UPPER SCIOTO RIVER WATERSHED PROJECT

Watershed Action Plan

Contact Information

The sponsoring organization for the
Upper Scioto River Watershed Project is the
Delaware Soil and Water Conservation District
557 Sunbury Road
Delaware, Ohio 43015
Phone: (740) 368-1921 ext. 4
Fax: (740) 369-8321
www.delawareswcd.org

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Acknowledgements

Development of the Upper Scioto River Watershed Project Watershed Action Plan was accomplished through the dedication and commitment of many stakeholders in a community-based effort to involve as many water quality partners as possible. As in all successful water quality projects, no single individual or organization can be solely credited with the development of the watershed action plan. So many individuals and organizations have provided information and guidance that in is not possible to list everyone. However, the Upper Scioto River Watershed Project would like to recognize those special groups and organizations that have been closely involved in supporting and advising the project over time.

Allen Soil and Water Conservation District
Auglaize Soil and Water Conservation District
Columbus Division of Power and Water
Crawford Soil and Water Conservation District
Delaware General Health District
Delaware Soil and Water Conservation District
Hardin Soil and Water Conservation District
Logan Soil and Water Conservation District
Marion County General Health District
Marion Soil and Water Conservation District
Ohio Department of Natural Resources
Ohio Environmental Protection Agency
Ohio Farm Bureau
Ohio State University Extension
Scioto Conservancy District
Union Soil and Water Conservation District
Wyandot Soil and Water Conservation District
Upper Scioto Drainage and Conservancy District
Upper Scioto River Watershed Project Advisory Committee
Upper Scioto River Watershed Project Area Assistance Team
United States Geological Survey
United States Department of Agriculture

Introduction

Upper Scioto River Watershed Project Action Plan

The watershed action plan is an itemization of the problems, priorities and activities the Upper Scioto River Watershed Project group would like to address within the watershed area using a process called the watershed approach. The watershed approach emphasizes identifying and prioritizing problem areas and developing comprehensive, integrated solutions involving a wide variety of stakeholders.

Purpose and Goal

The purpose of this plan is to reduce water resource impairments in all waterbodies within the Upper Scioto River Watershed Project area that do not currently meet water quality standards. The plan also identifies areas that are meeting standards and specifies how to protect these areas. In some instances, issues of local concern have been addressed in order to build public support. However, the main goal of this plan is to restore and maintain the chemical, physical and biological integrity of all waterbodies in the watershed including streams, constructed channels, wetlands, lakes, ponds, and groundwater. Attainment of the goals outlined in this plan are a part of a larger state goal to reach 80% aquatic life use attainment for Ohio waters by 2010.

Project Background

In December 2002 Delaware Soil and Water Conservation District agreed to house the Upper Scioto River Watershed Coordinator 319 Ohio EPA/DNR position. Nearly two years of this watershed coordinator grant had previously been carried out and supported by the Scioto River Valley Federation. The main position goal of creating a watershed action plan in the first two years of the coordinator grant was reset in January 2003. The position transfer to Delaware Soil and Water Conservation District gave that body the authority to oversee all actions taken by the watershed coordinator.

Chapter 1
Defining the Watershed

Introduction

This chapter provides information useful to understand the scope of the project area in terms of its size, administrative boundaries and jurisdictions, demographics, geographic surface drainage basin areas, and other general watershed information pertaining to previous and current watershed protection and management activities including previous planning documents.

Watershed Delineation

The Upper Scioto River Watershed Project covers approximately 718 square miles and includes parts of nine counties. Hardin, Marion, Union, and Delaware counties comprise nearly 88 percent of the project area. Allen, Auglaize, Logan, Wyandot, and Crawford counties comprise the remaining 12 percent. Kenton and Marion are the two largest cities in the project area. There are parts or all of 46 townships, 16 incorporated cities and villages, and numerous unincorporated populated areas in the watershed. Appendix 1A lists all of the municipalities and incorporated areas within the watershed.

Each of the counties in the watershed has a Soil and Water Conservation District, Natural Resources Conservation Service Field Office, and Farm Services Agency office. The Regional Connections Planning Program includes Delaware and Union counties. The Upper Scioto Drainage and Conservancy District exists for the Scioto River mainstem and Cottonwood Ditch in Hardin County. The Scioto Conservancy District in Marion County is also active in this watershed. The cities of Marion in Marion County and Bucyrus in Crawford County are both partially in this watershed project area and are in the process of becoming a part of the NPDES Phase II stormwater permitted system in 2006. The Floyd Browne Group of Delaware, Ohio has contracted to prepare and coordinate the stormwater management plan for the City of Marion. The six minimum control measures of this Appendix 7 community are proposed to be implemented by the Floyd Browne Group. C.T. Consultants of Willoughby, Ohio is advising the City of Bucyrus on their stormwater plan (SWMP). Neither Marion nor Bucyrus have submitted their notice of intent (NOI) letter to apply for a stormwater management permit or their stormwater management plans to OEPA at this time. The Village of Shawnee Hills in Delaware County has developed a stormwater management plan. The NOI and SWMP were submitted to Ohio EPA in March 2003.

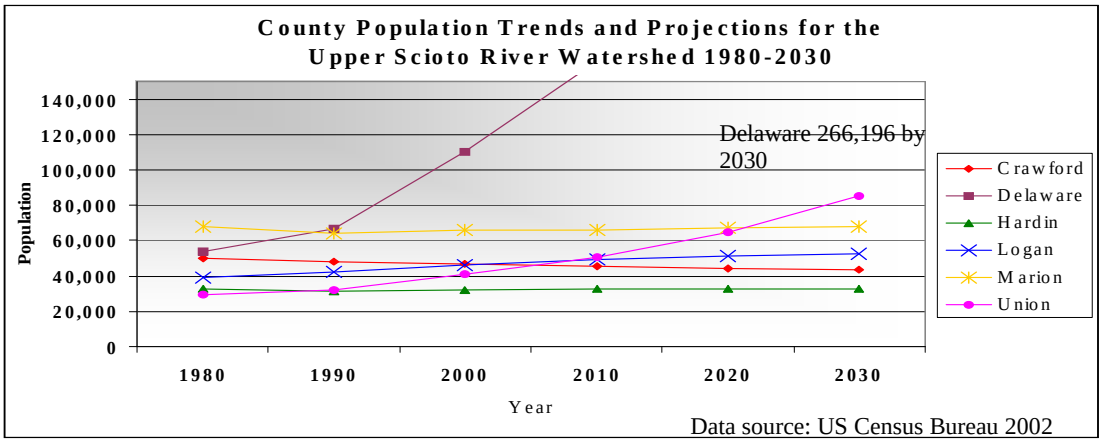
Extensive information about current and previous watershed planning documents and water quality management efforts can be found in this chapter and in Chapter 3 *Watershed Inventory*.

Demographics

The population of this watershed is well distributed through rural townships, small villages, and a couple of cities. An estimated watershed population of 86,367 people has been determined using the following method of assessing Census Bureau 2000 data of government units: Populations of townships and/or cities and villages that lie entirely within the watershed boundary are counted in whole. The areas that lie mostly within the watershed boundary are also counted in whole. Only half of the populations of townships that are partially within the watershed are counted. If a part of a township lies in the watershed but a village within the township is outside of the watershed, half of the population of the township minus the village population is taken. This calculation assumes that an unincorporated township has a population distributed equally when only half a township population is taken. Of the 46 townships that are part of this watershed area only 13 are entirely or mostly within the watershed boundaries (that is with population counted 100%). Many of the remaining townships have only minor land area within the watershed. An example of this approximation showing Marion County is presented in Appendix 3D. Geo-referenced population data would greatly improve the accuracy of this measurement.

Population growth: This watershed has a generally low population growth trend and projection. Just outside of the watershed boundary in Delaware and Union counties lays areas of very rapid urban/sub-urban development. The Delaware and Union County areas within the watershed are of the highest population growth. The most southern part of Delaware County in the watershed most likely has the highest growth rate due to the movement from Columbus. The most southern part of Union County has growth occurring from the Marysville area. Hardin and Marion counties population trends and projections are near stagnant, and Crawford County has been losing population for several years. County population trends and projections from 2002 Census Bureau data can be seen in Figure 1-1. This figure and other data presented in this section do not contain information about Allen, Auglaize, and Wyandot counties. This is because those counties have very little area in the watershed which, in all three counties, is entirely in unincorporated townships of agricultural land use with some farm houses.

Figure 1-1.



Dudley Township, Hardin County: A community of Amish is centered in this township. About 120 to130 Amish families with about 6-7 people per family or approximately 720 to 810 individuals live in Hardin County. Because of this communities more traditional manners, some water resource concerns may exist. The Ohio State University Extension has had some success in this region in working with Amish communities to promote environmental education environmental safety (Hoorman, 2003).

