause (a) or by independent legal counsel under clause (b) of this §5.04 shall be promptly communicated to the person who threatened or brought the action or suit by or in the right of the Foundation under §5.02, and within ten days after the receipt of such notification, such person shall have the right to petition the Court of Common Pleas or the court in which such action or suit was brought to review the reasonableness of such determination.

§5.05 Advances of Expenses. Expenses, including attorneys' fees, incurred in defending any action, suit, or proceedings referred to in §5.01 and §5.02 may be paid by the Foundation in advance of the final disposition of such action, suit, or proceeding as authorized by the Board of Trustees in the specific case upon receipt of an undertaking by or on behalf of the indemnified person to repay such amount, unless it shall ultimately be determined that he is entitled to be indemnified by the Foundation as authorized in this Article.

No voting member shall have the right to question expenses paid pursuant to this §5.05 so long as the Board of Trustees has authorized such payment and the aforementioned undertaking has been received by the Foundation; provided that the restriction contained in this sentence shall not be construed to restrict a voting member's right to question the reasonableness of the ultimate determination of indemnification as provided in §5.04.

§5.06 Indemnification Not Exclusive. The indemnification provided by this Article shall not be deemed exclusive of any other rights to which those seeking indemnification may be entitled under the Articles of Incorporation, or any agreement, vote of voting members or disinterested Trustees, statute (as now existing or as hereafter enacted or amended), or otherwise, both as to action in his official capacity and as to action in another capacity while holding such office and shall continue as to a person who has ceased to serve as a director, officer, partner, Trustee, or in any other indemnified capacity and shall inure to the benefit of the heirs, executors, and administrators of such a person.

§5.07 Insurance. The Foundation may purchase and maintain insurance on behalf of any person who is or was a director, officer, Trustee, employee, or agent of the Foundation, or is or was serving at the request of the Foundation as an officer, partner, Trustee, director, employee, or agent of another corporation, domestic or foreign, nonprofit or for profit, partnership, joint venture, trust, or other enterprise against any liability asserted against him and incurred by him in any such capacity, or arising out of his status as such, whether or not the Foundation has the obligation or power to indemnify him against such liability under this Article.

§5.08 Definitions. As used in this Article, references to "Foundation" include all constituent corporations in a consolidation or merger and the new or surviving corporation, so that any person who is or was a director or officer of such a constituent corporation, or is or was serving at the request of such constituent corporation as a director, officer, partner, Trustee, or in any other indemnified capacity of another corporation, domestic or foreign, nonprofit or for profit, partnership, joint venture, trust, or other enterprise, shall stand in the same position under this section with respect to the new or surviving corporation as he would if he had served in the new or surviving corporation in the same capacity.

ARTICLE VI

Miscellaneous

§6.01 Corporate Seal. The Board of Trustees may adopt and alter a corporate seal, and use the same or a facsimile thereof, but failure to affix or refer to the corporate seal, if any, shall not affect the validity of any instrument.

§6.02 Examination of Books by Voting Members. The Board of Trustees may make reasonable rules and Regulations prescribing under what conditions the books, records, accounts, and documents of the Foundation, or any of them, shall be open to the inspection of the voting members. No voting member shall be denied any right conferred by the Ohio Non-profit Corporation Law or any other Ohio law to inspect any book, record, account, or document of the Foundation.

§6.03 Amendment of Regulations. These Regulations may be amended, repealed, or superseded by a new Code of Regulations (a) at any annual or special meeting of the voting members by the affirmative vote of the voting members entitling them to exercise a majority of the voting power on such proposal, or (b) without a meeting of the voting members, by the written consent of the voting members entitling them to exercise a majority of the voting power on such proposal. If any such amendment or new Code of Regulations is adopted without a meeting of the voting members the Secretary shall mail a copy of the amendment or new Code of Regulations to each voting member who would have been entitled to vote thereon, but who did not participate in the adoption thereof.

§6.04 Definitions. As used herein, and as of any point in time, "Articles" shall mean the Articles of Incorporation of the Foundation as then in effect and as the same may thereafter be amended from time to time; "Regulations" shall mean this Code of Regulations as then in effect and as the same may thereafter be amended from time to time; the "Ohio Non-profit Corporation Law" shall mean Sections 1702.01 through 1702.99, inclusive, of the Ohio Revised Code, or any subsequent statute of like tenor or effect, as then in effect and as the same may thereafter be amended from time to time; and references to any section or subsection of the Ohio Non-profit Corporation Law shall include any subsequent amendment (including any renumbering) to such section or subsection or other amendment to the Ohio Non-profit Corporation Law dealing with the same subject matter as such section or subsection.

§6.05 Construction of Regulations. In the event these Regulations contain any terms or provisions that are inconsistent or in conflict with any of the terms or provisions of the Articles, such terms and provisions of the Articles shall control and supersede such conflicting or inconsistent terms and provisions of these Regulations, but such conflict or inconsistency shall not impair, nullify or otherwise affect the remaining terms and provision of these Regulations which shall remain in full force and effect. The captions at the beginnings of the several Articles and sections of these Regulations are not part of the context hereof, but are merely labels to assist in locating and reading those Articles and sections thereof; such captions shall be ignored in construing these Regulations.

§6.06 Fiscal Year. The Foundation shall conduct its finances within a fiscal year, such fiscal year to begin July 1 of each calendar year, and end on June 30 of the following calendar year.

§6.07 Trustee and Membership Restrictions. The rights of a Trustee or member to examine the Foundation's books and records, under the Ohio Revised Code §1702.15 (as amended) may be restricted or denied by vote of the full Board of Trustees (or, in any emergency until the Board's next regular or special meeting, by the President) whenever said restriction or denial is necessary to the good order and government of the Foundation, or the information available under Ohio Revised Code §1702.15 may be reasonably deemed likely to be misused, directly or indirectly, by said Trustee or member to benefit competitors of the Foundation or to reveal confidential information to unions or labor organizations which now represent (or may represent in the future) employees of the Foundation.

§6.08 Interpretation of Language. Throughout these Regulations, all references to individuals shall be considered gender-neutral and inclusive, with "he," "his," and "him" representing both male and female persons.

## ARTICLE VII

## Membership

§7.01 Membership Book. The Foundation shall keep a membership book containing the names and addresses of each member, the date of admission to membership, and the class of membership, if any, to which the member belongs.

§7.02 Certificates. If authorized by resolution of the Board of Trustees, the Foundation may issue certificates evidencing any class of membership. However, certificates evidencing membership need not necessarily be authorized or issued.

§7.03 Termination of Membership. Upon termination of membership for any cause, such fact and the date of termination shall be recorded in the membership book. Unless the Articles or this Code of Regulations otherwise provide, all rights and privileges of a member in the Foundation cease upon termination of membership.

§7.04 Classification of Members. The Foundation shall have two classes of members. Only individuals meeting the requirements of §7.05 may be members.

§7.05 Qualification As Member. Qualification as a member of the Foundation is an honor to be bestowed upon those individuals or organizations which the existing members feel best exemplify extraordinary and unique devotion to the purposes and goals of the Foundation. Membership shall be open to those individuals who have demonstrated interest and dedication to the goals of the Foundation, and who pay membership dues in one of these two categories:

(a) upon payment of a sum of $500.00 or greater, Lifetime membership, or

(b) upon payment annually of a sum of at least $10.00, Annual membership.

Voting rights shall not be exercised unless the member's dues shall have been paid in full at least 30 calendar days before the Foundation's annual meeting or any special meeting.

Membership status shall terminate upon nonpayment of the member's dues, or upon the vote of at least two-thirds of the members if they feel a member has conducted himself in a manner which is not in the best interests of the Foundation.

§7.06 Voting Rights of Members. Each member, whether lifetime or annual, shall be entitled to one full vote on each matter properly submitted to the members of the Foundation for their vote, consent, waiver, release or other action.

[End of Code of Regulations]

J. Nodrey
Secretary
4-5-93


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# LITTLE BEAVER CREEK LAND FOUNDATION
## TRUSTEES & OFFICERS
### Updated 8/22/07

| NAME & ADDRESS | HOME PHONE | WORK PHONE | FAX NUMBER |
|---|---|---|---|
| **TRUSTEES:** | | | |
| Richard H. Berg<br>60 Brookfield Avenue<br>Youngstown, OH 44512<br>Email: tamea5@zoominternet.net<br>EXPIRATION: Dec. 2009 | (330) 758-6741 | | |
| Carol F. Bretz, President<br>P. O. Box 275<br>3874 West Main Street<br>New Waterford, OH 44445<br>Email: bretz@caaofcc.org<br>EXPIRATION: Dec. 2008 | (330) 457-2385 | (330) 424-7221 Ext. 101<br>(330) 424-4190<br>(after hours) | (330) 424-3731 |
| Bert H. Dailey, Vice President<br>47114 Tomahawk Drive<br>Negley, OH 44441<br>EXPIRATION: Dec. 2009 | (330) 227-3418 | | |
| Jacquelyn S. Yates **Z**<br>50680 Duke-Vodrey Road<br>East Liverpool, OH 43920<br>Email: yates@mail.salem.kent.edu<br>EXPIRATION: Dec. 2009 | (330) 385-0130 | (330) 337-4282 | (330) 332-9256<br>KSU- Salem<br>2491 SR 45 S<br>Salem, OH 44460 |
| Bradley R. Bosley **Z**<br>50900 Pancake-Clarkson Road<br>Negley, OH 44441<br>Email: clbosley@cc.ysu.edu<br>Email: bbosley@cceng.org<br>EXPIRATION: Dec. 2009 | (330) 227-2432 | (330) 424-1459<br>(Ext. 291) | (330) 424-0525 |
| **SECRETARY/TREASURER:** | | | |
| Jackman S. Vodrey<br>P. O. Box 60<br>East Liverpool, OH 43920<br>Email: jsvlo@vodrey.org | (330) 385-1135 | (330) 385-3400 | (330) 385-3999 |
| **CONSULTANT:** | | | |
| D. Mitch Cattrell<br>Columbiana S & WCD<br>1834-B S. Lincoln Avenue<br>Salem, OH 44460<br>Email: mitch.cattrell@oh.usda.gov | (330) 482-9393 | (877) 345-1198 | (330) 332-2976 |

FSS locations.

| *Address* | *Township* | *Site code* |
|---|---|---|
| 5417 Woodsdale Rd, Hanoverton | Butler | BU001 |
| 9021 Wayne Bridge Rd, Lisbon | Center | CE001 |
| 7381 SR 45, Lisbon | Center | CE002 |
| 38113 Adams Rd., Lisbon | Center | CE003 |
| 6618 Lisbon Rd, Lisbon | Center | CE004 |
| 7472 SR 164, Lisbon | Center | CE005 |
| 38969 Adams Rd, Lisbon | Center | CE006 |
| 6154 Lisbon Rd, Lisbon | Center | CE007 |
| 6324 SR 45, Lisbon | Center | CE008 |
| 8346 Woos St, Lisbon | Center | CE009 |
| 39056 Forest St, Lisbon | Center | CE010 |
| 36521 SR 172, Lisbon | Center | CE011 |
| 10690 Black Rd, Lisbon | Center | CE012 |
| 9416 Freeman Rd, Lisbon | Center | CE013 |
| 6689 SR 45, Lisbon | Center | CE014 |
| 38031 Mattix Rd, Lisbon | Center | CE015 |
| 10611 Endley Rd, Lisbon | Center | CE016 |
| 7433 Elmwood Dr, Lisbon | Center | CE017 |
| 42103 SR 154, Lisbon | Elkrun | EL001 |
| 40212 SR 517, Lisbon | Elkrun | EL002 |
| 40176 Ganders Flat, Lisbon | Elkrun | EL003 |
| 10838 Stookesberry Rd, Lisbon | Elkrun | EL004 |
| 6391 Fairfield School Rd, Columbiana | Elkrun | EL005 |
| 40690 Church Hill Rd, Lisbon | Elkrun | EL006 |
| 41520 SR 517, Lisbon | Elkrun | EL007 |
| 1334 Columbiana-Lisbon Rd, Columbiana | Fairfield | FA001 |
| 1925 Lower Elkton Rd, Columbiana | Fairfield | FA002 |
| 5157 Signal Rd, Columbiana | Fairfield | FA003 |
| 1846 Lower Elkton Rd, Columbiana | Fairfield | FA004 |
| 41938 SR 558, Leetonia | Fairfield | FA005 |

| | | |
|---|---|---|
| 40335 Kelly Park Rd, Leetonia | Fairfield | FA006 |
| 2423 Beeson Mill Rd, Leetonia | Fairfield | FA007 |
| 43751 Crestview Rd, Columbiana | Fairfield | FA008 |
| 42348 Applesway Dr, Leetonia | Fairfield | FA009 |
| 1505 Columbiana-Lisbon Rd, Columbiana | Fairfield | FA010 |
| 42852 Woodville Ln, Columbiana | Fairfield | FA011 |
| 4985 SR 7, New Waterford | Fairfield | FA012 |
| 4404 Fairfield School Rd, Columbiana | Fairfield | FA013 |
| 42431 Crestview Rd, Leetonia | Fairfield | FA014 |
| 4720 Kirk Rd, Columbiana | Fairfield | FA015 |
| 3755 Lower Elkton Rd, Columbiana | Fairfield | FA016 |
| 42405 Applesway Dr, Leetonia | Fairfield | FA017 |
| 5260 SR 7, New Waterford | Fairfield | FA018 |
| 4368 Signal Rd, Columbiana | Fairfield | FA019 |
| 44403 1/2 SR 517, Columbiana | Fairfield | FA020 |
| 4836 Woodville Rd, Leetonia | Fairfield | FA021 |
| 3995 Fairfield School Rd, Leetonia | Fairfield | FA022 |
| 45305 SR 46, New Waterford | Fairfield | FA023 |
| 1162 Fairfield School Rd, Columbiana | Fairfield | FA024 |
| 43033 Crestview Rd, Columbiana | Fairfield | FA025 |
| 45660 Crestview Rd, New Waterford | Fairfield | FA026 |
| 44640 SR 517, Columbiana | Fairfield | FA027 |
| 42954 Woodville Ln, Columbiana | Fairfield | FA028 |
| 4450 SR 164, Leetonia | Fairfield | FA029 |
| 4024 Fairfield School Rd, Columbiana | Fairfield | FA030 |
| 5981 Woodville Ln, Leetonia | Fairfield | FA031 |
| 5935 SR 7, New Waterford | Fairfield | FA032 |
| 14027 Jackson St, Kensington | Franklin | FR001 |
| 32947 McKaig Rd, Hanoverton | Hanover | HA001 |
| 44031 Y&O Rd, Wellsville | Madison | MA001 |
| 13740 SR 7, Lisbon | Madison | MA002 |
| 11007 Stookesberry Rd, Lisbon | Madison | MA003 |

| | | |
|---|---|---|
| 14831 Old Lincoln Hwy, East Liverpool | Madison | MA004 |
| 12376 SR 45, Lisbon | Madison | MA005 |
| 47565 Tomahawk Dr, Rogers | Middleton | ML001 |
| 46944 Riffle Rd, Rogers | Middleton | ML002 |
| 50763 Carmel Achor Rd, Negley | Middleton | ML003 |
| 47829 Tomahawk Dr, Negley | Middleton | ML004 |
| 47101 Pancake-Clarkson Rd, Rogers | Middleton | ML005 |
| 5856 SR 170, East Palestine | Middleton | ML006 |
| 8657 SR 170, Negley | Middleton | ML007 |
| 49257 Carmel Achor Rd, Negley | Middleton | ML008 |
| 5090 Bye Rd, Rogers | Middleton | ML009 |
| 47354 Chippewa Tr, Negley | Middleton | ML010 |
| 16740 SR 14, Salem | Perry | PE001 |
| 1780 SR 344, Salem | Perry | PE002 |
| no address, Cidermill Rd, Salem | Perry | PE003 |
| no address, Beechwood, Salem | Perry | PE004 |
| no address, Beechwood, Salem | Perry | PE005 |
| no address, Beechwood, Salem | Perry | PE006 |
| no address, Stewart, Salem | Perry | PE007 |
| no address, Harding, Salem Heights | Perry | PE008 |
| no address, Harding, Salem Heights | Perry | PE009 |
| no address, Prospect Ext., Salem | Perry | PE010 |
| no address, Chestnut Grove, Salem | Perry | PE011 |
| no address, Main St., Salem Heights | Perry | PE012 |
| 1680 Goshen Rd, Perry | Perry | PE013 |
| 1197 W State St, Salem | Perry | PE014 |
| 1271 Prospect St, Salem | Perry | PE015 |
| 701 Stewart Rd, Salem | Perry | PE016 |
| 835 W Pine Lake Rd, Salem | Perry | PE017 |
| 805 W Pidgeon Rd, Salem | Perry | PE018 |
| 1245 W State St, Salem | Perry | PE019 |
| 995 Georgetown Rd, Salem | Perry | PE020 |

| | | |
|---|---|---|
| 661 Heritage Ln, Salem | Perry | PE021 |
| 725 W Pidgeon Rd, Salem | Perry | PE022 |
| 1829 Garfield Rd, Salem | Perry | PE023 |
| 1826 Cider Mill Rd, Salem | Perry | PE024 |
| 620 W Pidgeon Rd, Salem | Perry | PE025 |
| 2223 Shamrock Arbor, Salem | Perry | PE026 |
| 1655 Harding Ave, Salem | Perry | PE027 |
| 1666 Franklin Rd, Salem | Perry | PE028 |
| 621 W Pidgeon Rd, Salem | Perry | PE029 |
| 36061 Butcher Rd, Salem | Perry | PE030 |
| 867 W Pidgeon Rd, Salem | Perry | PE031 |
| 885 W Pine Lake Rd, Salem | Perry | PE032 |
| 2061 Goshen Rd, Salem | Perry | PE033 |
| 1670 Goshen Rd, Salem | Perry | PE034 |
| 1976 S Lincoln St, Salem | Perry | PE035 |
| 5461 SR 45, Leetonia | Salem | SA001 |
| 5081 St Jacobs-Logtown Rd, Lisbon | Salem | SA002 |
| 39963 SR 14, Leetonia | Salem | SA003 |
| 4987 SR 164, Leetonia | Salem | SA004 |
| 38376 Butcher Rd, Leetonia | Salem | SA005 |
| 138 Lisbon Rd, Salem | Salem | SA006 |
| 38150 SR 344, Leetonia | Salem | SA007 |
| 38120 SR 344, Leetonia | Salem | SA008 |
| 4347 Lisbon Rd, Leetonia | Salem | SA009 |
| 36312 Butcher Rd, Salem | Salem | SA010 |
| 39189 SR 558, Leetonia | Salem | SA011 |
| 36122 Teegarden Rd, Salem | Salem | SA012 |
| 3345 Glenview Ln, Leetonia | Salem | SA013 |
| 39424 Lodge Rd, Leetonia | Salem | SA014 |
| 582 Butcher Rd, Leetonia | Salem | SA015 |
| 16442 SR 267, ELiverpool | St Clair | SC001 |
| 16440 SR 267, ELiverpool | St Clair | SC002 |

| | | |
|---|---|---|
| 16438 SR 267, ELiverpool | St Clair | SC003 |
| 16456 SR 267, ELiverpool | St Clair | SC004 |
| 50378 Calcutta Smith-Ferry Rd, East Liverpool | St Clair | SC005 |
| 48669 Bloomfield Ave, East Liverpool | St Clair | SC006 |
| 15815 Millbourne Ave, East Liverpool | St Clair | SC007 |
| 13849 Sprucevale Rd, Calcutta | St Clair | SC008 |
| 13080 SR 170, East Liverpool | St Clair | SC009 |
| 15646 Plaza Dr, Calcutta | St Clair | SC010 |
| 46850 Mary St, East Liverpool | St Clair | SC011 |
| 14580 Avery Cir, East Liverpool | St Clair | SC012 |
| 49563 N Hollywood, East Liverpool | St Clair | SC013 |
| 50288 Calcutta Smith-Ferry Rd, East Liverpool | St Clair | SC014 |
| 50845 Stagecoach Rd, Calcutta | St Clair | SC015 |
| 51548 SR 14, East Palestine | Unity | UN001 |
| 48039 Hamilton Rd, East Palestine | Unity | UN002 |
| 4666 Padgett Rd, New Waterford | Unity | UN003 |
| 4688 Adams Rd, East Palestine | Unity | UN004 |
| 895 Waterford Rd, East Palestine | Unity | UN005 |
| 1254 Beaver Cir, Columbiana | Unity | UN006 |
| 50257 SR 14, East Palestine | Unity | UN007 |
| 50835 Hadley Rd, East Palestine | Unity | UN008 |
| 4484 Hawkins Rd, New Waterford | Unity | UN009 |
| 49203 McClure Rd, East Palestine | Unity | UN010 |
| no address, Hawkins Rd, New Waterford | Unity | UN011 |
| 48481 Metz Rd, New Waterford | Unity | UN012 |
| 5175 Latta Rd, East Palestine | Unity | UN013 |
| 48594 Hamilton Rd, East Palestine | Unity | UN014 |
| 3220 Waterford Rd, New Waterford | Unity | UN015 |
| 51495 Chain School Rd, East Palestine | Unity | UN016 |
| 4298 Unity Line Rd, New Waterford | Unity | UN017 |

AMD sampling locations.

Site: LBC-001 Mahoning Co. Green Twp.
40º 56' 39" N 080º 49' 39" W
Middle Fork, LBC – Main stem, N side of S.R. 165

Site: LBC-002 Mahoning Co. Green Twp.
40º 56' 24" N 080º 50' 07" W
Mine drainage – NW side of North Egypt Rd.

Site: LBC-003 Mahoning Co. Green Twp.
40º 56' 15" N 080º 50' 03" W
Mine drainage – E side of North Egypt Rd.

Site: LBC-004 Mahoning Co. Green Twp.
40º 56' 09" N 080º 49' 59" W
Mine drainage – E side North Egypt Rd.

Site: LBC-005 Mahoning Co. Green Twp.
40º 56' 03" N 080º 49' 56" W
Mine drainage – E side North Egypt Rd. – large flow

Site: LBC-006 Mahoning Co. Green Twp.
40º 55' 49" N 080º 49' 52" W
Mine drainage – E side North Egypt Rd.

Site: LBC-007 Columbiana Co. Perry Twp.
40º 55' 45" N 080º 49' 50" W
Mine drainage – high flow; E side North Egypt Rd., just N of Pine Lake Rd.

Site: LBC-008 Mahoning Co. Green Twp.
40º 55' 47" N 080º 49' 48" W
Middle Fork, LBC – main stem; off Pine Lake Rd. bridge

Site: LBC-009 Columbiana Co. Perry Twp.
40º 55' 02" N 080º 49' 32" W
Mine drainage at concrete box culvert; E side of North Egypt Rd.

Site: LBC-010 Mahoning Co. Green Twp.
40º 54' 20" N 080º 48' 16" W
Middle Fork, LBC – main stem, N side of SR 14A

Site: LBC-011 Columbiana Co. Salem Twp.
40º 51' 56" N 080º 47' 22" W

Middle Fork, LBC – main stem, W side of Lisbon Rd., S of SR 344 at railroad underpass

Site: LBC-012 Columbiana Co. Salem Twp.
40º 49' 18" N 080º 49' 37" W
Middle Fork, LBC – main stem, S side of Eagleton Rd. at Teegarden Rd. bridge

Site: LBC-013 Columbiana Co. Center Twp.
40º 46' 30" N 080º 46' 46" W
Middle Fork, LBC – main stem, Willowgrove Park off Logtown Rd., pedestrian bridge

Site: LBC-014 Columbiana Co. Center Twp.
40º 45' 58" N 080º 46' 36" W
Tributary stream; E side of SR 164, 0.25 mi S of Lisbon

Site: LBC – 015 Columbiana Co. Elkrun Twp.
40º 45' 46" N 080º 41' 53" W
Elk Run; N side of CR 419 (Middle Beaver Rd.) at Elkton

Site: LBC-016 Columbiana Co. Elkrun Twp.
40º 44' 59" N 080º 39' 58" W
Pine Run; N side, private drive W of Lusk Lock Rd.

Site: LBC-017 Columbiana Co. Elkrun Twp.
40º 44' 03" N 080º 38' 28" W
Turkeyfoot Run; E side footbridge, N of Bear Hollow Rd. at Middle Fork confluence

Site: LBC-018 Columbiana Co. Elkrun Twp.
40º 44' 02" N 080º 38' 28" W
Middle Fork, LBC – main stem, N side, bridge at Bear Hollow Rd.

Site: LBC-019 Columbiana Co. Hanover Twp.
40º 46' 30" N 080º 52' 11" W
West Fork, LBC – main stem, S side of SR 172, outflow from Guilford Lake

Site: LBC-020 Columbiana Co. Hanover Twp.
40º 45' 13" N 080º 51' 38" W
West Fork, LBC – main stem, S side of bridge at Laughlin Mill Rd.

Site: LBC-021 Columbiana Co. Center Twp.
40º 44' 24" N 080º 50' 31"
Cold Run; NE side of bridge at junction of Trinity Church and Dungannon Rds.

Site: LBC-022 Columbiana Co. Wayne Twp.

40º 43’ 17” N 080º 50’ 12” W
Tributary to WF – W side Trinity Church Rd. 0.75 mi N of SR 518

Site: LBC-023 Columbiana Co. Franklin Twp.
40º 42’ 06” N 080º 51’ 60” W
Williard Run; N side of bridge on SR 518 at Foundry Hill Rd.

Site: LBC-024 Columbiana Co. Franklin Twp.
40º 42’ 04” N 080º 52’ 16” W
Brush Creek; main stem, S side of SR 518 0.25 mi W of Williard Run

Site: LBC-025 Columbiana Co. Wayne Twp.
40º 42’ 30” N 080º 47’ 56” W
Tributary to WF; N side of bridge on SR 518, 100 yds W of intersection with SR 164

Site: LBC-026 Columbiana Co. Wayne Twp.
40º 42’ 17” N 080º 47’ 17” W
Rowley Run; S side of bridge on SR 518

Site: LBC-027 Columbiana Co. Wayne Twp.
40º 41’ 58” N 080º 45’ 32” W
Tributary to WF; S side of SR 518 just E of Steubenville-Pike Rd.

Site: LBC-028 Columbiana Co. Madison Twp.
40º 41’ 35” N 080º 44’ 15” W
West Fork – main stem; S side of bridge on McCormack Run Rd.

Site: LBC-029 Columbiana Co. Madison Twp.
40º 42’ 50” W 080º 41’ 23” W
West Fork – main stem; N dead end of Buckeye Rd. (CR 448)

Site: LBC-030 Columbiana Co. Madison Twp.
40º 43’ 06” N 080º 38’ 06” W
West Fork – main stem; E side of bridge on SR 7

Site: LBC-031 Columbiana Co. Elkrun Twp.
40º 45’ 58” N 080º 42’ 58” W
Middle Run – at SR 154 bridge W of Elkton

Site: LBC-032 Columbiana Co. Center Twp.
40º 47’ 56” N 080º 45’ 14” W
Mill Trace Run – at Adams Rd. 2 mi N of Lisbon

Site: LBC-033 Columbiana Co. Center Twp.

40º 47' 40" N 080º 47' 44" W
Tributary to MF – at Hunters Camp Rd 1 mile W of SR 45

Site: LBC-034 Columbiana Co. Salem Twp.
40º 51' 27" N 080º 47' 49" W
Stone Mill Run – at Salem Grange Rd. (SR 558) 0.5 mi W of Franklin Square

Site: LBC-035 Columbiana Co. Salem Twp.
40º 51' 43" N 080º 47' 21" W
East Branch of MF – at Lisbon Rd. 0.5 mi N of Franklin Square

Site: LBC-036 Columbiana Co. Elkrun Twp.
40º 45' 43" N 080º 43' 05" W
Tributary to MF – at Darner Rd. 0.5 mi S of SR 154

Site: LBC-037 Columbiana Co. Center Twp.
40º 46' 46" N 080º 47' 35" W
Tributary to MF – at Furnace Rd. 0.25 mi W of St. Jacob's-Logtown Rd.

Site: LBC-038 Columbiana Co. Salem Twp.
40º 49' 24" N 080º 49' 39" W
Tributary of MF – at Teegarden Rd. just N of Eagleton Rd. intersection

Site: LBC-039 Mahoning Co. Goshen Twp.
40º 55' 12" N 080º 54' 06" W
Tributary of MF – at Cleveland-East Liverpool Rd. (SR 14) 0.25 mi S of Duck Creek Rd

Site: LBC-040 Mahoning Co. Goshen Twp.
40º 56' 32" N 080º 52' 58" W
Middle Fork, LBC – main stem, at Goshen Rd. 0.25 mi S of SR 165

Site: LBC-041 Mahoning Co. Green Twp.
40º 54' 35" N 080º 45' 54" W
Cherry Valley Run – at West Garfield Rd. just W of Washingtonville Rd.

Site: LBC-042 Columbiana Co. Center Twp.
40º 46' 19" N 080º 45' 14" W
Mill Trace Run – at SR 154 just E of Lisbon

Site: LBC-043 Columbiana Co. Butler Twp.
40º 49' 40" N 080º 51' 48" W
Cold Run – at Winona Rd. just W of Depot Rd.

Site: LBC-044 Columbiana Co. Butler Twp.

40º 49' 07" N 080º 53' 04" W
West Fork, LBC –main stem, at Woodsdale Rd. 0.75 mi N of Guilford Lake

Site: LBC-045 Columbiana Co. Center Twp.
40º 48' 06" N 080º 50' 49" W
Cold Run – at Sell Rd.

Site: LBC-046 Columbiana Co. Wayne Twp.
40º 41' 19" N 080º 46' 04" W
Tributary of WF – at CR 413 (Steubenville-Pike Rd.) 1 mi S of SR 518

Site: LBC-047 Columbiana Co. Madison Twp.
40º 41' 46" N 080º 43' 25" W
Brush Run – at SR 518 2 mi W of West Point

Site: LBC-048 Columbiana Co. Madison Twp.
40º 42' 27" N 080º 42' 06" W
Patterson Creek – at SR 518 just W of West Point

Site: LBC-049 Columbiana Co. Franklin Twp.
40º 42' 30" N 080º 53' 20" W
Tributary of Brush Creek – at Williard Rd. just E of SR 644

Site: LBC-050 Columbiana Co. Wayne Twp.
40º 42' 08" N 080º 48' 28" W
West Fork, LBC – main stem, at SR 164 0.5 mi S of Gavers

Site: LBC-051 Columbiana Co. Hanover Twp.
40º 44' 01" N 080º 53' 10" W
Williard Run – at McKaig Rd. 0.5 mi W of Dungannon

Site: LBC-052 Columbiana Co. Hanover Twp.
40º 44' 02" N 080º 52' 35" W
Tributary of Williard Run – at CR 407 just E of Dungannon

Site: LBC-053 Columbiana Co. Wayne Twp.
40º 41' 58" N 080º 48' 30" W
Tributary to WF – at intersection of SR 164 and Seigler Rd. 1 mile S of Gavers

Site: LBC-054 Columbiana Co. Franklin Twp.
40º 40' 57" N 080º 54' 01" W
Brush Creek – at Emerick Rd. 1 mi N of Summitville

Site: LBC-055 Columbiana Co. Wayne Twp.

40º 42’ 16” N 080º 46’ 35” W
Tributary to WF – at SR 518 1.5 mi E of Gavers

Site: LBC-056 Columbiana Co. Center Twp.
40º 44’ 31” N 080º 48’ 24” W
Rowley Run – at Wayne Bridge Rd. just N of entrance to Scenic Vista Park

Site: LBC-057 Columbiana Co. Madison Twp.
40º 41’ 44” N 080º 43’ 05” W
Peter’s Run – at confluence with WF just E of Ketchum Rd.