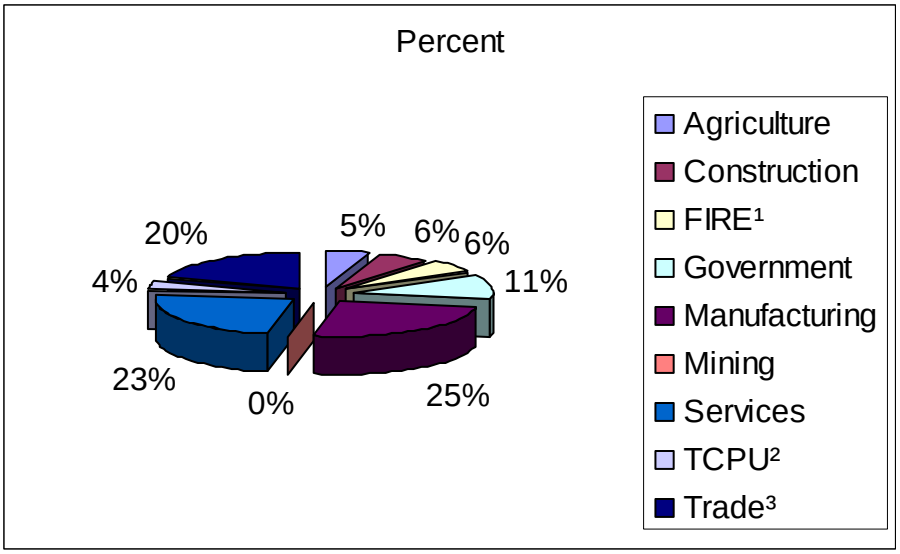
Employment: While agriculture is the largest land use of the watershed it is a very small part of the local employment. Percentages of employment by sector for the six prominent counties in the watershed (Table 1-1) and a pie chart of those counties' averages (Figure 1-2) indicate manufacturing and services are the largest employment contributors. The 40% for Union County's manufacturing is inflated due to industry for this watershed because the Honda Motor Company near Marysville is not within the watershed area. Logan County's percentage of employment for the manufacturing sector is most likely also inflated for the watershed due to its being mostly rural in the Upper Scioto River Watershed Project area.

Table 1-1. Percent (%) employment by sector

Sector	Crawford	Delaware	Hardin	Logan	Marion	Union	Average
Agriculture	6	3	3	6	3	7	4.66
Construction	5	8	7	5	6	5	6
FIRE [1]	6	12	5	4	4	3	5.66
Government	10	10	7	9	17	11	10.66
Manufacturing	29	10	26	25	22	40	25.33
Mining	<1	<1	<1	0	<1	0	0
Services	22	28	24	26	21	16	22.83
TCPU [2]	3	2	4	5	7	4	4.16
Trade [3]	19	25	24	19	20	13	20

Employment includes full-time and part-time workers and the self-employed in all sectors, including agriculture
[1] FIRE: Finance, Insurance, Real Estate; [2] TCPU: Transportation, Communications, Public Utilities; [3] Trade: includes wholesale and retail trade Data source: US Census Bureau 2002

Figure 1-2. Employment by sector average of watershed (6 counties) pie chart



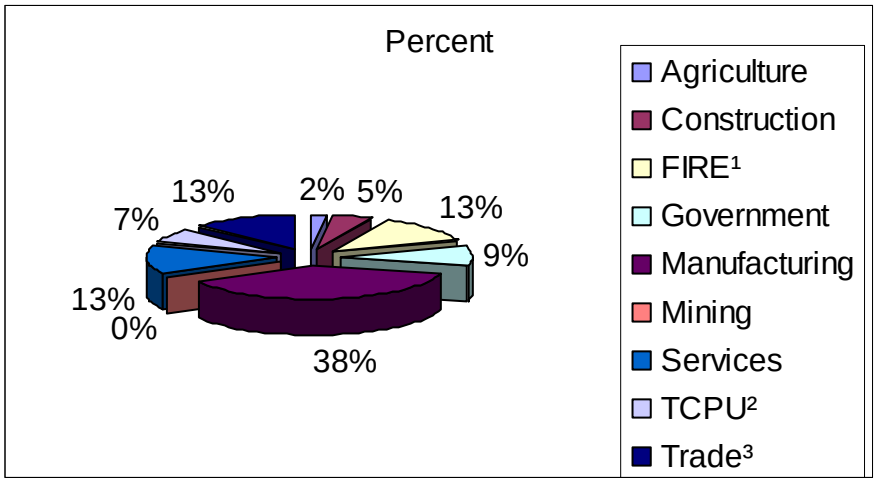
Industry: The industry sectors percentages of the value added economy indicates greater manufacturing and transportation, communication, and public utilities than in the employment industry sector percentages (Table 1-2 and Figure 1-3). Value added is a measure of an industries employment and proprietary compensations, property incomes, and taxes. Similar to the employment figures above, the manufacturing percentage is inflated in Logan and Union counties for the Upper Scioto River Watershed Project area.

Table 1-2. Percent (%) of industry sectors of the value added economy

Sector	Crawford	Delaware	Hardin	Logan	Marion	Union	Average
Agriculture	2	1	1	2	1	2	1.5
Construction	5	7	5	4	4	2	4.5
FIRE [1]	17	22	13	11	13	5	13.5
Government	9	9	5	7	15	6	8.5
Manufacturing	38	15	32	48	28	69	38.33333
Mining	0	1	0	0	0	0	0.166667
Services	13	22	15	12	14	6	13.66667
TCPU [2]	3	2	14	5	12	3	6.5
Trade [3]	12	21	14	11	13	6	12.83333

Value added is a broad measure of income that includes employee compensation (wages, salaries, benefits), proprietary income (self-employment), other property income (interest, rent, royalties, dividends profits) and indirect business taxes (excise and sales taxes).
[1] FIRE: Finance, Insurance, Real Estate; [2] TCPU: Transportation, Communications, Public Utilities; [3] Trade: includes wholesale and retail trade Data source: US Census Bureau 2002

Figure 1-3. Value added by sector average of watershed (6 counties) pie chart



Expected residential/commercial development: Information pertaining to expected developments has not been collected.

Expected road, highway, and bridge construction: Only one federal highway, US 23, crosses the watershed for 6.2 miles in the upper Little Scioto River subwatershed. All roads, except for some municipal, are drawn on the specific subwatershed maps and most are labeled (Map 3-12).

Geographic Locators

In general, watersheds can be identified using Hydrologic Unit Codes (HUC), which were created through the Federal Information Processing Standards. Major watersheds, for example, the Ohio Region, are assigned a 2-digit identification number. They may then be subdivided into successively smaller hydrologic units by adding more digits to the original code number. The area of this watershed project occupies much of the northwestern portion of the Upper Scioto River watershed (HUC-05060001), which is located in central and north-central Ohio (Map 1). The project area can be defined as the Scioto River watershed north of the O'Shaughnessy Dam in southern Delaware County with the exclusion of the Mill Creek and Bokes Creek subwatersheds in eastern Union and western Delaware counties. The watershed project spans approximately 718 square miles and is comprised of twenty-nine 14-digit HUC subwatersheds (see color Map 2). The project area has been divided further into 11 subwatersheds to simplify planning and for organizational management (see Map 2 showing the subwatershed outlines in green). The 11 subwatersheds defined for planning and management are a combination of two or more 14 digit HUC watersheds and do not in and of themselves have an assigned HUC. These 11 subwatersheds are listed in Table 1-3 including their respective identification numbers and descriptive names, their associated 14-digit HUCs, and their constituent counties. Throughout this document each sub-watershed is referred to by the number and/or descriptive name as found in Table 1-3.

Table 1-3. 14-digit HUCs of the subwatersheds

Subwatershed # / name	14-digit HUC #(05061001******)	Acres	Counties
1 - Headwaters / Cottonwood Ditch	010010, 010020	61,649	Allen, Auglaize, Hardin
2 - Upstream Kenton	010030, 010040, 010050	40,564	Hardin, Logan
3 - Downstream Kenton	030010, 030020, 030030	40,457	Hardin, Logan
4 - LaRue/Big Island	030040, 030050, 030060	51,861	Hardin, Logan, Marion
5 - Rush Creek	020010, 020020, 020030, 020040	67,377	Login, Union, Marion
6 - Upper Little Scioto	040010, 040020	45,744	Crawford, Wyandot, Marion
7 - Lower Little Scioto	040030, 040040	26,562	Marion
8 - Downstream Little Scioto	050010, 050020, 050030, 050040, 050050	50,899	Marion, Union, Delaware
9 - Fulton Creek area	050060, 050070	38,699	Union, Delaware
10 - Bokes/Mill Confluence	060020	15,700	Delaware
11 - O'Shaughnessy Area	080010, 080020	19,330	Delaware, Union

A portion of nine different counties fall within the project area. Table 1-4 provides an account of each county's contribution in acreage and square miles to the project area, as well as the percentage of the county's area that is occupied by the watershed project. Maps detailing streams, roads, and other features of these subwatersheds are located in the appendices of this document (Maps 3-12).