Site: LBC-058 Columbiana Co. Center Twp.
40º 46’ 24” N 080º 49’ 30” W
Tributary – at County Home Rd. 0.25 mi N of US Rt 30

Site: LBC-059 Columbiana Co. Wayne Twp.
40º 42’ 26” N 080º 48’ 51” W
Tributary to WF – at SR 518 0.75 mi W of Gavers

Site: LBC-060 Columbiana Co. Franklin Twp.
40º 41’ 47” N 080º 53’ 19” W
Tributary of Brush Creek – at Fink Rd. 1 mi N of Summitville

APPENDIX F: AMD WQ analysis results; first run.

| Sample No | Sample_Date | Site Location | Lat/Lon | Sampler | pH-Lab | Sp_Cond-Lab | Acidity-Lab | Alkalinity-Lab | TDS | TSS | Hardness | Sulfate | Total-Fe | Total-Mn | Total-Al |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LBC-001 | 6/23/2004 | MFLBC | 40.56.650N/80.49.657W | JJN | 7.4 | 636 | 4.96 | 132 | 364 | 8 | 220 | 56 | 0.415 | 0.159 | 0.25 |
| LBC-004 | 6/23/2004 | E side of N Egypt Rd | 40.56.08N /80.49.58 W | JJN | 4.18 | 1270 | 132 | 0 | 1130 | 25 | 670 | 745 | 3.06 | 8.92 | 20.2 |
| LBC-005 | 6/23/2004 | E side of N Egypt Rd- large flow | 40.56.03N/80.49.56 W | JJN | 6.67 | 1290 | 7.02 | 62.5 | 991 | 50 | 816 | 585 | 6.77 | 7.48 | 0.312 |
| LBC-006 | 6/23/2004 | E side of N Egypt Rd | 40.55.48N/80.49.52 W | JJN | 3.45 | 2620 | 265 | 0 | 2680 | 28 | 2057 | 1844 | 6.42 | 50.4 | 31.6 |
| LBC-007 | 6/23/2004 | E side of N Egypt Rd-s of Pine Lake | 40.55.44N/80.49.50 W | JJN | 7.33 | 1930 | 6.17 | 125 | 1660 | 42 | 1420 | 1021 | 2.34 | 11.9 | 0.25 |
| LBC-008 | 6/24/2004 | MS-Pine Lake Rd bridge | 40.55.46N/80.49.48 W | JJN | 7.32 | 800 | 7.1 | 119 | 485 | 131 | 340 | 131 | 0.184 | 1.61 | 0.25 |
| LBC-009 | 6/24/2004 | AMD-culvert E side N Egypt Rd | 40.55.01N/80.49.32 W | JJN | 7.12 | 754 | 5.54 | 208 | 467 | 23 | 369 | 119 | 2.92 | 0.731 | 0.25 |
| LBC-010 | 6/24/2004 | MS-N side SR 14A | 40.54.20N/80.48.16 W | JJN | 7.35 | 729 | 5.31 | 124 | 430 | 12 | 318 | 119 | 0.161 | 1.12 | 0.25 |
| LBC-011 | 6/24/2004 | MS-Lisbon Rd s SR344 @RR | 40.51.55N/80.47.21 W | JJN | 7.41 | 679 | 5.15 | 118 | 418 | 12 | 323 | 143 | 0.095 | 0.783 | 0.25 |
| LBC-012 | 6/24/2004 | MS-s Eagleton Rd @Teegarden Rd | 40.49.18N/80.49.36 W | JJN | 7.41 | 589 | 4.62 | 119 | 360 | 12 | 293 | 99.6 | 0.115 | 0.457 | 0.25 |
| LBC-013 | 6/24/2004 | MS-Willowgrove Park off Logtown Rd | 40.46.29N/80.46.46 W | JJN | 7.55 | 568 | 4.16 | 118 | 341 | 6 | 230 | 93 | 0.093 | 0.205 | 0.25 |
| LBC-014 | 6/24/2004 | E s SR164 just s of Lisbon | 40.45.57N/80.46.36 W | JJN | 7.94 | 452 | 2.81 | 121 | 273 | 10 | 255 | 79.9 | 0.05 | 0.05 | 0.25 |
| LBC-015 | 6/24/2004 | Elk Run N s CR419 @ Elkton | 40.45.45 N/80.41.53 W | JJN | 7.65 | 565 | 3.96 | 116 | 355 | 5 | 314 | 118 | 0.05 | 0.065 | 0.25 |
| LBC-016 | 6/24/2004 | Pine Run N s W of Lusk Lock Rd | 40.44.59N/80.39.57 W | JJN | 8.02 | 1190 | 5.99 | 251 | 892 | 3 | 836 | 434 | 0.05 | 0.071 | 0.25 |
| LBC-017 | 6/25/2004 | Turkeyfoot Run N of Bear Hollow Br | 40.44.03N/80.38.27W | JJN | 7.86 | 651 | 4.45 | 139 | 442 | 4 | 338 | 193 | 0.05 | 0.05 | 0.25 |
| LBC-018 | 6/25/2004 | MS-NS Br @Bear Hollow Rd | 40.44.02N/80.38.27W | JJN | 7.79 | 652 | 4.87 | 138 | 426 | 9 | 335 | 179 | 0.05 | 0.05 | 0.25 |
| LBC-019 | 6/25/2004 | MS-s SR172 outflow fr Guilford Lake | 40.47.30N/80.52.10W | JJN | 7.98 | 261 | 3.68 | 71.2 | 148 | 13 | 98.5 | 29.6 | 0.194 | 0.113 | 0.25 |
| LBC-020 | 6/25/2004 | MS-ss Br Laughlin Mill Rd | 40..45.57N/80.51.38W | JJN | 7.65 | 537 | 4.72 | 121 | 343 | 9 | 267 | 128 | 0.103 | 0.152 | 0.25 |
| LBC-021 | 6/25/2004 | Cold Run Nes junct Trinity Ch & Dungan | 40.44.24N/80.50.30W | JJN | 7.81 | 542 | 3.95 | 119 | 333 | 3 | 263 | 119 | 0.278 | 0.095 | 0.25 |
| LBC-022 | 6/25/2004 | Ws Trinity Ch Rd n of SR 518 | 40.43.16N/80.50.12W | JJN | 7.92 | 1050 | 5.42 | 281 | 723 | 6 | 572 | 284 | 0.086 | 0.133 | 0.25 |
| LBC-023 | 6/25/2004 | Williard Run Ns Br SR518 @ Foundry Hill | 40.42.05N/80.51.59W | JJN | 7.78 | 565 | 4.56 | 132 | 359 | 6 | 276 | 127 | 0.108 | 0.11 | 0.25 |
| LBC-024 | 6/25/2004 | MS-Brush Cr Ss SR518 W of Williard Run | 40.42.04N/80.52.15W | JJN | 7.73 | 491 | 3.8 | 111 | 306 | 10 | 237 | 105 | 0.175 | 0.105 | 0.25 |
| LBC-025 | 6/25/2004 | Ns SR518 Br W of intersect SR164 | 40.42.30N/80.47.55W | JJN | 7.61 | 607 | 3.58 | 90.1 | 403 | 21 | 299 | 202 | 0.075 | 0.078 | 0.25 |
| LBC-026 | 6/25/2004 | Rowley Run Ss Br on SR518 | 40.42.17N/80.47.17W | JJN | 7.9 | 443 | 2.81 | 101 | 276 | 3 | 215 | 103 | 0.188 | 0.108 | 0.25 |
| LBC-027 | 6/25/2004 | Trib Ss SR518 E of Steubenville Pike Rd | 40.41.57N/80.45.31W | JJN | 7.47 | 390 | 3.48 | 47.4 | 239 | 13 | 174 | 106 | 0.123 | 0.103 | 0.25 |
| LBC-028 | 6/25/2004 | MS-Ss Br on McCormack Run Rd | 40.41.35N/80.44.14W | JJN | 7.67 | 457 | 3.55 | 99 | 278 | 9 | 215 | 88.9 | 0.142 | 0.066 | 0.25 |
| LBC-029 | 6/25/2004 | MS-N end of Buckeye Rd (CR448) | 40.42.49N/80.41.22W | JJN | 7.61 | 531 | 3.9 | 110 | 321 | 3 | 246 | 123 | 0.101 | 0.05 | 0.25 |
| LBC-030 | 6/25/2004 | MS-Es Br on SR 7 | 40.43.06N/80.38.05W | JJN | 7.9 | 517 | 3.81 | 106 | 320 | 2 | 228 | 130 | 0.071 | 0.05 | 0.25 |
| LBC-031 | 7/20/2004 | Middle Run @ SR154 W of Elkton | 40.45.58N/80.42.58W | JJN | 7.82 | 489 | 2.55 | 124 | 268 | 3 | 190 | 37 | 0.05 | 0.05 | 0.25 |
| LBC-032 | 7/20/2004 | Mill Site Cr @ Adams Rd 2 mi N of Lisbon | 40.47.56N/80.45.56W | JJN | 7.89 | 754 | 3.79 | 179 | 502 | 5 | 391 | 198 | 0.113 | 0.103 | 0.25 |
| LBC-033 | 7/20/2004 | Hunters Camp Rd Ns W of SR45 | 40.47.40N/80.47.44W | JJN | 7.84 | 520 | 3.17 | 159 | 291 | 3 | 235 | 68.3 | 0.091 | 0.05 | 0.25 |
| LBC-034 | 7/20/2004 | Stone Mill Run @ Salem Grange Rd | 40.51.27N/80.47.49W | JJN | 8.06 | 563 | 2.88 | 151 | 321 | 4 | 227 | 51.9 | 0.05 | 0.05 | 0.25 |
| LBC-035 | 7/20/2004 | E Branch @ Lisbon-Canfield Rd | 40.51.43N/80.47.21W | JJN | 7.82 | 710 | 4.15 | 160 | 422 | 11 | 304 | 114 | 0.167 | 0.362 | 0.25 |
| LBC-036 | 7/20/2004 | Trib to MF @ Darner Rd | 40.45.43N/80.43.05W | JJN | 7.84 | 1000 | 4.24 | 127 | 744 | 12 | 544 | 408 | 0.05 | 0.05 | 0.25 |
| LBC-037 | 7/20/2004 | Furnace Rd Ss W St Jacobs-Logtwn Rd | 40.46.46N/80.47.35W | JJN | 7.77 | 476 | 3.15 | 113 | 264 | 9 | 170 | 50.2 | 0.05 | 0.05 | 0.25 |
| LBC-038 | 7/20/2004 | Teegarden Rd NWs N of Eagleton Rd | 40.49.24N/80.49.39W | JJN | 7.56 | 512 | 2.66 | 67.8 | 320 | 11 | 235 | 147 | 0.055 | 0.127 | 0.25 |
| LBC-039 | 7/20/2004 | Cleve-E Liverpool Rd/SR14 SE Duck Cr Rd | 40.55.12N/80.54.06W | JJN | 7.37 | 794 | 5.16 | 124 | 436 | 16 | 221 | 59.3 | 0.268 | 0.325 | 0.25 |
| LBC-040 | 7/20/2004 | Goshen Rd S of SR165 | 40.56.32N/80.52.58W | JJN | 7.81 | 841 | 3.1 | 133 | 464 | 13 | 255 | 66.7 | 0.128 | 0.05 | 0.25 |
| LBC-041 | 7/20/2004 | Cherry Valley Run @ W Garfield Rd | 40.54.35N/80.45.54W | JJN | 7.86 | 561 | 4.13 | 121 | 311 | 18 | 210 | 58.4 | 0.287 | 0.139 | 0.25 |
| LBC-042 | 7/20/2004 | Mill Site Cr @ SR154 E of Lisbon | 40.46.19N/80.45.14W | JJN | 7.91 | 711 | 4.45 | 162 | 431 | 7 | 323 | 137 | 0.05 | 0.05 | 0.25 |
| LBC-043 | 7/20/2004 | Cold Run @ Winona Rd W of Depot Rd | 40.49.40N/80.51.48W | JJN | 7.68 | 358 | 3.49 | 105 | 203 | 12 | 153 | 25.5 | 0.175 | 0.1 | 0.25 |
| LBC-044 | 7/20/2004 | Trib to Guilford Lake @ Woodsdale Rd | 40.49.07N/80.53.04W | JJN | 7.45 | 404 | 4.38 | 124 | 233 | 7 | 168 | 19.8 | 0.171 | 0.08 | 0.25 |
| LBC-045 | 7/20/2004 | Cold Run @ Sell Rd | 40.48.06N/80.50.49W | JJN | 7.61 | 575 | 4.84 | 129 | 370 | 18 | 286 | 135 | 0.27 | 0.309 | 0.25 |
| LBC-046 | 7/28/2004 | CR413/Steubenville Pike Rd S of SR518 | 40.41.19N/80.46.04W | JJN | 7.54 | 837 | 6.94 | 226 | 527 | 30 | 317 | 204 | 0.161 | 0.344 | 0.25 |
| LBC-047 | 7/28/2004 | Brush Run @ SR518 W of West Point | 40.41.46N/80.43.25W | JJN | 7.72 | 946 | 5.62 | 192 | 624 | 10 | 497 | 307 | 0.079 | 0.063 | 0.25 |
| LBC-048 | 7/28/2004 | Patterson Cr @ SR518 W of West Point | 40.42.27N/80.42.06W | JJN | 7.7 | 956 | 5.02 | 170 | 624 | 9 | 479 | 300 | 0.089 | 0.139 | 0.25 |
| LBC-049 | 7/28/2004 | Brush Cr @ Williard Rd E of SR644 | 40.42.30N/80.53.20W | JJN | 7.68 | 366 | 14.4 | 103 | 207 | 14 | 146 | 34.6 | 0.453 | 0.18 | 0.25 |
| LBC-050 | 7/28/2004 | WF @ SR164 S of Gavers | 40.42.08N/80.48.28W | JJN | 7.87 | 435 | 11.3 | 113 | 274 | 14 | 204 | 90.6 | 0.236 | 0.057 | 0.25 |
| LBC-051 | 7/28/2004 | Williard Run @ McKaig Rd W of Dungannon | 40.44.01N/80.53.10W | JJN | 7.54 | 359 | 8.7 | 78 | 194 | 8 | 121 | 25.5 | 0.191 | 0.099 | 0.25 |
| LBC-052 | 7/28/2004 | Williard Run @ CR407 E of Dungannon | 40.44.02N/80.52.35W | JJN | 7.81 | 864 | 15.6 | 202 | 571 | 21 | 458 | 220 | 0.142 | 0.251 | 0.25 |
| LBC-053 | 7/28/2004 | SR164 & Seigler Rd S of Gavers | 40.40.58N/80.48.30W | JJN | 7.8 | 330 | 5.82 | 85.8 | 204 | 7 | 154 | 54.3 | 0.143 | 0.05 | 0.25 |
| LBC-054 | 7/28/2004 | Bursh Cr @ Emerick Rd N of Summitville | 40.40.57N/80.54.01W | JJN | 7.59 | 226 | 5.13 | 59.3 | 129 | 15 | 91.3 | 22.1 | 0.608 | 0.135 | 0.25 |
| LBC-055 | 7/28/2004 | SR518 1.5 mi E of Gavers | 40.42.16N/80.46.35W | JJN | 7.79 | 579 | 8.75 | 171 | 374 | 21 | 301 | 127 | 0.149 | 0.292 | 0.25 |
| LBC-056 | 7/28/2004 | Rowley Run @ Wayne Br Rd N of Park | 40.44.31N/80.48.24W | JJN | 7.59 | 331 | 3.95 | 110 | 195 | 7 | 158 | 42 | 0.709 | 0.568 | 0.25 |
| LBC-057 | 7/28/2004 | Peters Run @ confl E of Ketchum Rd | 40.41.44N/80.43.05W | JJN | 7.88 | 488 | 4.06 | 117 | 294 | 26 | 225 | 79.9 | 0.197 | 0.05 | 0.25 |
| LBC-058 | 7/28/2004 | County Home Rd .25 mi N of US30 | 40.46.24N/80.49.30W | JJN | 7.77 | 459 | 4.37 | 147 | 252 | 6 | 197 | 43.6 | 0.324 | 0.272 | 0.25 |
| LBC-059 | 7/28/2004 | SR518 .75 mi W of Gavers | 40.42.26N/80.48.51W | JJN | 7.84 | 607 | 3.11 | 105 | 382 | 14 | 299 | 180 | 0.102 | 0.136 | 0.25 |
| LBC-060 | 7/28/2004 | Brush Cr @ Fink Rd N of Summitville | 40.41.47N/80.53.19W | JJN | 7.52 | 234 | 3.32 | 65.1 | 142 | 6 | 103 | 32.9 | 0.325 | 0.08 | 0.25 |

APPENDIX F: AMD WQ analysis results; second run.

| Sample No | Sample_Date | Site Location | Site Source | Lat/Lon | Sampler | pH-Lab | pH-Field | Sp_Cond-L | Acidity-Lab | Alkalinity-Lal | TDS | TSS | Hardness | Sulfate | Total-Fe | Total-Mn | Total-Al |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LBC-001 | 12/6/2004 | MFLBC | MS- N SR 165 | 40.56.39N/80.49.39W | JJN | 7.0 | 7.0 | 630 | 6.78 | 131 | 355 | 10 | 201 | 61.3 | 0.74 | 0.16 | 0.25 |
| LBC-002 | 12/6/2004 | MFLBC | NW side N Egypt Rd | 40.56.24N/80.50.6W | JJN | 5.8 | 6.0 | 1150 | 18.7 | 12.6 | 1010 | 157 | 695 | 654 | 5.33 | 2.02 | 0.25 |
| LBC-003 | 12/6/2004 | MFLBC | E side of N Egypt Rd | 40.56.15N/80.50.3W | JJN | 5.3 | 5.5 | 1060 | 21.7 | 12.9 | 853 | 49 | 576 | 552 | 0.31 | 3.42 | 0.958 |
| LBC-004 | 12/6/2004 | MFLBC | E side of N Egypt Rd | 40.56.08N /80.49.58 W | JJN | 4.2 | 4.5 | 1140 | 85.4 | 0 | 929 | 153 | 595 | 617 | 1.03 | 7.23 | 7.23 |
| LBC-005 | 12/6/2004 | MFLBC | E side of N Egypt Rd- large flow | 40.56.03N/80.49.56 W | JJN | 6.7 | 7.0 | 1400 | 11.6 | 116 | 1110 | 24 | 775 | 637 | 4.53 | 5.79 | 0.25 |
| LBC-006 | 12/6/2004 | MFLBC | E side of N Egypt Rd | 40.55.48N/80.49.52 W | JJN | 3.2 | 4.0 | 2430 | 162 | 0 | 2430 | 23 | 1531 | 1671 | 3.14 | 32.20 | 13.4 |
| LBC-007 | 12/6/2004 | MFLBC | E side of N Egypt Rd-s of Pine Lake | 40.55.44N/80.49.50 W | JJN | 7.2 | 7.2 | 1860 | 10.6 | 152 | 1560 | 34 | 1053 | 947 | 0.76 | 5.86 | 0.25 |
| LBC-008 | 12/6/2004 | MFLBC | MS-Pine Lake Rd bridge | 40.55.46N/80.49.48 W | JJN | 7.2 | 7.0 | 692 | 6.81 | 123 | 405 | 17 | 233 | 111 | 0.21 | 0.68 | 0.25 |
| LBC-009 | 12/6/2004 | MFLBC | AMD-culvert E side N Egypt Rd | 40.55.01N/80.49.32 W | JJN | 7.3 | 7.0 | 833 | 4.49 | 119 | 529 | 79 | 393 | 259 | 0.09 | 0.12 | 0.25 |
| LBC-010 | 12/6/2004 | MFLBC | MS-N side SR 14A | 40.54.20N/80.48.16 W | JJN | 7.1 | 6.6 | 632 | 6.26 | 121 | 384 | 13 | 226 | 95.9 | 0.15 | 0.34 | 0.25 |
| LBC-011 | 12/6/2004 | MFLBC | MS-Lisbon Rd s SR344 @RR | 40.51.55N/80.47.21 W | JJN | 7.1 | 6.8 | 631 | 5.21 | 116 | 388 | 11 | 229 | 108 | 0.13 | 0.55 | 0.25 |
| LBC-012 | 12/6/2004 | MFLBC | MS-s Eagleton Rd @Teegarden Rd | 40.49.18N/80.49.36 W | JJN | 7.2 | 7.0 | 530 | 4.42 | 115 | 318 | 9 | 209 | 77.8 | 0.15 | 0.46 | 0.25 |
| LBC-013 | 12/6/2004 | MFLBC | MS-Willowgrove Park off Logtown Rd | 40.46.29N/80.46.46 W | JJN | 7.3 | 7.0 | 511 | 3.59 | 112 | 319 | 6 | 201 | 78.2 | 0.13 | 0.28 | 0.25 |
| LBC-014 | 12/6/2004 | MFLBC | E s SR164 just s of Lisbon | 40.45.57N/80.46.36 W | JJN | 7.4 | 7.0 | 386 | 2.33 | 107 | 218 | 13 | 179 | 51 | 0.06 | 0.05 | 0.25 |
| LBC-015 | 12/6/2004 | MFLBC | Elk Run N s CR419 @ Elkton | 40.45.45 N/80.41.53 W | JJN | 7.5 | 7.0 | 446 | 2.62 | 97.3 | 294 | 9 | 206 | 86.4 | 0.07 | 0.08 | 0.25 |
| LBC-016 | 12/8/2004 | MFLBC | Pine Run N s W of Lusk Lock Rd | 40.44.59N/80.39.57 W | JJN | 7.7 | 7.0 | 1060 | 5.69 | 218 | 744 | 191 | 579 | 366 | 1.74 | 0.14 | 1.03 |
| LBC-017 | 12/8/2004 | MFLBC | Turkeyfoot Run N of Bear Hollow Br | 40.44.03N/80.38.27W | JJN | 7.5 | 6.5 | 500 | 3.64 | 99.5 | 300 | 14 | 227 | 127 | 0.13 | 0.06 | 0.25 |
| LBC-018 | 12/8/2004 | MFLBC | MS-NS Br @Bear Hollow Rd | 40.44.02N/80.38.27W | JJN | 7.5 | 7.0 | 457 | 3.29 | 97.8 | 270 | 39 | 185 | 74.5 | 0.31 | 0.10 | 0.25 |
| LBC-019 | 12/8/2004 | WFLBC | MS-s SR172 outflow fr Guilford Lake | 40.47.30N/80.52.10W | JJN | 7.5 | 6.4 | 290 | 1.81 | 84 | 164 | 20 | 121 | 32.5 | 0.05 | 0.08 | 0.25 |
| LBC-020 | 12/8/2004 | WFLBC | MS-ss Br Laughlin Mill Rd | 40..45.57N/80.51.38W | JJN | 7.4 | 6.7 | 323 | 2.61 | 88.4 | 187 | 10 | 135 | 43.6 | 0.09 | 0.08 | 0.25 |
| LBC-021 | 12/8/2004 | WFLBC | Cold Run Nes junct Trinity Ch & Dungan | 40.44.24N/80.50.30W | JJN | 7.4 | 6.2 | 364 | 2.98 | 90.9 | 213 | 21 | 154 | 56.4 | 0.34 | 0.10 | 0.25 |
| LBC-022 | 12/8/2004 | WFLBC | Ws Trinity Ch Rd n of SR 518 | 40.43.16N/80.50.12W | JJN | 7.5 | 6.6 | 368 | 3 | 90.8 | 205 | 16 | 156 | 58.4 | 0.34 | 0.10 | 0.032 |
| LBC-023 | 12/8/2004 | WFLBC | Williard Run Ns Br SR518 @ Foundry Hill | 40.42.05N/80.51.59W | JJN | 7.3 | 6.6 | 418 | 3.58 | 95.5 | 234 | 16 | 189 | 76.1 | 0.26 | 0.20 | 0.25 |
| LBC-024 | 12/8/2004 | WFLBC | MS-Brush Cr Ss SR518 W of Williard Run | 40.42.04N/80.52.15W | JJN | 7.2 | 6.0 | 294 | 4.44 | 62.8 | 174 | 27 | 120 | 50.2 | 0.29 | 0.15 | 0.25 |
| LBC-025 | 12/8/2004 | WFLBC | Ns SR518 Br W of intersect SR164 | 40.42.30N/80.47.55W | JJN | 7.3 | 6.7 | 546 | 3.82 | 87.9 | 366 | 22 | 271 | 177 | 0.07 | 0.14 | 0.25 |
| LBC-026 | 12/8/2004 | WFLBC | Rowley Run Ss Br on SR518 | 40.42.17N/80.47.17W | JJN | 7.3 | 6.5 | 358 | 3.06 | 76.1 | 212 | 18 | 158 | 83.1 | 0.25 | 0.18 | 0.25 |
| LBC-027 | 12/8/2004 | WFLBC | Trib Ss SR518 E of Steubenville Pike Rd | 40.41.57N/80.45.31W | JJN | 7.2 | 5.9 | 315 | 2.73 | 35.4 | 162 | 9 | 127 | 82.3 | 0.24 | 0.12 | 0.25 |
| LBC-028 | 12/8/2004 | WFLBC | MS-Ss Br on McCormack Run Rd | 40.41.35N/80.44.14W | JJN | 7.4 | 6.0 | 338 | 3.05 | 75.6 | 195 | 55 | 138 | 63 | 0.28 | 0.10 | 0.25 |
| LBC-029 | 12/8/2004 | WFLBC | MS-N end of Buckeye Rd (CR448) | 40.42.49N/80.41.22W | JJN | 7.4 | 6.2 | 387 | 2.48 | 82.3 | 236 | 46 | 162 | 70.4 | 0.28 | 0.09 | 0.25 |
| LBC-030 | 12/8/2004 | WFLBC | MS-Es Br on SR 7 | 40.43.06N/80.38.05W | JJN | 7.5 | 6.8 | 379 | 2.77 | 78.8 | 228 | 60 | 162 | 80.3 | 0.28 | 0.07 | 0.25 |
| LBC-031 | 12/15/2004 | MFLBC | Middle Run @ SR154 W of Elkton | 40.45.58N/80.42.58W | JJN | 7.4 | 6.5 | 349 | 8.97 | 79.2 | 205 | 5 | 131 | 44 | 0.10 | 0.05 | 0.25 |
| LBC-032 | 12/15/2004 | MFLBC | Mill Site Cr @ Adams Rd 2 mi N of Lisbon | 40.47.56N/80.45.56W | JJN | 7.5 | 6.7 | 487 | 9.79 | 121 | 316 | 9 | 229 | 94.3 | 0.13 | 0.14 | 0.25 |
| LBC-033 | 12/15/2004 | MFLBC | Hunters Camp Rd Ns W of SR45 | 40.47.40N/80.47.44W | JJN | 7.4 | 7.0 | 348 | 4.53 | 89.2 | 178 | 6 | 146 | 46.9 | 0.13 | 0.86 | 0.25 |
| LBC-034 | 12/15/2004 | MFLBC | Stone Mill Run @ Salem Grange Rd | 40.51.27N/80.47.49W | JJN | 7.7 | 6.8 | 557 | 4.89 | 119 | 302 | 5 | 184 | 46.5 | 0.09 | 0.08 | 0.25 |
| LBC-035 | 12/15/2004 | MFLBC | E Branch @ Lisbon-Canfield Rd | 40.51.43N/80.47.21W | JJN | 7.5 | 6.5 | 532 | 7.41 | 118 | 314 | 9 | 215 | 71.6 | 0.58 | 0.32 | 0.25 |
| LBC-036 | 12/15/2004 | MFLBC | Trib to MF @ Darner Rd | 40.45.43N/80.43.05W | JJN | 7.6 | 6.7 | 496 | 6.36 | 105 | 288 | 16 | 193 | 73.3 | 0.15 | 0.22 | 0.25 |
| LBC-037 | 12/15/2004 | MFLBC | Furnace Rd Ss W St Jacobs-Logtwn Rd | 40.46.46N/80.47.35W | JJN | 7.5 | 7.0 | 370 | 9.03 | 80.7 | 219 | 8 | 128 | 42.2 | 0.10 | 0.05 | 0.25 |
| LBC-038 | 12/15/2004 | MFLBC | Teegarden Rd NWs N of Eagleton Rd | 40.49.24N/80.49.39W | JJN | 7.3 | 6.6 | 368 | 7.85 | 50.2 | 240 | 7 | 160 | 102 | 0.16 | 0.18 | 0.25 |
| LBC-039 | 12/15/2004 | MFLBC | Cleve-E Liverpool Rd/SR14 SE Duck Cr Rd | 40.55.12N/80.54.06W | JJN | 7.3 | 6.6 | 375 | 12.7 | 82.5 | 231 | 6 | 141 | 40.7 | 0.42 | 0.20 | 0.25 |
| LBC-040 | 12/15/2004 | MFLBC | Goshen Rd S of SR165 | 40.56.32N/80.52.58W | JJN | 7.7 | 7.0 | 797 | 19.2 | 145 | 418 | 13 | 215 | 63 | 0.22 | 0.13 | 0.25 |
| LBC-041 | 12/15/2004 | MFLBC | Cherry Valley Run @ W Garfield Rd | 40.54.35N/80.45.54W | JJN | 7.6 | 6.8 | 428 | 9.71 | 90.3 | 231 | 6 | 165 | 42 | 0.25 | 0.18 | 0.25 |
| LBC-042 | 12/15/2004 | MFLBC | Mill Site Cr @ SR154 E of Lisbon | 40.46.19N/80.45.14W | JJN | 7.8 | 6.8 | 490 | 12 | 116 | 271 | 8 | 203 | 75.7 | 0.08 | 0.06 | 0.25 |
| LBC-043 | 12/15/2004 | WFLBC | Cold Run @ Winona Rd W of Depot Rd | 40.49.40N/80.51.48W | JJN | 7.6 | 7.0 | 346 | 10.1 | 96.8 | 174 | 5 | 145 | 33.3 | 0.17 | 0.08 | 0.25 |
| LBC-044 | 12/15/2004 | WFLBC | Trib to Guilford Lake @ Woodsdale Rd | 40.49.07N/80.53.04W | JJN | 7.4 | 6.7 | 358 | 7.51 | 87.3 | 173 | 15 | 133 | 34.2 | 0.14 | 0.09 | 0.25 |
| LBC-045 | 12/15/2004 | WFLBC | Cold Run @ Sell Rd | 40.48.06N/80.50.49W | JJN | 7.6 | 7.0 | 456 | 7.2 | 106 | 268 | 13 | 199 | 78.6 | 0.18 | 0.17 | 0.25 |
| LBC-046 | 12/16/2004 | WFLBC | CR413/Steubenville Pike Rd S of SR518 | 40.41.19N/80.46.04W | JJN | 7.2 | 7.0 | 596 | 12.4 | 142 | 342 | 13 | 219 | 135 | 0.53 | 0.38 | 0.25 |
| LBC-047 | 12/16/2004 | WFLBC | Brush Run @ SR518 W of West Point | 40.41.46N/80.43.25W | JJN | 7.4 | 7.0 | 676 | 11.4 | 120 | 448 | 10 | 342 | 218 | 0.07 | 0.06 | 0.25 |
| LBC-048 | 12/16/2004 | WFLBC | Patterson Cr @ SR518 W of West Point | 40.42.27N/80.42.06W | JJN | 7.4 | 7.0 | 589 | 9.62 | 102 | 373 | 6 | 291 | 183 | 0.10 | 0.11 | 0.25 |
| LBC-049 | 12/16/2004 | WFLBC | Brush Cr @ Williard Rd E of SR644 | 40.42.30N/80.53.20W | JJN | 7.4 | 6.5 | 243 | 5.98 | 53 | 124 | 18 | 94 | 24.3 | 0.19 | 0.19 | 0.25 |
| LBC-050 | 12/16/2004 | WFLBC | WF @ SR164 S of Gavers | 40.42.08N/80.48.28W | JJN | 7.6 | 6.2 | 354 | 7.4 | 85.9 | 200 | 12 | 154 | 53.5 | 0.11 | 0.12 | 0.25 |
| LBC-051 | 12/16/2004 | WFLBC | Williard Run @ McKaig Rd W of Dungannon | 40.44.01N/80.53.10W | JJN | 7.0 | 6.0 | 236 | 8.39 | 40.9 | 117 | 13 | 83.7 | 17.3 | 0.14 | 0.12 | 0.25 |
| LBC-052 | 12/16/2004 | WFLBC | Williard Run @ CR407 E of Dungannon | 40.44.02N/80.52.35W | JJN | 7.5 | 6.6 | 608 | 10.6 | 134 | 405 | 15 | 308 | 165 | 0.11 | 0.39 | 0.25 |
| LBC-053 | 12/16/2004 | WFLBC | SR164 & Seigler Rd S of Gavers | 40.40.58N/80.48.30W | JJN | 7.2 | 5.8 | 220 | 5.19 | 44.5 | 130 | 12 | 91.1 | 38.7 | 0.15 | 0.18 | 0.25 |
| LBC-054 | 12/16/2004 | WFLBC | Bursh Cr @ Emerick Rd N of Summitville | 40.40.57N/80.54.01W | JJN | 7.6 | | 226 | 5.13 | 59.3 | 129 | 15 | 91.3 | 22.1 | 0.61 | 0.14 | 0.25 |
| LBC-055 | 12/16/2004 | WFLBC | SR518 1.5 mi E of Gavers | 40.42.16N/80.46.35W | JJN | 7.8 | | 579 | 8.75 | 171 | 374 | 21 | 301 | 127 | 0.15 | 0.29 | 0.25 |
| LBC-056 | 12/16/2004 | WFLBC | Rowley Run @ Wayne Br Rd N of Park | 40.44.31N/80.48.24W | JJN | 7.6 | | 331 | 3.95 | 110 | 195 | 7 | 158 | 42 | 0.71 | 0.57 | 0.25 |
| LBC-057 | 12/16/2004 | WFLBC | Peters Run @ confl E of Ketchum Rd | 40.41.44N/80.43.05W | JJN | 7.9 | | 488 | 4.06 | 117 | 294 | 26 | 225 | 79.9 | 0.20 | 0.05 | 0.25 |
| LBC-058 | 12/16/2004 | WFLBC | County Home Rd .25 mi N of US30 | 40.46.24N/80.49.30W | JJN | 7.8 | | 459 | 4.37 | 147 | 252 | 6 | 197 | 43.6 | 0.32 | 0.27 | 0.25 |
| LBC-059 | 12/16/2004 | WFLBC | SR518 .75 mi W of Gavers | 40.42.26N/80.48.51W | JJN | 7.8 | | 607 | 3.11 | 105 | 382 | 14 | 299 | 180 | 0.10 | 0.14 | 0.25 |
| LBC-060 | 12/16/2004 | WFLBC | Brush Cr @ Fink Rd N of Summitville | 40.41.47N/80.53.19W | JJN | 7.5 | | 234 | 3.32 | 65.1 | 142 | 6 | 103 | 32.9 | 0.33 | 0.08 | 0.25 |