Table 1-4. County and total watershed area breakdown

County	Acres in watershed	Sq. miles in watershed	% of watershed in county	% of county in watershed
Allan	2,849	4.45	0.62	1.12
Auglaize	10,163	15.88	2.21	3.99
Crawford	17,417	27.21	3.79	6.95
Delaware	59,431	92.86	12.91	19.62
Hardin	151,264	236.35	32.89	50.54
Logan	23,597	36.87	5.13	7.81
Marion	120,577	188.40	26.21	47.10
Union	73,341	114.60	15.94	26.98
Wyandot	1,326	2.07	0.29	0.52
Total	459,965	718.70	---	---

General Watershed Information

This section describes previous and current watershed protection and management activities, including previous planning documents.

Previous Efforts to Meet Water Quality Standards

OEPA Sawyer-Ludwig Park Sediment Removal Action This project was completed in 2006 by Ohio EPA to remove lead and petroleum contamination from about 2550 linear feet of an unnamed tributary to the Little Scioto River running through Sawyer-Ludwig Park on the west side of Marion.

OEPA. 2000. Biological and Water Quality Study of Marion Area Streams 1998, OEPA Technical Report MAS/1999-12-6. Division of Surface Water.
The Marion area study included several streams in the Upper Scioto River Watershed Project area. Streams evaluated from the upper Scioto watershed included the Scioto River (Green Camp to Prospect), Little Scioto River, Rockswale Ditch, North Rockswale Ditch, Columbia Ditch, Rock Fork, Honey Creek, Goose Creek, and one unnamed tributary. The survey created a summary of biological and water/stream sediment quality. Specific objectives of the evaluation listed in the report are as follows: 1) determine the extent of hazardous chemical constituents in sediment and surface water of Marion area streams, 2) establish the present biological use condition in the above noted streams, 3) identify the relative significance of hazardous waste contaminants on any demonstrated impairment of biological communities and potential risks to public health, 4) determine the attainment status of the current aquatic life use designations for streams within the study area, and establish the appropriate use designations and attainment status for undesignated streams, and 5) follow-up on conditions documented in previous Ohio EPA studies. A comprehensive list and brief description of facilities contributing to pollutant loadings is included in this study. The study states that of the 62.6 miles of streams evaluated only 10.9 miles were in full attainment of aquatic life uses. The study reported that the biological integrity of 67.6 percent of the streams evaluated were of poor and very poor quality.

City of Columbus (ESAC) 1999 Watershed Impacts from Large Scale Animal Feed Operations The Buckeye Egg Farm Findings and Recommendations Executive Summary
In March 1998, the Franklin County Commissioners requested that the City of Columbus Environmental Science Advisory Committee (EASC) to evaluate whether the practice of applying high phosphorus content chicken manure to agricultural fields in the Upper Scioto River watershed may be contributing to the apparent increase in nutrient concentrations in the Griggs and O'Shaughnessy Reservoirs. The report of the ESAC investigation includes major findings and recommendations of the Committee.

OEPA. 1997. Biological and Water Quality Study of the Upper Scioto River Basin Delaware, Franklin, Hardin, Marion, and Wyandot Counties, OEPA Technical Report Number MAS/1996-12-13. Division of Surface Water
This study of the upper Scioto River consisted of the Scioto River mainstem from its headwaters near Roundhead to downstream from O'Shaughnessy Reservoir near Interstate 270. The study included the tributaries of Cottonwood Ditch, Taylor Creek,

Silver Creek, Panther Creek, and Wildcat Creek. Specific objectives of the study as listed in the report are as follows: 1) describe or quantify the physical habitat, surface water and sediment quality, and the biological integrity of the Upper Scioto River Study area, 2) assess potential impacts to water quality and biological integrity associated with the major permitted dischargers Kenton WWTP and Occidental Chemical Corporation, 3) assess potential impacts to water quality and biological intensity associates with the minor dischargers Rockwell International, Alger WWTP, and McGuffey WWTP, 4) evaluate the city of Kenton's CSOs, 5) identify and evaluate non-point sources of pollution, and assess habitat impacts within the jurisdiction of the Upper Scioto Conservancy District, 6) determine attainment status of aquatic life use and non-aquatic life use designations, and recommend changes where appropriate, and 7) compare results of this survey with previous surveys to assess changes in water quality and biological integrity. A trend assessment shows that most locations throughout the surveyed area met applicable biological criteria and aquatic life use designations. Exceptions were in channelized areas of the upper 20 miles of the Scioto River mainstem and downstream from the Kenton WWTP outfall and downstream from the confluence of the Little Scioto River in the Prospect dam pool. Panther Creek and Wildcat Creek were impacted by discharge from unsewered communities.

<u>OEPA. 1994. Biological, Sediment and Water Quality Study of the Little Scioto River, Marion, Ohio Marion County, OEPA Technical Report EAS/1994-4-3. Division of Surface Water</u>
This study found high amounts of pollution in the Little Scioto River and some of its tributaries in the city of Marion area. Seventeen polycyclic aromatic hydrocarbons (PAHs), five of which are possible human carcinogens, were found in the water and/or sediments of this study area. Stream sediments are described as highly contaminated with PAHs, metals, and cyanide. High surface water loadings of ammonia-N and oxygen demanding wastes from sewage overflows and impaired fish/macroinvertebrate communities are also documented in this study. The Scioto River mainstem just downstream of the Little Scioto River's mouth is documented to be impacted by the Little Scioto River's contaminates as well.

<u>OEPA. 1992. Bottom Sediment Evaluation, Little Scioto River Marion, Ohio. Division of Water Quality Planning and Assessment Ecological Assessment Section</u>
This publication documents the contaminated stream sediments that are discussed in the 1994 Little Scioto study summarized above.

<u>Ohio State University 1992. Winter Quarter. A Resource Assessment of the Upper Scioto River Watershed</u>
This 159 page watershed assessment by OSU students submitted to Drs. John Disinger and James Dowdy includes a history, watershed inventory of natural resources and pollution, demographics, economics, utilities and public services, transportation, and land use and includes watershed recommendations.

USDA. 1990. Flood Plain Management Study - Fulton Creek, Delaware and Union Counties Ohio. Soil Conservation Service.
The Fulton Creek flood plain study was prepared as a result of a Joint Coordination Agreement between the Soil Conservation Service (Natural Resources Conservation Service) and the Ohio Department of Natural Resources for the purpose of conducting flood plain management studies (FPMS). The study provides a description of the area, natural values, flood plain problems, existing flood plain management, flood plain management alternatives, floodway, and various appendices showing flood hazard areas on photomosaics and flood profiles and other data.

USDA. 1988. Flood Plain Management Study- Upper Scioto River Hardin County Ohio. Soil Conservation Service.
The upper Scioto River flood plain study was prepared as a result of a Joint Coordination Agreement between the Soil Conservation Service (Natural Resources Conservation Service) and the Ohio Department of Natural Resources for the purpose of conducting flood plain management studies (FPMS). The study provides a description of the area, natural values, flood plain problems, existing flood plain management, flood plain management alternatives, floodway, and various appendices showing flood hazard areas on photomosaics and flood profiles and other data. These data indicate clearing and snagging of vegetation debris as the only alternative with a benefit to cost ratio greater than one.

ODNR. 1977. Central Ohio Water Plan. Division of Water.
This plan was designed to provide communities in central Ohio area with alternatives for meeting future water supply needs. The plan was prepared as one of five regional plans for the state following a 1967 recommendation by the Ohio Water Commission. An extensive amount of information similar to this watershed inventory is compiled for a much larger area including watersheds of the Scioto River. Several descriptive maps are included.

ODNR. 1963. Water Inventory of the Scioto River Basin. Division of Water, Report No. 17
This report inventories water resources of the Scioto River Basin and presents conclusions, a summary, and recommendations for managing the states water supplies public consumption and recreational uses and addresses flood related concerns. The report acknowledges Federal and State responsibilities for long-range planning in cooperation with local agencies.

Current Efforts to Meet Water Quality Standards

In addition to this Upper Scioto River Watershed Project there are efforts to help meet water quality standards from such agencies as the Ohio Department of Natural Resources, USDA-Natural Resources Conservation Service, Heart of Ohio Resource Conservation and Development, Soil and Water Conservation Districts, Ohio Environmental Protection Agency, and U.S. Environmental Protection Agency, City of Columbus, Division of Water, U.S. Geological Survey, various non-profit citizens groups, such as the Scioto River Valley Federation, and local high school biology departments. The Bokes/Mill Creek Watershed Partnership has created a watershed action plan for two large tributaries that join the Scioto River within this watershed project area. While there

are two conservancy districts in this project area focusing on drainage improvements of the Scioto River mainstem (in Hardin and Marion counties) their actions do not attempt to meet Ohio EPA water quality standards.

Ohio Environmental Protection Agency; Total Maximum Daily Load for the Upper Scioto River: The Upper Scioto River Watershed Project's subwatersheds 1, 2, 3, and 5 are listed on the Ohio EPA's 303(d) list to have a Total Maximum Daily Load (TMDL) report created. Field work for the TMDL is scheduled to begin in 2009 with a report due by 2011.

The TMDL processes use water and sediment chemistry, physical measurements, and biological / habitat indicators to assess water resource quality. These assessments allow Ohio EPA to determine which reaches of streams do not meet water quality standards, and what the causes and sources of the impairments are. Quantitative pollutant reduction from point and non-point sources will be allocated necessary to meet water quality standards. These are actual values of pollutes or physical measurement a stream must meet to be considered healthy. TMDL process uses water quality models to take the multiple sources into consideration and also to determine reduction scenarios utilizing various conservation practices and changes to surface water discharging permits.

TMDL projects also aim to include a high degree of stakeholder input to determine the most effective and practical (solutions) manners of meeting the reduction targets and habitat improvements. This process is very similar to watershed action planning process currently underway for the Upper Scioto River Watershed Project. Because of this, it seems the most beneficial outcomes for the TMDL will transpire if it works in accord with the Upper Scioto River Watershed Project.

Scioto River Valley Federation: This a non-profit group based in Delaware County with the mission statement, "To preserve and protect the Scioto River for future generations." This group has sponsored various water quality improvement projects including part of a stream restoration project on the Bokes Creek watershed and this watershed action planning process.

United States Environmental Protection Agency, Little Scioto River Cleanup: The U.S. EPA is carrying out a cleanup of North Rockswale Ditch and the Little Scioto River from about 800 feet upstream of North Rockswale Ditch's confluence to its mouth. This cleanup is removing creosote and other oil products from the stream channel sediments in this reach (Figure 1-4). The process includes removing stream sediment and restoring the channel with packed clay. The project is planned to remediate the downstream half mile of North Rockswale Ditch and about 3.5 miles of the Little Scioto River downstream. All of North

Figure 1-4. Oily stream sediments from the river bed being mixed and dug out of the channel.

Rockswale Ditch and the first 1.25 miles of the Little Scioto were cleaned in 2002; however funding issues have hampered the project's field work.
The project is currently underway for the summer of 2006 (Durno, 2006)

Sandusky Plains Environmental Education Center at Elgin High School, Marion County in coordination with collaborating partners operates an education center and outdoor laboratory which conducts water quality studies on Glade Run, a direct tributary to the Scioto mainstem.

Heart of Ohio Resource Conservation and Development (RC&D) seeks to address natural resource conservation issues including land management, water quality, farmland protection, habitat degradation/loss and other similar issues in Delaware and Marion counties in the Upper Scioto River Watershed Project area. The RC&D has a vision to see a sustainable, regional community with open spaces, clean water and air, and natural habitats in balance with a viable mixed economy that includes agriculture, commerce, industry, and tourism. The RC&D is developing an area plan which includes such goals and objectives as the control of erosion and sedimentation, protection of water quality resources, water management improvement, conservation and waste minimalization, riparian corridor protection, and providing environmental education opportunities. Currently the RC&D is involved in grant writing for community-based watershed projects and facilitation of project activities.

City of Columbus, Division of Water is developing a series of three reservoirs which are planned for construction on 2,500 acres of land owned by the City of Columbus in northwest Delaware County. These reservoirs are the site of the Water Beyond 2000 Upground Reservoir Project to meet the water supply needs of the central Ohio area. As part of this project environmental studies/impact assessments are being conducted to demonstrate their commitment to environmental stewardship as well as to meet engineering and permit requirements. Environmental attributes being considered include cultural resources, terrestrial habitats, endangered species, wetlands, aquatic habitats, hazardous materials. The Division of Water conducts water sampling activities near the confluences of Ottawa Creek, Fulton Creek, Bokes Creek, and Mill Creeks with the Scioto River mainstem.

Local Public Health Agencies such as the Delaware General Health District which has developed a county-wide household sewage treatment (HSTS) program that includes a comprehensive plan to repair or replace failing septic systems. The program includes an inventory of all HSTSs in the county including the Upper Scioto River Watershed Project area. Data from the inventory and sewage inspections is linked to a GIS to aid in analyzing the information. Crawford County Health Department is currently in the process of acquiring funds for septic inspections and system improvements.

Farm Bureau Agricultural Watershed Awareness Resource Evaluation (AWARE) program is a member-based voluntary education and assessment program for agricultural watersheds. The goals of the program are to increase natural resource stewardship of rural landowners and citizens while at the same time raising public awareness about local

water resources. The program has a water quality monitoring component that enables members to check water quality on their property or conduct larger efforts to evaluate the water quality of the streams in the watershed.

Ohio Environmental Protection Agency, Division of Environmental and Financial Assistance (DEFA) makes available below-market interest rate loans to farmers through the Water Pollution Control Loan Fund (WPCLF) program. A wide variety of water quality improvements from agricultural nonpoint source pollution problems may be funded through agreements with Soil & Water Conservation Districts, landowners, and local banks. Several Counties in the watershed are participants in the program including, Union, Marion, Crawford and Hardin.

The United States Geological Survey has a stream gauging station on the Scioto River just downstream of the Hoskins Road Bridge in northern Delaware County. This location is just south of the Village of Prospect and just north (upstream) of the river's confluence with Ottawa Creek. The City of Columbus and the US Army Corps of Engineers have cooperated with the USGS to provide a station supplying water level (stage), water discharge (flow), and several water quality measurements at this location. This station has been collecting water discharge information since 1925, although there was a seven year non-recording period in the 1930s. Water quality has been monitored since June 1998.

Conservation Reserve Program (CRP) is a USDA program is an environmental improvement program that uses financial incentives to encourage the establishment of permanent covers of grasses and trees on environmentally sensitive lands. The program protects the soil from erosion, increases wildlife habitat, and protects ground and surface water by reducing water runoff and sedimentation (USDA 2001).

Scioto River Watershed Conservation Reserve Enhancement Program (CREP) is a program of the Ohio Department of Natural Resources, the United States Department of Agriculture (USDA), and Soil and Water Conservation Districts. The Upper Scioto River Watershed Project area is a part of this larger Scioto River watershed program. CREP is a farmer/landowner-implemented agricultural environmental stewardship program. The goal is to create filter strips, riparian buffers, wildlife habitat, wetland, and tree plantings to reduce sediment and nutrient runoff into the river and it tributaries. As a result it will improve biodiversity in the entire watershed. Landowners enrolling cropland or marginal pastureland receive annual rental payments from USDA and cost-share for installation and maintenance of eligible practices. State incentive payments are provided on wetland and wildlife conservation practices. Optional voluntary easements can be enrolled provided funding is available. The conservation practices implemented through this program will help to improve water quality, reduce soil erosion, increase wildlife habitat, and meet biodiversity goals. The program will mean less sediment and nutrient runoff entering streams, improved wildlife habitat, reduced flood damage, improved ground water recharge, and a safer drinking water supply.

Environmental Quality Incentive Program (EQIP) is a USDA cost share program. This program can be used for any USDA cost share practice including, but not limited to, animal waste storage facilities, grid sampling and nutrient management, compost facilities, and cover crops.

Wildlife Habitat Incentive Program (WHIP) is a USDA program that offers landowners cost share assistance for grassland plantings, riparian tree plantings and wetland restoration to benefit wildlife.

Wetland Reserve Program (WRP) is a nationwide voluntary conservation program that offers landowners the means and the opportunity to protect, restore, and enhance wetlands on their property. The USDA, Natural Resources Conservation Service (NRCS) manages the program as well as provides technical and financial support to landowners who participate in WRP. Additional benefits of the WRP include: improved water quality, enhanced habitat for water fowl and endangered species, enhanced habitat for other wildlife, reduced soil erosion, improved water supply, reduced flooding. (USDA 2001).

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Chapter 2
Watershed Plan Development

Watershed Partners

The stakeholders that have participated in the watershed project have come from a broad base of representation within the multi-county project area. There have also been many individuals, although living and working outside the watershed boundaries, who have actively participated in the planning process. No listing of acknowledgements could accurately reflect the countless citizens and organizations responsible for the formation and development of the watershed action plan. In general, participants in the planning process have come from watershed residents, businesses, landowners, community organizations, local, state, and federal government, educational institutions or educators, non governmental organizations, and the regulated community.