WF riparian corridor data.

| WEST FORK SUBWATERSHED (HUC 05030101-080) | | |
|---|---|---|
| SEGMENT # | SW BANK | NE BANK |
| 1 | 2 | 3 |
| 2 | 2 | 3 |
| 3 | 3 | 1 |
| 4 | 3 | 3 |
| 5 | 3 | 3 |
| 6 | 3 | 3 |
| 7 | 3 | 3 |
| 8 | 3 | 3 |
| 9 | 3 | 3 |
| 10 | 3 | 3 |
| 11 | 3 | 3 |
| 12 | 3 | 3 |
| 13 | 3 | 3 |
| 14 | 3 | 3 |
| 15 | 3 | 3 |
| 16 | 3 | 3 |
| 17 | 3 | 3 |
| 18 | 3 | 3 |
| 19 | 2 | 2 |
| 20 | 3 | 2 |
| 21 | 3 | 2 |
| 22 | 3 | 2 |
| 23 | 1 | 3 |
| 24 | 2 | 2 |
| 25 | 3 | 2 |
| 26 | 3 | 1 |
| 27 | 3 | 2 |
| 28 | 3 | 2 |
| 29 | 3 | 3 |
| 30 | 2 | 1 |
| 31 | 0 | 1 |
| 32 | 3 | 2 |
| 33 | 0 | 3 |
| 34 | 3 | 3 |
| 35 | 3 | 2 |
| 36 | 3 | 2 |
| 37 | 2 | 2 |
| 38 | 1 | 1 |
| 39 | 0 | 3 |
| 40 | 3 | 3 |
| 41 | 3 | 0 |
| 42 | 2 | 0 |
| 43 | 1 | 1 |
| 44 | 0 | 1 |
| 45 | 2 | 3 |
| 46 | 0 | 3 |

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|---|---|---|
| 47 | 1 | 3 |
| 48 | 3 | 2 |
| 49 | 3 | 2 |
| 50 | 3 | 3 |
| 51 | 2 | 3 |
| 52 | 2 | 3 |
| 53 | 2 | 3 |
| 54 | 2 | 3 |
| 55 | 3 | 3 |
| 56 | 3 | 3 |
| 57 | 3 | 3 |
| 58 | 3 | 1 |
| 59 | 2 | 1 |
| 60 | 3 | 3 |
| 61 | 3 | 3 |
| 62 | 2 | 3 |
| 63 | 2 | 2 |
| 64 | 0 | 0 |
| 65 | 0 | 0 |
| 66 | 2 | 2 |
| 67 | 2 | 2 |
| 68 | 3 | 3 |
| 69 | 3 | 2 |
| 70 | 3 | 3 |
| 71 | 3 | 3 |
| 72 | 3 | 2 |
| 73 | 3 | 2 |
| 74 | 3 | 2 |
| 75 | 3 | 2 |
| 76 | 3 | 3 |
| 77 | 3 | 3 |
| 78 | 3 | 2 |
| 79 | 3 | 3 |
| 80 | 0 | 3 |
| 81 | 3 | 3 |
| 82 | 3 | 3 |
| 83 | 3 | 3 |
| 84 | 3 | 2 |
| 85 | 3 | 0 |
| 86 | 3 | 1 |
| 87 | 3 | 0 |
| 88 | 3 | 0 |
| 89 | 3 | 1 |
| 90 | 3 | 2 |
| 91 | 3 | 2 |
| 92 | 3 | 1 |
| 93 | 3 | 3 |
| 94 | 3 | 3 |
| 95 | 3 | 3 |
| 96 | 1 | 1 |
| 97 | 3 | 0 |
| 98 | 1 | 0 |

| | | |
|---|---|---|
| 99 | 2 | 0 |
| 100 | 3 | 1 |
| 101 | 3 | 2 |
| 102 | 3 | 3 |
| 103 | 3 | 2 |
| 104 | 3 | 3 |
| 105 | 3 | 3 |
| 106 | 3 | 3 |
| 107 | 3 | 3 |
| 108 | 3 | 3 |
| 109 | 3 | 0 |
| 110 | 1 | 2 |
| 111 | 1 | 3 |
| 112 | 1 | 3 |
| 113 | 1 | 3 |
| 114 | 2 | 3 |
| 115 | 3 | 1 |
| 116 | 3 | 3 |
| 117 | 3 | 3 |
| 118 | 3 | 3 |
| 119 | 3 | 2 |
| 120 | 3 | 3 |
| 121 | 3 | 3 |
| 122 | 3 | 3 |
| 123 | 3 | 3 |
| 124 | 3 | 3 |
| 125 | 3 | 3 |
| 126 | 3 | 3 |
| 127 | 3 | 3 |
| 128 | 3 | 0 |
| 129 | 2 | 3 |
| 130 | 2 | 3 |
| 131 | 3 | 3 |
| 132 | 3 | 3 |
| 133 | 3 | 3 |
| 134 | 3 | 2 |
| 135 | 3 | 2 |
| 136 | 3 | 1 |
| 137 | 3 | 1 |
| 138 | 3 | 2 |
| 139 | 3 | 3 |
| 140 | 3 | 2 |
| 141 | 3 | 3 |
| 142 | 3 | 2 |
| 143 | 3 | 3 |
| 144 | 3 | 2 |
| 145 | 3 | 3 |
| 146 | 3 | 3 |
| 147 | 3 | 3 |
| 148 | 3 | 3 |
| 149 | 3 | 3 |
| 150 | 1 | 3 |

| | | |
|---|---|---|
| 151 | 2 | 2 |
| 152 | 2 | 2 |
| 153 | 2 | 2 |
| 154 | 2 | 3 |
| 155 | 1 | 2 |
| 156 | 2 | 2 |
| 157 | 3 | 3 |
| 158 | 2 | 3 |
| 159 | 2 | 2 |
| 160 | 2 | 3 |
| 161 | 3 | 3 |
| 162 | 3 | 3 |
| 163 | 3 | 3 |
| 164 | 3 | 3 |
| 165 | 3 | 3 |
| 166 | 3 | 3 |
| 167 | 3 | 3 |
| 168 | 3 | 3 |
| 169 | 2 | 3 |
| 170 | 2 | 3 |
| 171 | 2 | 3 |
| 172 | 3 | 3 |
| 173 | 3 | 3 |
| 174 | 2 | 3 |
| 175 | 2 | 3 |
| 176 | 1 | 2 |
| 177 | 1 | 2 |
| 178 | 2 | 3 |
| 179 | 3 | 3 |
| 180 | 2 | 3 |
| 181 | 2 | 2 |
| 182 | 2 | 3 |
| 183 | 3 | 3 |
| 184 | 3 | 3 |
| 185 | 3 | 3 |
| 186 | 3 | 3 |
| 187 | 3 | 3 |
| 188 | 3 | 3 |
| 189 | 3 | 3 |
| 190 | 3 | 3 |
| 191 | 3 | 3 |
| 192 | 3 | 3 |
| 193 | 3 | 3 |
| 194 | 3 | 3 |
| 195 | 3 | 3 |
| 196 | 3 | 3 |
| 197 | 3 | 3 |
| 198 | 3 | 3 |
| 199 | 3 | 3 |
| 200 | 3 | 3 |
| 201 | 3 | 3 |
| 202 | 3 | 3 |

| | | |
|---|---|---|
| 203 | 3 | 3 |
| 204 | 3 | 3 |
| 205 | 3 | 3 |
| 206 | 3 | 1 |
| 207 | 1 | 2 |
| 208 | 2 | 2 |
| 209 | 3 | 3 |
| 210 | 3 | 2 |
| 211 | 3 | 3 |
| TOTAL SCORE | 540 | 513 |
| AVG | 2.55924171 | 2.4312796 |

MF riparian corridor data.

| MIDDLE FORK SUBWATERSHED (HUC 05030101-070) | | |
|---|---|---|
| SEGMENT # | SW BANK | NE BANK |
| 1 | 3 | 2 |
| 2 | 1 | 2 |
| 3 | 3 | 3 |
| 4 | 2 | 3 |
| 5 | 2 | 3 |
| 6 | 3 | 3 |
| 7 | 3 | 3 |
| 8 | 3 | 3 |
| 9 | 3 | 3 |
| 10 | 3 | 3 |
| 11 | 3 | 3 |
| 12 | 3 | 3 |
| 13 | 3 | 3 |
| 14 | 3 | 3 |
| 15 | 3 | 3 |
| 16 | 3 | 3 |
| 17 | 3 | 3 |
| 18 | 3 | 3 |
| 19 | 3 | 3 |
| 20 | 3 | 3 |
| 21 | 3 | 3 |
| 22 | 2 | 3 |
| 23 | 2 | 3 |
| 24 | 2 | 3 |
| 25 | 3 | 3 |
| 26 | 3 | 3 |
| 27 | 3 | 3 |
| 28 | 0 | 0 |
| 29 | 0 | 0 |
| 30 | 2 | 0 |
| 31 | 3 | 3 |
| 32 | 2 | 3 |
| 33 | 1 | 1 |
| 34 | 0 | 3 |
| 35 | 1 | 3 |
| 36 | 1 | 3 |
| 37 | 1 | 3 |
| 38 | 1 | 3 |
| 39 | 1 | 3 |
| 40 | 1 | 3 |
| 41 | 1 | 3 |
| 42 | 1 | 3 |
| 43 | 2 | 3 |
| 44 | 3 | 3 |
| 45 | 3 | 3 |
| 46 | 3 | 3 |

| | | |
|---|---|---|
| 47 | 3 | 3 |
| 48 | 3 | 3 |
| 49 | 3 | 3 |
| 50 | 1 | 1 |
| 51 | 0 | 3 |
| 52 | 2 | 3 |
| 53 | 2 | 2 |
| 54 | 3 | 3 |
| 55 | 3 | 3 |
| 56 | 2 | 2 |
| 57 | 2 | 2 |
| 58 | 2 | 2 |
| 59 | 2 | 2 |
| 60 | 2 | 1 |
| 61 | 2 | 2 |
| 62 | 3 | 2 |
| 63 | 3 | 2 |
| 64 | 3 | 0 |
| 65 | 2 | 2 |
| 66 | 1 | 3 |
| 67 | 1 | 3 |
| 68 | 3 | 1 |
| 69 | 3 | 1 |
| 70 | 3 | 1 |
| 71 | 3 | 1 |
| 72 | 3 | 2 |
| 73 | 3 | 2 |
| 74 | 3 | 2 |
| 75 | 3 | 2 |
| 76 | 3 | 2 |
| 77 | 3 | 2 |
| 78 | 3 | 1 |
| 79 | 3 | 1 |
| 80 | 3 | 1 |
| 81 | 3 | 3 |
| 82 | 3 | 3 |
| 83 | 3 | 3 |
| 84 | 3 | 3 |
| 85 | 3 | 3 |
| 86 | 3 | 3 |
| 87 | 3 | 3 |
| 88 | 3 | 3 |
| 89 | 3 | 3 |
| 90 | 3 | 3 |
| 91 | 3 | 3 |
| 92 | 3 | 3 |
| 93 | 3 | 3 |
| 94 | 3 | 3 |
| 95 | 3 | 3 |
| 96 | 2 | 3 |
| 97 | 2 | 2 |
| 98 | 1 | 1 |

| | | |
|---|---|---|
| 99 | 3 | 2 |
| 100 | 2 | 2 |
| 101 | 3 | 1 |
| 102 | 3 | 3 |
| 103 | 3 | 3 |
| 104 | 3 | 3 |
| 105 | 3 | 1 |
| 106 | 0 | 0 |
| 107 | 3 | 2 |
| 108 | 3 | 2 |
| 109 | 3 | 2 |
| 110 | 2 | 1 |
| 111 | 2 | 3 |
| 112 | 1 | 3 |
| 113 | 2 | 3 |
| 114 | 2 | 3 |
| 115 | 3 | 3 |
| 116 | 2 | 2 |
| 117 | 3 | 2 |
| 118 | 3 | 3 |
| 119 | 3 | 3 |
| 120 | 3 | 2 |
| 121 | 3 | 2 |
| 122 | 3 | 1 |
| 123 | 3 | 1 |
| 124 | 3 | 1 |
| 125 | 3 | 1 |
| 126 | 3 | 3 |
| 127 | 3 | 3 |
| 128 | 2 | 2 |
| 129 | 3 | 3 |
| 130 | 3 | 2 |
| 131 | 2 | 2 |
| 132 | 1 | 2 |
| 133 | 0 | 0 |
| 134 | 0 | 0 |
| 135 | 0 | 0 |
| 136 | 0 | 0 |
| 137 | 0 | 0 |
| 138 | 3 | 3 |
| 139 | 3 | 3 |
| 140 | 3 | 3 |
| 141 | 3 | 3 |
| 142 | 3 | 2 |
| 143 | 3 | 2 |
| 144 | 3 | 1 |
| 145 | 3 | 3 |
| 146 | 3 | 1 |
| 147 | 3 | 3 |
| 148 | 3 | 3 |
| 149 | 3 | 3 |
| 150 | 3 | 3 |