Although the watershed is primarily rural and agricultural, the involvement of other non-agricultural watershed partners has played a role in the development of the action plan. Of the 16 incorporated cities and villages within the project area nearly all have participated in the development of the action plan during the public input phase. Many continue to represent their respective municipality or village at watershed meetings as water quality concerns arise. Representatives from municipal and private drinking water providers have provided extensive support with water quality data, expertise, and funding for water quality improvements. Local County Soil and Water Conservation Districts and Health Departments have generally assisted in the writing and review of the action plan. Many have incorporated parts of their respective agency water quality plans into the action items detailed in Chapter 4. Environmental Engineering consultants are now showing increasing interest in the water quality planning efforts of the project as the implementation phase approaches.

Mission Statement

To partner with community members in the development and implementation of a workable watershed action plan to improve and maintain the water resources of the Scioto River and its tributaries.

Organizational Structure

This watershed project is not a separate non-profit organization nor has it created memoranda of understanding with Soil and Water Conservation Districts or any subdivisions of the State or other organizations. Direction and assistance is provided by a watershed Advisory Committee with a chairperson and vice-chairperson elected by the committee, an Area Assistance Team (AAT) which is made up of one district representative each from Ohio EPA, OSU Extension, and Ohio Department of Natural Resources.

Group Decision Making Process

The watershed Advisory Committee has been tasked with providing guidance and direction for the participant's respective areas of representation and interests in the watershed project. This group meets to review progress of the planning efforts, report on activities of interest to the project, and provide limited assistance in review and preparation of the watershed action plan. Over the course of developing the plan over 60 individuals have participated on the Advisory Committee. Composition of the committee has included various state, federal, and local agency resource people, representatives from agricultural industries and the farming community, community officials, public drinking water industry representatives, watershed residents and members of other watershed groups, public health, and engineering.

The development of this plan was carried out in three stages. The plan development was advised by the watershed project Advisory Committee and Delaware SWCD.

The first stage carried out in January to November 2003 involved collecting watershed resource information and explaining the watershed project to stakeholders.

Throughout this period the Advisory Committee met seven times to further explain the watershed project goals and discuss the method of plan development.

During this time a County SWCD/NRCS Committee for the watershed project met six times. Additionally one project update email was distributed. This committee provided an opportunity for the seven counties with greater than 5 square miles in the watershed to direct the coordinator in the collection of water resource information.

Activities were carried out to increase the public's understanding of the watershed project. General watershed education programs were carried out by the watershed project coordinator. Presentations about the watershed project and several informal meetings with farmers were carried out by the watershed coordinator through SWCD offices. The watershed coordinator created and manned a display at the Marion and Hardin County Fairs in 2003. Two picnics, one in Kenton and one in Richwood, were held to advertise the formation of the watershed project with a short presentation about the action plan in the summer of 2003.

The second stage of plan development included a series of nine public meetings in early 2004. The intent of these meetings was to obtain pubic input and participation determining priority concerns and actions for the plan. Due to an often quick loss of participation from the public, these meetings did not focus on explanation or education of the known and suspected watershed impairments. Rather, after setting the general goals of the watershed project, participants were asked to share their top water resource concerns. These meetings also demonstrated to participants possible ways the watershed project could address their concerns and encouraged them continue participating through the Advisory Committee.

Three rounds of meetings took place in each of three locations: Kenton, Richwood, and Marion. These meetings were advertised in the local newspapers, in Soil and Water District newsletters, and by direct letters and phone calls. The following describes the agenda of each round of meetings and some of the results.

Round 1- Watershed project
Kenton- January 22; participants 23
Richwood- February 3; participants 24
Marion- January 29; participants 27

At these three meetings the purpose of the watershed project was presented. The planning structure of problem identification, goal settings, and management measure targeting was outlined. At this meeting Ohio EPA and the City of Columbus discussed their willingness to assist stakeholders in addressing water quality concerns. At the close of these three meetings a local NRCS conservationist discussed the need to support the watershed and general endorsement of the project. Various examples of how their SWCD/NRCS offices have already worked with watershed projects were also described. Throughout this round of meetings the public was encouraged to ask questions about the process. At the close of these meetings participants were asked to consider their primary water resource concerns and bring them to the next meeting.

Round 2- Gathering of concerns
Kenton- February 19; participants 14
Richwood- February 24; participants 14
Marion- February 26; participants 14

At this round of meetings participants were asked to discuss their water resource concerns. Robert McCall of OSU Extension facilitated these meetings writing the concerns on flip chart paper. When all concerns seemed to be expressed, Mr. McCall led a grouping of like concerns. Following this all participants were asked to vote on the three concerns most important to them. In this manner of voting all votes were equal and participants were allowed to give more than one vote for a concern. Also at these meetings participants noted on watershed maps special water resource concern areas. The public input from these meetings are used in Chapter 4 Watershed Impairments, Restoration and Protection Goals, and Implementation. The unedited concerns as they were voted on and the amount of votes each received can be viewed in Appendix 2A.

Round 3- Discussion of actions
Kenton- March 18; participants 12
Richwood- March 23; participants 8
Marion- March 25; participants 8

The third round of meetings consisted of a three part discussion relating to the concerns that were prioritized at the second round of meetings. As much as is known about the extent of each concern that received at least one vote was discussed by the coordinator. The watershed inventory was used to address these concerns and this part of the discussions allowed participants to share additional problem specific information.

The second part of these meetings focused on potential management measures for addressing the water quality concerns. It was noted that assistance is available for many of the agricultural best management practices that were discussed at the meetings through

Natural Resource Conservation Service (NRCS) and Farm Services Agency programs. NRCS employees were present at the Kenton and Marion meetings and provided information during these discussions. Management measures that were unfamiliar to some of the participants were discussed as well. It was restated that some practices desired by local participants could not be supported by this watershed project in that they do not improve the quality of the resource as it relates to surface water quality standards. For example, at each of the three "final round" participants suggested measures that involved improving drainage conveyance, which standing alone may do little to improve water quality. A watershed project's inability to support in-channel drainage improvements that do not take stream habitat into consideration was brought up at all three of these meetings. The final discussion point of these meetings included outlining several potential funding sources for management measures.

Stage 3: Using available water quality information and public comments the watershed coordinator drafted an assessment of each water resource concern for the Advisory Committee. These assessments evaluated the extent of current water quality impairments due to each concern by subwatershed. With each of these assessments the coordinator supplied a list of possible action items that would best address these concerns. The Advisory Committee determined the appropriateness of each assessment and indicated where more rigorous data were needed. Information about how implementation practices work and/or are feasible was provided by guest speakers at the Advisory Committee meetings. The guests and the topics they discussed included:

June 10: Scioto CREP and possible involvements of the Upper Scioto River Watershed Project. Rob Hamilton, Resource Specialist, Ohio Department of Natural Resources, Division of Soil and Water Conservation.

July 23: Controlled drainage (water table management) management measures: Dr. Larry Brown, The Ohio State University discussed this practice. His talk outlined how the practice works, what benefits and costs are associated, what is currently being studied, and how it may be eligible for cost-share in the near future.

Field Day:
The diversity of the Advisory Committee has allowed for various options to be considered. Reviewing and asking the watershed coordinator to revise proposed assessments and scrutinizing actions' effectiveness and feasibility has allowed the Advisory Committee to come to consensus for watershed impairment problem statements, restoration/protection goals, and implementation. The likelihood that the many voluntary management measures in this plan will be implemented is strengthened due to the landowner core leading the Advisory Committee.

General Contents
This plan is a dynamic document that describes the watershed approach to watershed management and encompasses the elements of watershed plan development including building public support, defining problems, setting goals and developing solutions, and planning for the implementation of the plan.

The plan includes a comprehensive inventory of all known information pertaining to the water resources, geology, soil resources, biological features, agricultural resources, and cultural resources in the watershed. Previous and current water quality efforts have been evaluated and are referenced in Chapter 1.

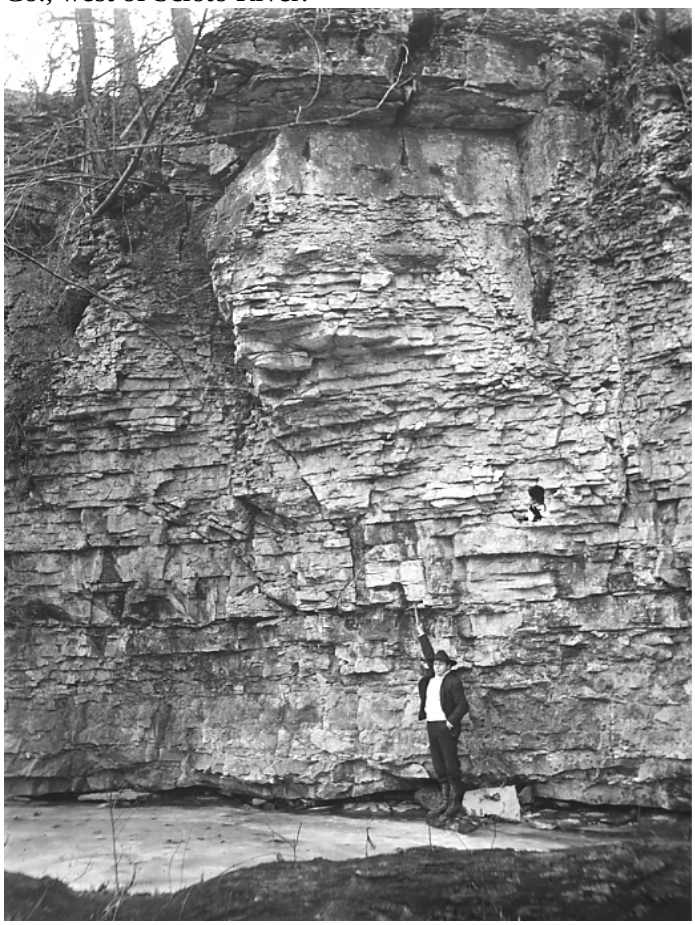
Chapter 3
Watershed Inventory

A. Characteristics of the Watershed

I. Natural Features

This section inventories and describes the natural features of the watershed and identifies sensitive areas that influence the water resource. Information in this section can also help in understanding the role each natural feature plays in influencing the water resource and helps to determine the causes, sources and impacts of pollutants.

Figure 3-1. Columbus Limestone (Onondaga, Middle Devonian). Chert zone in lower part. Deer Run, 3 1/4 miles north of Dublin, Ohio, on south edge of Delaware Co., west of Scioto River.



Property of Case Western Reserve University (CWRU) Department of Geological Sciences, The Jesse Earl Hyde Collection

Bedrock Geology

The role bedrock geology plays in determining water quality may often go unnoticed by planners and developers of watershed action plans. Although bedrock geology may play a far greater role in determining the quality and quantity of ground water resources there are many instances in the watershed where its influence on surface water quality are both direct and indirect. Bedrock outcrops in stream channels control riffle patterns and behavior and in turn play a part in the local ecosystems and may even contribute to widespread flooding. Rock outcrops and escarpments along stream channels may determine the degree of erodibility of stream channels and can influence the types of wildlife habitat and vegetation. In some areas bedrock formations control the topography and slope of the land. Where bedrock is close to the surface natural soil drainage and development of the soil profile may be influenced. These situations play a role in surface runoff potentials and soil permeability rates. The nature of the bedrock geology has played a major role in the development of stone quarries in the watershed.

The geology of the Upper Scioto River Watershed Project area consists of middle-Paleozoic Era bedrock overlain by clayey Wisconsinan-age glacial till of the Central Lowland Province. The western 76.6% of the watershed consists of Silurian System carbonate rocks (e.g., limestone and dolomite) and some shale except for an island of Devonian bedrock near the headwaters of Rush Creek in Logan County (see Map 14). The eastern edge, including the Little Scioto River sub-watershed, is comprised of Devonian bedrock with limestone, dolomite, shale and sandstone surface rocks. Devonian carbonates are also found in the upper section of the Rush Creek subwatershed which is a part of the Bellefontaine Outlier. Devonian bedrock is found in Delaware, eastern Marion, Crawford, and Wyandot counties. Both the Silurian and Devonian Systems are from the Paleozoic Erathem (Bedrock dataset).

Silurian system rocks in this watershed were formed 425-405 million years ago, when most of the Ohio region was covered by a shallow sea. The Silurian strata are primarily carbonates, shale, as well as some gypsum. Most of the surface Silurian rocks belong to the Cayugan or Salina group (412-405 million years ago), which among them are the Tymochtee, Greenfield, and Lockport dolomites.

The Devonian system bedrock in both the eastern section of the watershed and the upper Rush Creek subwatershed were formed 405-365 million years ago through deposition processes that occurred in relatively deep seas. The formations of this system include the Columbus and Delaware limestone and the Lucas Dolomite in the Bellefontaine Outlier/Rush Creek area. Figure 3-1 shows a slide taken in the early 20th Century of a Columbus Limestone outcropping along Deer Run, a Scioto River tributary just south of the O'Shaughnessy Dam. Shale that was formed by transgressions and regressions of the Devonian seas has resulted in the layers of Ohio Shale found throughout this system's strata. A cap of Ohio Shale on the Bellefontaine Outlier contributes to that feature's resistance to erosion.

Two areas of well-developed karst terrain occur in the watershed where glacial deposits are thin and a high degree of weathering occurred in the bedrock below. These areas are located in western Delaware County and the southern section of Marion County in upland areas adjacent to the Scioto River (in subwatersheds 8, 9, 10, and 11). The Scioto River has eroded the bedrock 50 to 100 feet, which created a shallow gorge through this area. Groundwater percolating through fracture and joint systems of the Devonian limestone eroded the rock creating these karst features. In this area, sinkholes ranging from 10 to 100 feet in diameter can be found at densities of up to one sinkhole per acre. Other karst areas found in the Devonian carbonates occur within the Bellefontaine Outlier in the Rush Creek subwatershed. The locations of known karst features can be seen in the subwatershed maps 6, 9, 10, and 11.

Glacial History

Most of the watershed is within the Central Ohio Clayey Till Plain physiographic region of Ohio. These glacial deposits are the parent material for most of the soils in the project area The latest Wisconsinan glaciations (Cenozoic Erathem, Pleistocene Series 24,000 to 14,000 years before present) spanned a large proportion of Ohio, including the entire upper Scioto River watershed. Map 16 illustrates the glacial features of the watershed including ground moraine, end moraine, lakebed, kames, and outwash deposits.

Ohio experienced its most recent glaciations in the late Pleistocene Series, 24,000 to 14,000 years ago, when a southward expanding continental ice sheet entered the region.
The maximum (i.e., most southern) extent of the ice expansion is to have occurred 18,000 to 17,000 years ago (ODNR, 1997). At that time, end moraines formed as soil, rock, and other materials pushed by the ice mass were left at the terminus of the glacier. After the ice began its recession from its maximum extent, several smaller advance and retreat episodes occurred, which created additional end moraines. In general, these end moraines were left in curvilinear patterns across the northwestern two-thirds of Ohio. The receding glaciers left poorly sorted till deposits, or ground moraines, along their melting edge creating large flat areas that lack significant boulder belts, are clayey in nature and rich in lime content. The resistance of the Bellefontaine Outlier to erosion and shearing caused the advancing ice sheets to split into two lobes (the eastern side of this split has been named the Scioto Lobe). This area now marks the divide between the Scioto River and the Miami River watersheds. Ice dams that formed as large pieces of the glacier that separated from the remaining mass created several shallow lakes. In fact, thirteen major inter-morainal lakes were formed in the Central Ohio Clayey Till Plain Physiographic region of the Central Lowland Till Plains.

The upper Scioto River watershed can be characterized as an expanse of low relief ground moraines that are interrupted by ridges of end moraines and four areas of lakebed deposits. Outwash deposits were also left along parts of the river valleys of the Scioto River mainstem, Rush Creek, and Fulton Creek. Two relatively large, shallow meltwater lakes formed in the watershed near northern edge of the divide in western Hardin County (the Scioto Marsh area, see water resources section) and in central Marion County just west of the City of Marion (Big Island area, see water resources section). Part or all of two other lakes were located in the watershed south of the Scioto Marsh area in eastern Auglaize County and east of the Scioto Marsh near the City of Kenton. By the end of the Pleistocene, the natural succession of each of these lakes resulted in marshes and flat-lying silt and clay filled plains. These areas were drained and used for agricultural production when the region was settled. Recently, land was purchased by the State of Ohio (ODNR) in the Marion lakebed area and several wetlands have been created in what is now the Big Island Wildlife Area (managed by the ODNR-Division of Wildlife). The three lakebed areas in Hardin and Auglaize Counties are almost exclusively used for agriculture and sub-surface drainage is extensively employed. Despite this fact, much of the area remains poorly drained. The following excerpt from the “History of Hardin County” describes the marshy areas throughout the Ohio Till Plains (Unknown, 1883):

> “There seems no doubt that they were once shallow lakes. The occurrence of shell-marl below the peaty surface, and of sandy deposits about their margins,

> indicates not only that there was a time when they were receiving the annual freshet washings of calcareous matter from the adjacent (glacial) Drift surface, but were also agitated by the wind into little waves which broke upon a sandy beach."

The Lima End Moraine defines the northern boundary of the upper Scioto River watershed as well as the northwest edge of the Little Scioto River subwatershed (see Map 16). It is also a part of the Ohio River/Lake Erie drainage divide. The Lima End Moraine dips southward slightly as it traverses Hardin County and enters into Marion County from west to east. West of the City of Marion it begins to arc in a northeast direction into Crawford County. The St. Johns End Moraine runs parallel to the Lima End Moraine and loosely bisects the watershed. The Broadway and Powell End Moraines cross into the project watershed in Delaware County and account for little of its drainage area. The Scioto River takes a cross-sectional path through both of these end moraines, resulting in fairly steep valley walls at those locations.