| | | |
|---|---|---|
| 151 | 2 | 2 |
| 152 | 2 | 2 |
| 153 | 2 | 2 |
| 154 | 2 | 3 |
| 155 | 3 | 3 |
| 156 | 3 | 3 |
| 157 | 3 | 3 |
| 158 | 3 | 3 |
| 159 | 3 | 3 |
| 160 | 3 | 3 |
| 161 | 3 | 3 |
| 162 | 3 | 3 |
| 163 | 3 | 3 |
| 164 | 3 | 3 |
| 165 | 3 | 2 |
| 166 | 3 | 3 |
| 167 | 3 | 3 |
| 168 | 3 | 3 |
| 169 | 3 | 3 |
| 170 | 3 | 3 |
| 171 | 3 | 3 |
| 172 | 3 | 3 |
| 173 | 3 | 3 |
| 174 | 3 | 3 |
| 175 | 3 | 3 |
| 176 | 3 | 3 |
| 177 | 3 | 3 |
| 178 | 3 | 3 |
| 179 | 3 | 3 |
| 180 | 3 | 3 |
| 181 | 3 | 3 |
| 182 | 3 | 3 |
| 183 | 3 | 3 |
| 184 | 3 | 2 |
| 185 | 3 | 3 |
| 186 | 3 | 3 |
| 187 | 3 | 3 |
| 188 | 3 | 3 |
| 189 | 3 | 3 |
| 190 | 3 | 3 |
| 191 | 3 | 2 |
| 192 | 3 | 2 |
| 193 | 3 | 3 |
| 194 | 3 | 3 |
| 195 | 3 | 3 |
| 196 | 3 | 3 |
| 197 | 3 | 3 |
| 198 | 2 | 2 |
| 199 | 2 | 3 |
| 200 | 1 | 3 |
| 201 | 3 | 3 |
| 202 | 3 | 3 |

| | | |
|---|---|---|
| 203 | 3 | 3 |
| 204 | 3 | 3 |
| 205 | 3 | 3 |
| 206 | 0 | 2 |
| 207 | 3 | 3 |
| 208 | 3 | 3 |
| 209 | 3 | 1 |
| 210 | 3 | 3 |
| 211 | 1 | 2 |
| 212 | 1 | 0 |
| 213 | 3 | 0 |
| 214 | 3 | 0 |
| 215 | 3 | 1 |
| 216 | 3 | 3 |
| 217 | 1 | 1 |
| 218 | 1 | 1 |
| 219 | 1 | 1 |
| 220 | 1 | 2 |
| 221 | 2 | 2 |
| 222 | 2 | 3 |
| 223 | 2 | 2 |
| 224 | 3 | 2 |
| 225 | 2 | 3 |
| 226 | 3 | 2 |
| 227 | 3 | 1 |
| 228 | 3 | 1 |
| 229 | 3 | 1 |
| 230 | 0 | 0 |
| 231 | 2 | 0 |
| 232 | 1 | 3 |
| 233 | 1 | 3 |
| 234 | 1 | 3 |
| 235 | 3 | 2 |
| 236 | 3 | 3 |
| 237 | 3 | 3 |
| 238 | 3 | 1 |
| 239 | 3 | 2 |
| 240 | 3 | 3 |
| 241 | 3 | 3 |
| 242 | 3 | 3 |
| 243 | 3 | 3 |
| 244 | 3 | 3 |
| 245 | 3 | 2 |
| 246 | 3 | 2 |
| 247 | 2 | 3 |
| 248 | 2 | 2 |
| 249 | 2 | 2 |
| 250 | 2 | 2 |
| 251 | 3 | 3 |
| 252 | 2 | 3 |
| 253 | 3 | 3 |
| 254 | 3 | 3 |

| | | |
|---|---|---|
| 255 | 3 | 3 |
| 256 | 3 | 3 |
| 257 | 3 | 3 |
| 258 | 3 | 3 |
| 259 | 3 | 3 |
| 260 | 3 | 3 |
| 261 | 3 | 3 |
| 262 | 3 | 3 |
| 263 | 3 | 3 |
| 264 | 3 | 3 |
| 265 | 3 | 3 |
| 266 | 3 | 3 |
| 267 | 3 | 3 |
| 268 | 2 | 3 |
| 269 | 1 | 3 |
| 270 | 3 | 3 |
| 271 | 2 | 3 |
| 272 | 2 | 3 |
| 273 | 3 | 3 |
| 274 | 3 | 3 |
| 275 | 3 | 3 |
| 276 | 3 | 3 |
| 277 | 3 | 3 |
| 278 | 3 | 3 |
| 279 | 3 | 3 |
| 280 | 3 | 3 |
| 281 | 3 | 3 |
| 282 | 3 | 3 |
| 283 | 3 | 3 |
| 284 | 3 | 3 |
| 285 | 3 | 3 |
| 286 | 3 | 3 |
| 287 | 3 | 3 |
| 288 | 3 | 3 |
| 289 | 3 | 3 |
| 290 | 3 | 3 |
| 291 | 3 | 3 |
| 292 | 3 | 3 |
| 293 | 3 | 3 |
| 294 | 3 | 3 |
| 295 | 3 | 3 |
| 296 | 2 | 1 |
| 297 | 2 | 2 |
| 298 | 1 | 1 |
| 299 | 0 | 2 |
| 300 | 3 | 2 |
| 301 | 3 | 2 |
| 302 | 3 | 3 |
| 303 | 3 | 3 |
| 304 | 3 | 1 |
| 305 | 3 | 1 |
| 306 | 3 | 2 |

| | | |
|---|---|---|
| 307 | 3 | 1 |
| 308 | 3 | 1 |
| 309 | 2 | 1 |
| 310 | 2 | 3 |
| 311 | 3 | 3 |
| TOTAL SCORE | 788 | 756 |
| AVG | 2.53376206 | 2.4308682 |

NF riparian corridor data.

| NORTH FORK SUBWATERSHED (HUC 05030101-090) | | |
|---|---|---|
| SEGMENT # | SW BANK | NE BANK |
| 1 | 3 | 3 |
| 2 | 3 | 3 |
| 3 | 3 | 3 |
| 4 | 1 | 3 |
| 5 | 3 | 3 |
| 6 | 2 | 3 |
| 7 | 1 | 3 |
| 8 | 3 | 3 |
| 9 | 1 | 3 |
| 10 | 2 | 1 |
| 11 | 3 | 2 |
| 12 | 3 | 3 |
| 13 | 3 | 3 |
| 14 | 2 | 3 |
| 15 | 2 | 3 |
| 16 | 3 | 3 |
| 17 | 3 | 3 |
| 18 | 2 | 3 |
| 19 | 2 | 3 |
| 20 | 3 | 3 |
| 21 | 3 | 3 |
| 22 | 2 | 2 |
| 23 | 2 | 1 |
| 24 | 3 | 2 |
| 25 | 2 | 3 |
| 26 | 3 | 2 |
| 27 | 3 | 2 |
| 28 | 3 | 2 |
| 29 | 3 | 2 |
| 30 | 3 | 2 |
| 31 | 3 | 3 |
| 32 | 3 | 2 |
| 33 | 3 | 3 |
| 34 | 3 | 3 |
| 35 | 3 | 3 |
| 36 | 3 | 3 |
| 37 | 2 | 3 |
| 38 | 2 | 3 |
| 39 | 2 | 3 |
| 40 | 3 | 3 |
| 41 | 3 | 3 |
| 42 | 3 | 3 |
| 43 | 3 | 3 |
| 44 | 3 | 3 |
| 45 | 3 | 3 |
| 46 | 3 | 3 |

| | | |
|---|---|---|
| 47 | 3 | 3 |
| 48 | 3 | 3 |
| 49 | 3 | 3 |
| 50 | 3 | 3 |
| 51 | 3 | 3 |
| 52 | 3 | 3 |
| 53 | 3 | 3 |
| 54 | 3 | 3 |
| 55 | 3 | 3 |
| 56 | 3 | 3 |
| 57 | 3 | 3 |
| 58 | 3 | 3 |
| 59 | 3 | 3 |
| 60 | 3 | 3 |
| 61 | 3 | 3 |
| 62 | 3 | 3 |
| 63 | 3 | 3 |
| 64 | 3 | 3 |
| 65 | 3 | 3 |
| 66 | 3 | 3 |
| 67 | 3 | 3 |
| 68 | 3 | 3 |
| 69 | 3 | 3 |
| 70 | 2 | 3 |
| TOTAL SCORE | 191 | 197 |
| AVG | 2.72857143 | 2.8142857 |

MS riparian corridor data.

| MAIN STEM SUBWATERSHED (HUC 05030101-090) | | |
|---|---|---|
| SEGMENT # | SW BANK | NE BANK |
| 1 | 3 | 3 |
| 2 | 3 | 3 |
| 3 | 3 | 3 |
| 4 | 3 | 3 |
| 5 | 3 | 3 |
| 6 | 3 | 3 |
| 7 | 2 | 3 |
| 8 | 3 | 3 |
| 9 | 3 | 3 |
| 10 | 3 | 3 |
| 11 | 3 | 3 |
| 12 | 3 | 3 |
| 13 | 3 | 3 |
| 14 | 1 | 3 |
| 15 | 3 | 3 |
| 16 | 3 | 3 |
| 17 | 3 | 3 |
| 18 | 3 | 3 |
| 19 | 3 | 3 |
| 20 | 3 | 3 |
| 21 | 3 | 3 |
| 22 | 3 | 3 |
| 23 | 3 | 3 |
| 24 | 3 | 3 |
| 25 | 3 | 3 |
| 26 | 3 | 3 |
| 27 | 3 | 3 |
| 28 | 3 | 3 |
| 29 | 3 | 3 |
| 30 | 3 | 3 |
| 31 | 3 | 3 |
| 32 | 3 | 3 |
| 33 | 3 | 3 |
| 34 | 3 | 3 |
| 35 | 3 | 3 |
| 36 | 3 | 3 |
| 37 | 3 | 3 |
| 38 | 3 | 3 |
| 39 | 3 | 3 |
| 40 | 3 | 3 |
| 41 | 3 | 3 |
| 42 | 3 | 3 |
| 43 | 3 | 1 |
| 44 | 3 | 1 |
| 45 | 3 | 3 |
| 46 | 3 | 3 |

| | | |
|---|---|---|
| 47 | 3 | 3 |
| 48 | 3 | 3 |
| 49 | 3 | 3 |
| 50 | 3 | 3 |
| 51 | 3 | 3 |
| 52 | 3 | 3 |
| 53 | 3 | 3 |
| 54 | 3 | 3 |
| 55 | 3 | 3 |
| 56 | 3 | 3 |
| 57 | 3 | 3 |
| 58 | 3 | 3 |
| 59 | 3 | 3 |
| 60 | 3 | 3 |
| 61 | 3 | 3 |
| 62 | 3 | 3 |
| 63 | 3 | 3 |
| 64 | 3 | 3 |
| 65 | 3 | 3 |
| 66 | 3 | 3 |
| 67 | 3 | 3 |
| 68 | 3 | 3 |
| 69 | 3 | 3 |
| 70 | 2 | 3 |
| 71 | 3 | 3 |
| 72 | 3 | 3 |
| 73 | 3 | 3 |
| 74 | 3 | 3 |
| 75 | 3 | 3 |
| 76 | 3 | 3 |
| 77 | 3 | 3 |
| 78 | 3 | 3 |
| 79 | 3 | 3 |
| 80 | 3 | 3 |
| 81 | 3 | 3 |
| 82 | 3 | 3 |
| 83 | 3 | 3 |
| 84 | 3 | 3 |
| 85 | 3 | 3 |
| 86 | 3 | 3 |
| 87 | 3 | 3 |
| 88 | 3 | 3 |
| 89 | 3 | 3 |
| 90 | 3 | 3 |
| 91 | 3 | 3 |
| 92 | 3 | 3 |
| 93 | 3 | 3 |
| 94 | 2 | 3 |
| 95 | 3 | 3 |
| 96 | 3 | 3 |
| 97 | 2 | 3 |
| 98 | 2 | 3 |

| | | |
|---|---|---|
| 99 | 2 | 3 |
| 100 | 3 | 2 |
| 101 | 2 | 3 |
| 102 | 3 | 1 |
| 103 | 3 | 3 |
| 104 | 3 | 3 |
| 105 | 3 | 0 |
| 106 | 3 | 0 |
| 107 | 3 | 3 |
| 108 | 3 | 3 |
| 109 | 3 | 3 |
| 110 | 3 | 3 |
| 111 | 3 | 3 |
| 112 | 3 | 3 |
| 113 | 3 | 3 |
| 114 | 3 | 3 |
| 115 | 3 | 3 |
| 116 | 3 | 3 |
| 117 | 3 | 3 |
| 118 | 3 | 3 |
| 119 | 3 | 3 |
| 120 | 3 | 3 |
| 121 | 3 | 3 |
| 122 | 3 | 3 |
| 123 | 3 | 3 |
| 124 | 3 | 3 |
| 125 | 3 | 3 |
| 126 | 3 | 3 |
| 127 | 3 | 3 |
| 128 | 3 | 3 |
| 129 | 3 | 3 |
| 130 | 3 | 3 |
| 131 | 3 | 3 |
| 132 | 3 | 3 |
| 133 | 3 | 3 |
| 134 | 3 | 1 |
| 135 | 3 | 1 |
| TOTAL SCORE | 396 | 388 |
| AVG | 2.93333333 | 2.8740741 |

Agricultural Priorities for the Little Beaver Creek Watershed

| Stream Name/HUC | Attainment Status | Cause | Project Type | Sources | Action | Unit | Target | Cost | Funding Sources | Agencies Involved | Timeline |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **HIGH PRIORITY** | | | | | | | | | | | |
| Various subwatersheds | Varies | Sedimentation and fecal coliform | Exclusion fencing and riparian restoration | Livestock stream access and confinement | Exclusion fencing, stock tanks, heavy use paddocks, and stream crossings | $ spent on BMP match | $67,768.80 | $244,955.40 | Ohio EPA 319 grant | **LBCLF,** CSWCD, OEPA | Completed 2009 |
| Lisbon Creek/MF 050301010404 | Non: siltation | Sedimentation | Exclusion fencing and riparian restoration[1] | Livestock stream access | Exclusion fencing | Linear feet | 1,000 | $3,000 | 319 grants, SWIF grants, individual landowners | **CSWCD**[2], LBCLF, OEPA, NRCS | 2012-2015 |
| Headwaters West Fork /WF 050301010502 | Non: phosphorous | Sedimentation | Exclusion fencing and riparian restoration | Livestock stream access | Exclusion fencing | Linear feet | 2,500 | $7,500 | 319 grants, SWIF grants, individual landowners | **CSWCD**, LBCLF, OEPA, NRCS | 2012-2015 |
| Headwaters Middle Fork/MF 050301010402 | Non: phosphorous | Sedimentation | Exclusion fencing and riparian restoration | Livestock stream access | Exclusion fencing | Linear feet | 5,000 | $15,000 | 319 grants, SWIF grants, individual landowners | **CSWCD**, LBCLF, OEPA, NRCS | 2013-2016 |
| Headwaters Middle Fork/MF 050301010 | Non: phosphorous | Sedimentation | Filter strips | Crop farming | Filter strips | Acres | 10 | Unknown | Individual landowners, EQUIP, foundation grants | **CSWCD**, LBCLF, NRCS | 2015-2016 |

[1] Exclusion fencing and riparian restoration includes any of the following necessary best management practices depending on the needs of the individual site: exclusion fencing, stream crossings, tree plantings, stream stabilization and restoration, alternative water systems, and heavy use areas.