Throughout most of the watershed glacial deposits are 25 to 100 feet thick, however in the Delaware County area and the southeastern part of Marion County it is typically less than 25 feet. Thin glacial deposits in these areas create an environment that is conducive for the development of karst. The places where the till is greater than 100 feet thick include the St Johns End Moraine in Auglaize County and southwestern Hardin County near the Scioto River mainstem as well as parts of the Rush Creek subwatershed. The data used to approximate the thickness of the glacial deposits comes from the georeferenced unconsolidated aquifer dataset, which is included in the metadata section (Unknown date, ODNR). Table 3-1 provides an example of the unconsolidated profile (e.g., the formations encountered) from a western Hardin County well that is based upon a driller's log data.

Table 3-1. Example drilling log for a well located within the St. Johns End Moraine

Well Log (Well # 735494) Well casing 160 ft.		
Formation description	From (ft)	To (ft)
Top soil	0	3
Grey clay	3	31
Gravel and clay	31	33
Grey clay	33	88
Small gravel and clay	88	91
Grey clay	91	155
Gravel	155	159
Coarse gravel	159	165
Brown clay	165	167
Source: ODNR, 2003.		

Holocene (i.e., recent) deposits of alluvium (e.g., alluvial terraces) and peat are found in the watershed and can be seen on the glacial features map (Map 16). The glacial history of the watershed is given in a subsequent section.

Topography

The total relief for the watershed is 620 feet with a range of elevation from 1,470 to 850 feet average mean sea level (AMSL). However, the Central Ohio Clayey Till Plain accounts for most of the physiography of the watershed, where elevations typically do not exceed 1,150 feet AMSL. The Bellefontaine Upland in northern Logan County constitutes a small portion of the watershed and is its topographically highest area. Rush Creek (subwatershed 5), the highest gradient stream in the watershed, begins on the Bellefontaine Upland. The most downstream point of the Scioto River is the lowest elevation for the project area and is located at the spillway of the O'Shaughnessy Reservoir. A digital elevation map (DEM) is included in the appendix as Map 13. The elevation range and total relief for each subwatershed is shown in Table 3-2. (USGS Topographic Maps).

Table 3-2. Highest and lowest elevation and relief (in feet) for each subwatershed

Sub-ws	Highest	Lowest	Relief
1	1,110	955	155
2	1,140	945	195
3	1,200	925	275
4	1,075	900	175
5	1,470	905	570
6	1,055	920	135

Sub-ws	Highest	Lowest	Relief
7	1,020	900	120
8	985	885	100
9	1,070	880	190
10	1,000	850	150
11	1,020	850	170
Entire	1,470	850	620

The Central Ohio Clayey Till Plain is of moderate relief and has gently sloping hills and some moderately steep valley sides within its near-level plains. End moraine glacial features have created some of the higher elevation areas within the watershed. The Lima End Moraine marks the northern watershed boundary and runs primarily in an east-west direction across Hardin, Marion, and Crawford counties. Several wave-planed ground moraines and kames also create relief features throughout the watershed. The flattest areas of the watershed lie within its three lacustrine depositional areas. The gradient of the Scioto River from its source to the confluence with the Little Scioto River is on average 1.5 feet per mile. This increases to 5 feet per mile from the Little Scioto confluence to central Franklin County (Olive, 1975).

The upper section of the Rush Creek subwatershed in Logan County is the only portion of the watershed within the Bellefontaine Upland Physiographic Region. This high relief area consists of resilient island of Devonian bedrock that resisted erosion from glacial activities and other erosive forces, but nonetheless is covered by glacial deposits. The highest point in Ohio lies within the Bellefontaine Upland, but is located just outside of the watershed project area.

Soils

Soil properties and qualities play an important role in influencing and determining the quality and quantity of the water resource. The rate of movement of water into and through the soil profile impacts the amount of surface water runoff making its way to streams or percolating into ground water recharge sites. Soil properties influence groundwater pollution potential, available water capacity to plants, and soil-water chemistry. Soil properties, such as cation exchange capacity, organic matter content, and mineralogy play an important role in influencing the

behavior of pesticides. Hydraulic conductivity, water table type and drainage class influence the behavior of nutrients, such as nitrates and phosphorus. Some of the more important properties and qualities of the soil resource that often have a direct impact on the water resource include, soil depth, slope, texture, organic matter content, hydraulic conductivity, cation exchange capacity, permeability, erodibility factors, pH, flooding hazard, water table type and various aspects of soil condition, such as degree of compaction.

The soils of the Upper Scioto River Watershed Project area are primarily depositional in nature and are mainly the result of Wisconsinan glacial and postglacial processes and soil forming processes. These glacial deposits are expressed mainly as ground moraines and end moraines, but also include some significant areas of post glacial lakebeds and marshes, small kames and eskers, outwash terraces, and alluvial sediments. Soils developed in these glacial deposits vary considerably in their properties and qualities and the impacts they have upon the water quality resource. For example, soils on glacial till end moraines are more sloping than soils on lacustrine lakebeds and are usually more subject to erosion and subsequent sedimentation.

Detailed county soil survey reports are available for each of the nine counties included in the project area. Soil Survey Geographic (SSURGO) database certified soil maps are also available for the nine counties in the project area. County soil surveys are available through the local soil and water conservation district office, Cooperative Extension, or the Natural Resources Conservation Service office in their respective counties.

For the purposes of this inventory, all soil associations throughout the watershed have been listed within four parent soil material categories, which can be viewed in Appendix 3A.

Soils on Till Plains make up about 80 percent of the watershed project area. Slopes range from 0 to 25 percent. The soils formed mainly in glacial till. About 68 percent of the entire project area is comprised of just four soil types - Blount, Pewamo, Glynwood, and Wetzel soils formed in glacial till.

Soils on Lake Plains and Marshes make up about 10 percent of the watershed project area. Slopes range from 0 to 35 percent. The soils formed mainly in lacustrine materials with some small areas having formed in organic deposits. In some areas the underlying material consists of glacial till. There are two large postglacial lake deposits surrounded by small wave-planed ground moraines within the watershed. The lacustrine deposits in western Hardin County make up the area known as the Scioto Marsh and contain the Roundhead-McGuffey soil association. The Milford-Patton soil association is to the north and east of this area. Another area of Milford-Patton wave-planed soils within the watershed is located in southeast Auglaize County. The postglacial lakebed deposit found in Marion County constitutes the soils of the Big Island Wildlife Area as well as an area spanning to the west that almost reaches the Marion-Hardin County line. The Latty-Fulton-Paulding association makes up these soils.

Soils on Floodplains make up nearly 5 percent of the watershed project area. Slopes range from 0 to 2 percent. These soils formed mainly in alluvium and occur along the Scioto River and Little Scioto River mainstem and many of their tributaries. Saranac, Sloan, and Nolin soils

comprise nearly 55 percent of the soils mapped on floodplains. Map 23 shows the distribution and extent of soils on floodplains in the project area and their flooding frequency.

Soils on Stream Terraces, Kames, and Outwash Plains make up nearly 5 percent of the watershed project area. Slopes range from 0 to 25 percent. The soils formed mainly glacial outwash deposits. Westland, Fox, Martinsville, and Scioto soils make up nearly 60 percent of the soils on terraces, kames, and outwash plains.

Natural Drainage refers to the frequency and duration of wet periods under conditions similar to those under which the soil developed (USDA SSM 1993). Over 35 percent of the soils in the watershed project area are naturally poorly or very poorly drained. Poorly and very poorly drained soils are hydric soils, a component of wetlands that often serve as sites for ground water recharge. Poorly and very poorly drained soils, such as Pewamo and Latty soils, are so wet that most mesophytic crops cannot be grown, unless the soil is artificially drained.

Soil Slopes and Environmental Hazards**:** About 4 percent of the watershed project area has soils with slopes greater than 6 percent. Map 21 shows the distribution of soils mapped with slopes greater than 6 percent. Areas mapped with slopes greater than 6 percent include large amounts of highly erodible land. These areas, if not properly managed and protected, can become seriously degraded and contribute large amounts of sediment to surrounding rivers and streams. The sloping areas highlighted on map 21 can be targeted by the type of land management practices that help reduce soil erosion and prevent runoff into nearby streams.

Prime Farmland**:** Prime farmland, as defined by the U.S. Department of Agriculture, is the land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. It has the combination soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable acidity or alkalinity, an acceptable concentration of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding (NSSH).

Map 15 and Table 3-3 show the extent of prime farmland in each sub-watershed based on soil classifications. Based on currently available data, only about 7.26% of the watershed is considered not prime farmland.

Table 3-3. Percentages of soils considered prime farmland, farmland of local importance, and not considered prime farmland.