[2] The first agency listed in each row is bolded because that agency has been identified as the lead agency.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 402 | | | | | | | | | | | |
| Headwaters Middle Fork/MF 050301010 402 | Non: phosphorous | Sedimentation | No-till | Crop farming | No-till | Acres | 90 | Unknown | Individual landowners, EQUIP, foundation grants | **CSWCD**, LBCLF, NRCS | 2015-2016 |
| Patterson Creek/WF 050301010 504 | Non: sedimentation | Sedimentation | Exclusion fencing and riparian restoration | Livestock stream access | Exclusion fencing | Linear feet | 3,000 | $9,000 | 319 grants, SWIF grants, individual landowners | **CSWCD**, LBCLF, OEPA, NRCS | 2013-2016 |
| Patterson Creek/WF 050301010 504 | Non: sedimentation | Sedimentation | No-till agriculture | Crop farming | No-till | Acres | 5 | Unknown | Individual landowners, foundation grants, EQUIP | **CSWCD,** LBCLF, NRCS | 2014-2016 |
| Longs Run/NF 050301010 601 | Non: phosphorous | Sedimentation and erosion | Exclusion fencing | Livestock stream access | Exclusion fencing | Linear feet | 1,040 | $3,120 | Individual landowners, foundation grants | **CSWCD,** LBCLF, NRCS | 2014-2016 |
| Cold Run/WF 050301010 501 | In | Sedimentation | Exclusion fencing and riparian restoration | Livestock stream access | Exclusion fencing | Linear feet | 5,000 | $15,000 | 319 grants, SWIF grants, individual landowners | **CSWCD**, LBCLF, OEPA, NRCS | 2012-2015 |
| Elk Run/MF 050301010 405 | In | Sedimentation | Exclusion fencing and riparian restoration | Livestock stream access | Exclusion fencing | Linear feet | 5,000 | $15,000 | 319 grants, SWIF grants, individual landowners | **CSWCD**, LBCLF, OEPA, NRCS | 2013-2016 |
| Rough Run/NF 050301010 609 | In | Sedimentation | Exclusion fencing and riparian restoration | Livestock stream access | Exclusion fencing | Linear feet | 5,000 | $15,000 | 319 grants, SWIF grants, individual landowners | **CSWCD**, LBCLF, OEPA, NRCS | 2013-2016 |
| East Branch/MF 050301010 401 | Non: phosphorous, fecal coliform | Sedimentation | Exclusion fencing and riparian restoration | Livestock stream access | Exclusion fencing | Linear feet | 15,000 | $45,000 | 319 grants, SWIF grants, individual landowners | **CSWCD**, LBCLF, OEPA, NRCS | 2013-2016 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NF PA 05030101-090 | Varies | Sedimentation | Exclusion fencing and riparian restoration | Livestock stream access | Exclusion fencing | Linear feet | 5,000 | $15,000 | 319 grants, SWIF grants, individual landowners | **Lawrence and Beaver Conservation Districts**, LBCLF, PADEP, NRCS | 2013-2016 |
| Brush Creek/WF 050301010503 | Non: ammonia, sedimentation, fecal coliform | Nutrient Loading | Exclusion fencing and riparian restoration | Livestock stream access | Exclusion fencing | Linear feet | 20,000 | $60,000 | 319 grant, SWIF grant, individual landowners | **CSWCD**, LBCLF, NRCS | 2013-2016 |
| Leslie Run/NF 050301010606 | Non: phosphorous, ammonia | Nutrient loading | Exclusion fencing and riparian restoration | Livestock stream access | Exclusion fencing | Linear feet | 2,200 for phosphorous, 10,000 for ammonia | $6,600 - $30,000 | 319 grant, SWIF grant, individual landowners | **CSWCD**, LBCLF, NRCS | 2013-2016 |
| Brush Creek/WF 050301010503 | Non: ammonia, sedimentation, fecal coliform | Nutrient Loading | Restoration | Livestock waste | Waste storage facilities | Cattle (number of cattle that have waste served) | 37 | Unknown | 319 grant, SWIF grant, individual landowners | **CSWCD**, LBCLF, NRCS | 2014-2016 |
| East Branch/MF 050301010401 | Non: phosphorous, fecal coliform | Nutrient Loading | Restoration | Agricultural crop farming | Agricultural filter strips | Acres | 160 | Unknown | 319 grant, SWIF grant, individual landowners | **CSWCD**, LBCLF, NRCS | 2014-2016 |
| East Branch/MF 050301010401 | Non: phosphorous, fecal coliform | Nutrient Loading | No-till agriculture | Crop farming | No-till | Acres | 3,000 | Unknown | 319 grant, EQUIP, individual landowners | **CSWCD, MSWCD,** LBCLF, NRCS | 2015-2016 |
| Honey Creek/NF 050301010602 | Non: phosphorous, ammonia | Nutrient Loading | Filter strips | Agricultural crop farming | Agricultural filter strips | Acres | 22 for phosphorous, 100 for ammonia | Unknown | 319 grant, EQUIP, individual landowners | **MSWCD**, LBCLF, NRCS | 2015-2016 |
| Honey Creek/NF 050301010602 | Non: phosphorous, ammonia | Nutrient Loading | No-till agriculture | Crop farming | No-till | Acres | 75 for phosphorous, 450 for ammonia | Unknown | 319 grant, EQUIP, individual landowners | **MSWCD**, LBCLF, NRCS | 2015-2016 |
| Leslie Run/NF 050301010606 | Non: phosphorous, ammonia | Nutrient loading | Filter strips | Agricultural crop farming | Agricultural filter strips | Acres | 50 for ammonia | Unknown | 319 grant, EQUIP, individual landowners | **CSWCD**, LBCLF, NRCS | 2015-2016 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Leslie Run/NF 050301010606 | Non: phosphorous, ammonia | Nutrient loading | No-till agriculture | Crop farming | No-till | Acres | 89 for ammonia | Unknown | 319 grant, EQUIP, individual landowners | **CSWCD**, LBCLF, NRCS | 2015-2016 |
| All 05030101-090, 05030101-080, 05030101-070 except Patterson Run and Brush Creek with separate sedimentation TMDLs | Varies | Sedimentation | Filter strips | Agricultural crop farming | Agricultural filter strips | Acres | 700 | Unknown | 319 grant, EQUIP, individual landowners | **CSWCD, MSWCD,** LBCLF, NRCS | 2015-2016 |
| All 05030101-090, 05030101-080, 05030101-070 except Patterson Creek and Brush Creek with separate sedimentation TMDLs | Varies | Sedimentation | No-till agriculture | Agricultural crop farming | No-till | acres | 3,000 | Unknown | 319 grant, EQUIP, individual landowners | **CSWCD, MSWCD,** LBCLF, NRCS | 2015-2016 |
| **MEDIUM PRIORITY** | | | | | | | | | | | |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Sedimentation and erosion | Stream setback for croplands | Crops planted in the riparian areas | Establish crop buffers | Crop buffer projects | 5 | Unknown | 319 grants, SWIF grants, individual landowners | **CSWCD**, MSWCD, BCCD, LCCD, LBCLF, NRCS | 2014-2016 |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Sedimentation and erosion | Pasture Walks | Livestock in streams, lack of riparian buffer | Education in innovative farming practices | Pasture walks | 5 | $1,000 each | Regional SWCDs | **CSWCD**, MSWCD, NRCS | 2011-2012 |

Riparian Priorities for the Little Beaver Creek Watershed

| Stream Name/HUC | Attainment Status | Cause | Project Type | Sources | Action | Unit | Target | Cost | Funding Sources | Agencies Involved | Timeline |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **HIGH PRIORITY** | | | | | | | | | | | |
| Lisbon Creek/MF 050301010 404 | Non: siltation | Sedimentation and erosion | Prevention | Development | Conservation easement | Acres | 135 | N/a | Donation | **Western Reserve Land Conservancy**, LBCLF | 2010 |
| Patterson Creek/WF 050301010 504 | Non: sedimentation | Sedimentation and erosion | Prevention | Development | Acquisition | Acres | 197 | $415,200 | Clean Ohio | **CCPD** | 2010 |
| Bieler Run/NF 050301010 610 | Non: siltation | Sedimentation and erosion | Prevention | Development | Conservation easement | Acres | 27.5 | $106,132 | Clean Ohio | **LBCLF** | 2011 |
| Elk Run/MF 050301010 405 | In | Sedimentation and erosion | Prevention | Development | acquisition | Acres | 11 | N/a | Donation | **LBCLF** | 2011 |
| Headwaters Middle Fork/MF 050301010 402 | Non: phosphorous | Sedimentation and erosion | Prevention | Development | Conservation easement | Acres | 18 | $75,000 | Clean Ohio | **LBCLF,** WRLC, Mill Creek MetroParks | 2011-2013 |
| Stone Mill Run/MF 050301010 403 | In | Lowhead dam | Research and possible restoration | Lowhead dam causing ponding | Dam removal research and dam removal | Research and potential removal | 1 | Unknown | 319 grant or SWIF grant | **LBCLF**, OEPA, Village of Lisbon, CSWCD | 2013- 2015 |
| East Branch/MF 050301010 401 | Non: phosphorous, fecal coliform | Sedimentation and habitat loss | Research and possible restoration | Stream channelization | Research and possible stream restoration | Feet | 7,000 | $350,000 | 319 grant or SWIF grant | **LBCLF**, OEPA, Village of Leetonia, CSWCD, ACOE | 2013-2015 |
| Rough Run/NF 050301010 609 | In | Sedimentation and erosion | Prevention | Lack of riparian area due to landslide | Restoration | Stream restoration | 1 | Unknown | 319 grant, SWIF grant, WRRSP | **LBCLF**, Scenic Rivers, CSWCD | 2013-2015 |
| Rough | In | Sedimentation and erosion | Prevention | Erosion | Riparian | Stream | 1 | Unknown | 319 grant, | **LBCLF**, Scenic | 2013-2015 |

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| Run/NF 050301010609 | | | | and lack of riparian area at BCSP Sprucevale Parking lot | restoration | restoration | | | SWIF grant, WRRSP | Rivers, CSWCD | |
| Headwaters West Fork /WF 050301010502 | Non: phosphorous | Nutrient loading and sedimentation | Restoration | Lack of riparian area at Guilford Lake | Restore riparian area | Linear feet | 670 | Unknown | 319 grant or WRRSP | **LBCLF**, Guilford Lake State Park, CSWCD | 2012-2013 |
| Patterson Creek/WF 050301010504 | Non: sedimentation | Reclaimed mined land | Restoration | Compacted mined land | Reforestation | Acres reforested | 209 | $284,720 | American Municipal Power, Laura Jane Musser Fund | **CCPD**, LBCLF, ARRI, AMP, ODNR, CSWCD | 2009-2011 |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | N/a | Education | n/a | Explore the Outdoors field day at Beaver Creek State Park | Field day | 1 | $2,500 | Fundraising, WTI | **Columbiana County Conservation Partners** | 2011-2016 |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Potential industrial contamination and vacant industrial sites | Assessment | Brownfields | Identify and map brownfields | Assessment | 1 | $200,000 | EPA Brownfields Assessment grant | **Columbiana County Port Authority**, municipalities, LBCLF | 2010-2012 |
| Stone Mill Run/MF 050301010403 | In | Pre-regulatory mining hazard | Hazard removal | Open mine shaft along Greenway Bike Trail | Hazard removal | Hazard removal | 1 | Unknown | ODNR MRM | **CCPD**, ODNR MRM, LBCLF | 2011-2014 |
| Stone Mill Run/MF 050301010403 | In | Acid mine drainage | Research | Acid mine drainage | Water samples | Research impacts on stream | 1 | $100 | ODNR MRM | **ODNR MRM**, LBCLF | 2011-2012 |
| All 05030101-090, 05030101-080, | varies | N/a | Education | n/a | Student water quality monitoring | Classrooms participating | 3 | $2,800 | Ohio Environmental Education Fund | **LBCLF**, Leetonia High School, Columbiana High School, | 2010-2011 |

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| 05030101-070 | | | | | | | | | | Crestview High School | |
| Rough Run/NF 050301010609 | In | Erosion and sedimentation | Prevention | Erosion | Streambank stabilization at Picnic Area 3 near culdesac at BCSP | Stabilization project | 1 | Unknown | 319 grant, SWIF grant, WRRSP | **LBCLF**, BCSP, CSWCD, Scenic Rivers | 2013-2015 |
| Headwaters Middle Fork/MF 050301010402 | Non: phosphorous | Wetland deterioration | Restoration | Invasive wetland species | Invasive species removal and native species planting | Acres restored | 20 | Unknown | 319 grant, WRRSP | **LBCLF**, CSWCD | 2012-2015 |
| Brush Run/NF 050301010608 | In | Reduced biodiversity | Prevention | Invasive species | Invasive species eradication and control in Sheepskin Hollow Nature Preserve and the rest of the subwatershed | Invasive species control plan | 1 | Unknown | ODNR, NFWF invasives removal grants | **ODNR DNAP** | 2011-2016 |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Erosion and sedimentation | Prevention | Development in riparian areas | Education on riparian setbacks | Educational initiative | 1 | N/a | N/a | **LBCLF**, CC Engineers, townships, Cities and Villages | 2013-2016 |
| **MEDIUM PRIORITY** | | | | | | | | | | | |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | N/a | Education | N/a | Install signs marking watershed boundaries and major tributaries | Signs | 30 | $2,500 | Ohio Environmental Education Fund | **LBCLF** | 2012-2013 |
| Stone Mill Run/MF 050301010403 | In | Erosion and sedimentation | Prevention | Breaching dam | Riparian and wetland enhancement to reduce load on dam | Enhancement project | 1 | Unknown | 319 grant, SWIF grant, WRRSP | **Northeast Ohio Christian Youth Camp**, LBCLF, OEPA, CSWCD, | 2013-2015 |

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| East Branch/MF 050301010 401 | Non: phosphorous, fecal coliform | Erosion and sedimentation | Prevention | Ditching near Veterans building in Washington-ville/ Leetonia | planting | Planting event | 1 | Unknown | 319 grant, other grant | **LBCLF**, Village of Leetonia, CSWCD | 2012-2014 |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Erosion, sedimentation and stormwater | Prevention | Unhealthy landscape practices | conservation landscaping education for homeowners | Workshops | 1 | $500 | Ohio Environmental Education Fund | **LBCLF** | 2011-2014 |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Erosion, sedimentation and stormwater | Prevention | Lack of riparian buffer at golf courses | Golf course manager education | Workshops | 1 | $500 | Ohio Environmental Education Fund | **LBCLF**, CSWCD | 2012-2014 |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | n/a | Education | n/a | School group riparian education | Lessons | 2 | $500 | CSWCD | **CSWCD** | 2011-2014 |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Erosion and sedimentation | Prevention | Homeowner practices | Erosion and sedimentation fact sheet distribution | Sheets | 50 per year | printing | CCHD | **CCHD**, LBCLF | 2010-2012 |
| Patterson Creek/WF 050301010 504 | Non: sedimentation | Trash | Restoration | Illegal dump site - Hellbender Bluff | Dump site clean-up | Clean-up | 1 | $1170.90 | ODNR Litter Grant | **CCPD**, LBCLF, Kent State University | 2010 |
| Patterson Creek/WF 050301010 504 | Non: sedimentation | Trash | Restoration | Illegal dump site - Leslie Road | Dump site clean-up | Clean-up | 1 | $200 | ODNR Litter Grant | **CCPD**, LBCLF, Kent State University | 2010 |
| Bieler | Non: | Trash | Restoration | Illegal dump | Dump site | Clean-up | 1 | $200 | Volunteers, | **LBCLF**, Scenic | 2010 |

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| Run/NF 050301010 610 | siltation | | | site - Grimms Bridge | clean-up | | | | ODOT allows us to put trash on our Adopt-A-Highway site | Rivers | |
| Leslie Run/NF 050301010 606 | Non: phosphorous, ammonia | Trash | Restoration | Illegal dump site - Jimtown Road | Dump site clean-up | Clean-up | 1 | $500 | Volunteers, ODOT allows us to put trash on our Adopt-A-Highway site | **LBCLF** | 2011 |
| Patterson Creek/WF 050301010 504 | Non: sedimentation | Trash | Restoration | Illegal dump site - McCormick Run Road | Dump site clean-up | Clean-up | 1 | $200 | Volunteers, ODOT allows us to put trash on our Adopt-A-Highway site | **LBCLF** | 2012-2014 |
| Leslie Run/NF 050301010 606 | Non: phosphorous, ammonia | Trash | Restoration | Illegal dump site - bridge along State Line Road | Dump site clean-up | Clean-up | 1 | $200 | Volunteers, ODOT allows us to put trash on our Adopt-A-Highway site | **LBCLF** | 2012-2014 |
| Little Bull Creek/NF 050301010 604 | In | Trash | Prevention | Illegal dump site - downstream of Rogers' Auction | Dump site clean-up | Clean-up | 1 | $200 | Volunteers, ODOT allows us to put trash on our Adopt-A-Highway site | **LBCLF** | 2012-2014 |
| Rough Run/NF 050301010 609 | In | Trash | Prevention | Illegal dump site - Sprucevale overlook at BCSP | Dump site clean-up | Clean-up | 1 | $200 | Volunteers, ODOT allows us to put trash on our Adopt-A-Highway site, ODNR litter cleanup grant | **BCSP**, LBCLF | 2012-2014 |
| Headwaters West Fork /WF 050301010 502 | Non: phosphorous | Nutrient loading and sedimentation | Restoration | Lack of riparian buffer | Streambank stabilization/ restoration | Linear feet | 1,000 | unknown | 319 grant, WRRSP | **LBCLF**, CSWCD, Guilford Lake State Park | 2013-2016 |
| Rough Run/NF | In | Erosion and sedimentation | Prevention | Lack of riparian area | Restore riparian area | Riparian restoration | 1 | Unknown | 319 grant, SWIF grant | **LBCLF**, CSWCD, Scenic | 2014-2015 |

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| 050301010 609 | | | | | along Picnic Area 1 at BCSP | | | | | Rivers, BCSP | |
| Rough Run/NF 050301010 609 | In | Erosion and sedimentation | Prevention | Washed away stream channel | Restore the stream channel | Stream channel restoration | 1 | Unknown | 319 grant, SWIF grant | **BCSP**, LBCLF, CSWCD, Scenic Rivers | 2014-2016 |
| **LOW PRIORITY** | | | | | | | | | | | |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Erosion and sedimentation | Prevention | Development in riparian areas | Establishment of riparian setbacks – dependent on success of educational efforts | Set of riparian setbacks | 1 | N/a | N/a | **LBCLF**, CC Engineers, townships, Cities and Villages | 2013-2016 |
| Headwaters Middle Fork/MF 050301010 402 | Non: phosphorous | Acid mine drainage | Research | Acid mine drainage | Research to ensure continual treatment of AMD by Egypt Road Wetlands | Monitoring event | 1 | $100 | ODNR MRM | **ODNR MRM**, LBCLF | 2011-2016 |
| Rough Run/NF 050301010 609 | In | Erosion and sedimentation | Prevention | Lack of riparian area | Restore riparian area along mill canal at BCSP | Riparian restoration | 1 | Unknown | 319 grant, SWIF grant | **LBCLF**, CSWCD, Scenic Rivers, BCSP | 2014-2015 |

Sewage and Septic Priorities for the Little Beaver Creek Watershed

| Stream Name/HUC | Attainment Status | Cause | Project Type | Sources | Action | Unit | Target | Cost | Funding Sources | Agencies Involved | Timeline |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **HIGH PRIORITY** | | | | | | | | | | | |
| All HUCs within Columbiana County | Varies | Nutrient Loading | Prevention and restoration | Failing septic systems | Repair or replace failing systems | Septic systems | 35 | $350,000 | Ohio EPA Water Pollution Control Loan Fund | **CCHD**, Community Action Agency of Columbiana County | 2011-2014 |
| Headwaters West Fork /WF 050301010 502 | Non: phosphorous | Nutrient Loading | Restoration | Failing septic systems in Winona | Install public sewage | Homes | 95 | $2.8 million | USDA Rural Development grants and loans, tap-in fees, CDBG Formula grant, CDBG BW Grant | **Columbiana County Engineer's Department**, Columbiana County Development Department | Completed September 2007, all homes connected as of 2010 |
| Longs Run/NF 050301010 601 | Non: phosphorous | Nutrient Loading | Restoration | Failing septic systems in Glenmoor/La Croft | Install public sewage | Homes | 435 | $9.8 million | ARC grant, CDBG Formula grant, Ohio Public Works grant, OPW Loan, USDA grant, USDA loan, ARRA grant | **Columbiana County Engineer's Department** | Completion by February 2011, tap-ins by spring 2011 |
| Headwaters Middle Fork/MF 050301010 402 | Non: phosphorous | Nutrient Loading | Restoration | Failing septic systems in Perry Township | Install public sewage | Homes | 26 | $200,000 | Perry Township Ohio Public Works allocation and tap-in fees | **Columbiana County Engineer's Department** | Bid out in Spring of 2011 |
| Headwaters Middle Fork/MF 050301010 402 | Non: phosphorous | Nutrient Loading | Restoration | Phosphorous loading from the Salem WWTP | WWTP upgrades | Pounds of phosphorous reduced per year | 1109,107 | Unknown | WRRSP or other loan or grant | **City of Salem,** OEPA | Unknown, as this matter is in court |
| Rough Run/NF 050301010 609 | In | Nutrient Loading | Prevention | Failing septic systems at Lake Tomahawk | Create a septic system reminder registry for the Lake Tomahawk community | Reminder registry | 1 | $2,925 | Ohio Environmental Education Fund | **Lake Tomahawk Property Owners Association**, LBCLF, CCHD | 2010-2013 |
| Cold | In | Nutrient | Prevention | Failing sewage | Install public | Public | 4 | $2 | Each entity | **Columbiana** | Expected to go |

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| Run/WF 050301010 501 | | Loading | | treatment systems - facilities on County Home Road | sewage | facilities - Tobin Center, Robert Bycroft, County Jail, County Dog Pound | | million | helping to fund, Ohio Public Works loan through CC Commissioners, WPCLF | **County Engineer's Department** | out to bid in 2011 as long as WPCLF loan is received |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Nutrient Loading | Prevention | Unmaintained septic systems | Septic system fact sheet distribution | Sheets | 50 per year | printing | CCHD | **CCHD**, LBCLF | 2010-2012 |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Nutrient Loading and other sources of contamin ation | Prevention | Private Well Water | Homeowner Education | Educational Workshops | 1 per year | $1,200 | Ohio Environmental Education Fund | **LBCLF**, CCHD | 2012-2015 |
| Stone Mill Run/MF 050301010 403 | In | Nutrient Loading | Prevention | Combined Sewage Overflow | Separation of Storm Drains and Sewerage System | CSO separations | 3 | $688,144 | ARRA, EPA | **Village of Lisbon** | 2010-2011 |
| Brush Creek/WF 050301010 503 | Non: ammonia, sedimentation, fecal coliform | Nutrient Loading | Restoration | Failing septic systems | Repair or replace home septic systems | Septic systems | 10 | $100,000 | SWIF grant, foundation grants, private landowners | **CCHD,** LBCLF | 2013-2015 |
| Leslie Run/NF 050301010 606 | Non: phosphorous, ammonia | Nutrient loading | Restoration | Failing septic systems | Repair or replace home septic systems | Septic systems | 7 | $70,000 | SWIF grant, foundation grants, private landowners | **CCHD,** LBCLF | 2013-2015 |
| Headwaters West Fork /WF 050301010 502 | Non: phosphorous | Sedimen tation | Restoration | Failing septic systems | Repair or replace home septic systems | Septic systems | 1 | $10,000 | SWIF grant, foundation grants, private landowners | **CCHD,** LBCLF | 2013-2015 |
| East Branch/MF 050301010 401 | Non: phosphorous, fecal coliform | Nutrient loading | Restoration | Phosphorous loading from Leetonia and Washingtonv ille WWTPs | WWTP upgrades | Pounds of phosphorous reduced per year | 3,131 | Unknown | WRRSP or other loan or grant | **Village of Leetonia, Village of Washingtonville** OEPA | 2013-2015 |
| Headwaters West Fork | Non: phosphorous | Nutrient loading | Restoration | Phosphorous loading from | WWTP upgrade | Pounds of phosphorous | 948 | Unknown | WRRSP or other loan or | **Guilford Lake Homeowners** | 2015-2016 |

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| /WF 050301010 502 | | | | the Guilford Lake WWWTP | | reduced per year | | | grant | **Association,** Guilford Lake State Park, OEPA | |
| Honey Creek/NF 050301010 602 | Non: phosphorous, ammonia | Nutrient Loading | Restoration | Failing septic systems | Repair or replace failing septic systems | Systems repaired or replaced | 5 | $50,000 | WRRSP, SWIF grant, or other grant | **MCHD,** LBCLF, OEPA | 2015-2016 |
| Leslie Run/NF 050301010 606 | Non: phosphorous, ammonia | Nutrient loading | Restoration | Failing septic systems | Repair or replace failing septic systems | Systems repaired or replaced | 7 | $70,000 | WRRSP, SWIF grant, or other grant | **CCHD,** LBCLF, OEPA | 2015-2016 |
| Honey Creek/NF 050301010 602 | Non: phosphorous, ammonia | Nutrient Loading | Restoration | Phosphorous loading from the New Middleton WWTP | WWTP upgrade | Pounds of phosphorous reduced per year | 1,389 | Unknown | WRRSP or other loan or grant | **Village of New Middleton,** OEPA | 2015-2016 |
| Honey Creek/NF 050301010 602 | Non: phosphorous, ammonia | Nutrient Loading | Restoration | Ammonia loading from the New Middleton WWTP | WWTP upgrade | Pounds of ammonia reduced per year | 1,532 | Unknown | WRRSP or other loan or grant | **Village of New Middleton,** OEPA | 2015-2016 |
| Leslie Run/NF 050301010 606 | Non: phosphorous, ammonia | Nutrient loading | Restoration | Phosphorous loading from the East Palestine WWTP | WWTP upgrade | Pounds of phosphorous reduced per year | 1,984 | Unknown | WRRSP or other loan or grant | **Village of East Palestine,** OEPA | 2015-2016 |
| Leslie Run/NF 050301010 606 | Non: phosphorous, ammonia | Nutrient loading | Restoration | Ammonia loading from the East Palestine WWTP | WWTP upgrade | Pounds of ammonia reduced per year | 7,110 | Unknown | WRRSP or other loan or grant | **Village of East Palestine,** OEPA | 2015-2016 |
| **MEDIUM PRIORITY** | | | | | | | | | | | |
| Patterson Creek/WF 050301010 504 | Non: sedimentation | Nutrient Loading | Restoration | Failing septic systems | Repair or replace failing systems | Septic systems | 5 | $50,000 | OEPA SWIF grant or 319 grant | **LBCLF**, CCHD | 2012-2014 |
| Stone Mill Run/MF 050301010 403 | In | Nutrient Loading | Prevention | Combined Sewage Overflow | Separation of Storm Drains and Sewerage System | CSO separations if initial separations do no prove sufficient | 5 | unknown | WRRSP or other loan or grant | **Village of Lisbon** | 2012-2016 |

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| Little Bull Creek/NF 050301010 604 | In | Nutrient Loading | Prevention | Rogers Septic System Hotspot | Repair or replace septic systems or sewerage | Remedied hotspot | 1 | Dependent on action taken | WRRSP or other loan or grant | **Village of Rogers**, CCHD Columbiana County Engineers | 2013-2016 |
| Headwaters North Fork /NF 050301010 603 | In | Nutrient Loading | Prevention | New Springfield Septic System Hotspot | Repair or replace septic systems or sewerage | Remedied hotspot | 1 | Dependent on action taken | WRRSP or other loan or grant | **Village of New Springfield,** Mahoning County Engineers | 2013-2016 |
| Honey Creek/NF 050301010 602 | Non: phosphorous, ammonia | Nutrient Loading | Restoration | New Middletown Septic System Hotspot | Repair or replace septic systems | Systems repaired or replaced | 10 | $100,000 | WRRSP or other loan or grant | **Village of New Middletown**, Mahoning County Engineers | 2014-2016 |

Stormwater Priorities for the Little Beaver Creek Watershed

| Stream Name/HUC | Attainment Status | Cause | Project Type | Sources | Action | Unit | Target | Cost | Funding Sources | Agencies Involved | Timeline |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **HIGH PRIORITY** | | | | | | | | | | | |
| Headwaters Middle Fork/MF 050301010402 Stone Mill Run/MF 050301010403 | Headwaters: Non: phosphorous Stone Mill Run: In | Storm-water | Restoration | Impervious surfaces | Develop a Phase II stormwater plan | Plan | 1 | Unknown | City of Salem | **City of Salem**, Howels and Baird | 2010-2012 |
| Bull Creek/NF 050301010605 | In | Storm-water | Restoration | Impervious surfaces | Develop a Phase II stormwater plan | Plan | 1 | Unknown | City of Columbiana | **City of Columbiana**, Howels and Baird | 2010-2012 |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Storm-water | Prevention | Impervious surfaces | Rain garden, rain barrel, and conservation landscaping fact sheet distribution | Sheets | 50 per year | Printing | CCHD | **CCHD**, LBCLF | 2010-2012 |
| East Branch/MF 050301010401 | Non: phosphorous, fecal coliform | Storm-water and mine drainage | Prevention | Unreclaimed deep mine and impervious surfaces | Divert and possible treat mine water and stormwater | Diversion | 1 | Unknown | ODNR MRM | **ODNR MRM**, Village of Leetonia, LBCLF | 2010-2012 |
| East Branch/MF 050301010401 | Non: phosphorous, fecal coliform | Storm-water | Prevention | Impervious surfaces and unreclaimed deep mine | Create wetlands on the Cherry Valley Coke Oven Property for stormwater retention | Wetland | 1 | Unknown | 319 grant, SWIF grant, WRRSP | **ODNR MRM**, Village of Leetonia, SWCD, | 2011-2014 |
| Headwaters Middle Fork/MF | Non: phosphorous | Storm-water | Restoration | Commercial and/or residential | Stormwater control measures | Acres managed | 150 commerc-ial or 240 residential | Unknown | Private businesses, 319 grant, SWIF | **City of Salem,** Contracted Engineer, | 2015-2016 |

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| 050301010 402 | | | | | such as retention basins and filter strips | | | | grant, WRRSP, foundation grants | LBCLF, CSWCD, landowners | |
| Honey Creek/NF 050301010 602 | Non: phosphorous, ammonia | Storm-water | Restoration | Commercial and/or residential | Stormwater control measures such as retention basins and filter strips | Acres managed | 130 commerc-ial or 210 residential | Unknown | Private businesses, 319 grant, SWIF grant, WRRSP, foundation grants | **Landowners and businesses,** LBCLF, MSWCD, Village of New Middleton | 2015-2016 |
| All 05030101-090, 05030101-080, 05030101-070 | Varies | Sedim-entation and erosion | Prevention | Flooding and erosion in road ditches | Install retention ponds at end of road ditches | Retention ponds | 5 | unknown | 319, WRRSP | **LBCLF**, Townships, CSWCD | 2011-2015 |
| Headwaters Middle Fork/MF 050301010 402 | Non: phosphorous | Storm-water | Restoration | Impervious surfaces | Install rain gardens | Rain garden | 1 | $2,500 | OEEF, grant, SWIF grant | **LBCLF**, CSWCD | 2011-2014 |
| Stone Mill Run/MF 050301010 403 | In | Storm-water | Prevention | Impervious surfaces | Install rain gardens | Rain garden | 1 | $2,500 | OEEF, grant, SWIF grant | **LBCLF**, Kent State University, CSWCD | 2011-2014 |
| Rough Run/NF 050301010 609 | In | Storm-water | Prevention | Impervious surfaces | Install rain gardens | Rain garden | 1 | $2,500 | OEEF, grant, SWIF grant | **LBCLF**, BCWEC, CSWCD | 2011-2014 |
| Little Bull Creek/NF 050301010 604 | In | Storm-water | Prevention | Impervious surfaces | Install rain gardens | Rain garden | 1 | $2,500 | OEEF, grant, SWIF grant | **LBCLF**, Fairfield Township, CSWCD | 2011-2014 |
| Headwaters Middle Fork/MF 050301010 402 | Non: phosphorous | Storm-water | Restoration | Impervious surfaces | Install a stormwater demonstration project in the City of Salem | Demonstr-ation site | 1 | Unknown | 319 grant, SWIF grant, WRRSP | **LBCLF**, City of Salem, CSWCD | 2013-2014 |
| **MEDIUM PRIORITY** | | | | | | | | | | | |

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| All 05030101-090, 05030101-080, 05030101-070 | Varies | Storm-water and flooding | Restoration | Culverts where railroad tressels used to be | Removal | Tressels | 1 | Unknown | 319 grant, WRRSP | **LBCLF**, CCPD, CSWCD | 2014-2016 |