Sub - watershed	Prime farmland	Prime farmland if drained	% Prime farmland if drained and not flooded	Farmland of local importance	Not prime farmland
1	8.18	80.58	0.10	-	11.14
2	11.21	79.72	0.18	-	8.89
3	12.91	82.82	0.24	-	4.03
4	12.97	84.78	0.23	0.01	2.03
5	12.49	78.05	0.08	0.60	8.79
6	18.90	77.35	-	-	3.75
7	22.13	55.02	3.49	-	19.36
8	20.00	77.57	-	0.02	2.42
9	13.84	82.28	0.50	0.84	1.54
10	40.05	44.98	-	-	14.96
11	29.12	53.20	0.03	1.17	16.48
Whole WS	15.68	76.52	0.33	0.21	7.26

II. Biological Features

The upper Scioto River watershed is in the Clayey, High Lime Till Plains' sub-ecoregion of the Eastern Cornbelt Plains Ecoregion. An ecoregion is an area of similar climate, landform, soil, potential natural vegetation, hydrology, and other ecologically relevant variables. This ecoregion and sub-ecoregion are described by US EPA as the following (Simon, 1997):

> Ecoregion 55 is primarily a rolling till plain with local end moraines. It has lighter colored soils than Ecoregion 54, loamier and better drained soils than Ecoregion 57, and richer soils than Ecoregion 61. Glacial deposits of Wisconsinan age are extensive; they are not as dissected nor as leached as the pre-Wisconsinan till which is restricted to the southern part of Ecoregion 55. Originally, natural tree cover was greater than Ecoregion 54; beech forests were common on Wisconsinan soils while beech forests and elm-ash swamp forests dominated the wetter pre-Wisconsinan soils. Today, extensive corn, soybean, and livestock production occurs and has affected stream chemistry and turbidity.
>
> 55a. The Clayey, High Lime Till Plains' ecoregion is transitional between the Loamy, High Lime Till Plains 55b. and the Maumee Lake Plains 57a.; soils are less productive and more artificially drained than ecoregion 55b. and supported fewer swampy areas than Ecoregion 57a. Corn, soybean, wheat, and livestock farming are dominant and have replaced the original beech forests and scattered elm-ash swamp forests. No exceptional fish communities exist in the turbid low gradient streams of ecoregion 55a.

Rare, Threatened and Endangered Species

A list of rare, threatened, and endangered plants and animals provided by the US Fish and Wildlife Service is included in the following section and can also be found at http://endangered.fws.gov/. Animals on the federal rare, threatened, and endangered list for Ohio whose ranges do not overlap the upper Scioto River watershed are not included in this inventory. The Ohio Department of Natural Resources maintains a state endangered and threatened species list which can be found at http://www.dnr.state.oh.us/endangered/ . Documented studies or surveys aimed at determining the presence of these listed species within the upper Scioto River watershed have been difficult to find. The Ohio Department of Natural Resources, Division of Wildlife has legal authority over Ohio's fish and wildlife.

Categories of Species

The Division uses six categories to define the status of selected species.

Endangered – A native species or subspecies threatened with extirpation from the state. The danger may result from one or more causes, such as habitat loss, pollution, predation, interspecific competition, or disease.

Threatened – A species or subspecies whose survival in Ohio is not in immediate jeopardy, but to which a threat exists. Continued or increased stress will result in its becoming endangered.

Species of Concern – A species or subspecies which might become threatened in Ohio under continued or increased stress. Also, a species or subspecies for which there is some concern but for which information is insufficient to permit an adequate status evaluation. This category may contain species designated as a furbearer or game species but whose statewide population is dependent on the quality and/or quantity of habitat and is not adversely impacted by regulated harvest.

Species of Interest – A species that occurs periodically and is capable of breeding in Ohio.. It is at the edge of a larger, contiguous range with viable populations (s) within the core of its range. These species have no federal endangered or threatened status, are at low breeding densities in the state and have not been recently released to enhance Ohio's wildlife diversity. With the exception of efforts to conserve occupied areas, minimal management efforts will be directed for these species because it is unlikely to result in significant increases in their populations within the state.

Extirpated – A species or subspecies that occurred in Ohio at the time of European settlement and that has since disappeared from its entire range.

Extinct – A species or subspecies that occurred in Ohio at the time of European settlement and that has since disappeared from its entire range.

Fish

The Scioto Madtom is believed to be extinct. Only a few specimens have been collected, all from the Big Darby Creek (outside this watershed project area) a few miles from its confluence with the Scioto River. The last collection occurred in 1957 (Trautman, 1981).

Endangered:
Scioto Madtom; *Noturus trautmani*

Mussels

Each of these mussels requires a sand or coarse sand and gravel stream substrate for survival. There is a possibility of such habitat within the Upper Scioto River Watershed, which can be related to the low gradient and chronically turbid water of its streams.

Endangered:
Purple Catspaw (pearlymussel); *Epioblasma obliquata obliquata*
White Catspaw (pearlymussel); *Epioblasma obliquata perobliqua*
Clubshell; *Pleurobema clava*
Fanshell; *Cyprogenia stegaria*
Pink Mucket (pearlymussel); *Lampsilis abrupta*
Northern riffleshell; *Epioblasma torulosa rangiana*

Insects

The following insects have very specific habitat requirements (with the exception of the American burying beetle).

Endangered:
American burying beetle; *Nicrophorus americanus*
Blue Karner (butterfly); *Lycaeides melissa samuelis*
Mitchell's satyr (Butterfly); *Neonympha mitchellii mitchellii*
Hine's emerald (Dragonfly); *Somatochlora hineana*

Mammals

The Indiana bat has a large “potential” range which covers several states.

Endangered:
Indiana Bat; *Myotis sodalis*

Birds

The Bald Eagle has been removed from the national endangered species list and is now considered threatened.

Threatened:
Bald Eagle, (lower 48 States) *Haliaeetus leucocephalus*
Piping Plover, *Charadrius melodus*

Reptiles & Amphibians

Threatened:
Copperbelly water snake (40° N. Lat.); *Nerodia erythrogaster neglecta*

Plants

Endangered:
Running buffalo clover; *Trifolium stoloniferum*

Threatened:
Northern wild Monkshood, *Aconitum noveboracense*
Lakeside daisy; *Hymenoxys herbacea*
Small whorled pogonia; *Isotria medeoloides*
Eastern prairie fringed orchid; *Platanthera leucophaea*
Virginia spiraea; *Spiraea virginiana*

Invasive Non-Native Species and their Potential Impacts

Several invasive plant species are present in the Upper Scioto River Watershed. These are listed by county in Appendix 3B.

Twelve exotic fish have been found in streams within the Upper Scioto River Watershed through Ohio EPA's biological monitoring (Table 3-4). The brown and rainbow trout and the striped bass are exotic species that were introduced as game fish and are not currently considered to be invasive. The common carp is the most widespread invasive and nonnative fish species in this watershed as well as in the state. Carp can prosper under many different conditions of warm water streams and lakes. The carp was introduced to the United States as a food source.

Table 3-4. Non-native fish in the Scioto River Watershed

Non-native fish species	Scientific name
Brown Trout	***Salmo trutta***
Rainbow Trout	***Oncorhynchus mykiss***
Common Carp	***Cyprinus carpio***
Goldfish	***Carassius auratus***
Grass Carp	***Ctenopharygodon idella***
Chain Pickerel	***Esox niger***
White Catfish	***Ameiurus catus***
Eastern Banded Killifish	***Fundulus diaphanus diaphanus***
Western Banded Killifish	***Fundulus diaphanus menona***
Striped Bass	***Morone saxatilis***
Mosquitofish	***Gambusia holbrooki***
Redear Sunfish	***Lepomis microlophus***
Source: Mishne, 2003	

Habitat Loss

Much of the wetlands which were once extensive throughout the watershed have been drained for agricultural, residential, and urban development. According to the Ohio Department of Natural Resources, wetland loss is the second leading cause of wildlife endangerment in Ohio. About 163,230 acres or over 35 percent of the watershed is composed of soils that are poorly or very poorly drained. Before being artificially drained these soils were so wet that crops now commonly grown in the area could not be raised. Loss of woodlands, due mainly to land clearing for agriculture, has also played a major part in the loss of habitat for many species. Degradation of the waters of the Scioto River, Little Scioto River and their tributaries has endangered the habitat of many aquatic species. In the Upper Scioto River Watershed Project area the major causes of natural waters degradation has been due to siltation from accelerated soil erosion, discharges from industrial, agricultural, and municipal sewage, stream channelization, and drainage of wetlands.

III. Water Resources

The quantity of water resources in the Upper Scioto River Watershed Project area is abundant. In fact, the semi-humid climate and prevalence of low-lying, nearly level, slowly or very slowly permeable soils often result in flooding and other problems associated with large quantities of surface water. The topography, and subsequently the drainage patterns of the watershed are largely the result of past glacial events. Nearly all of the present-day lakes and ponds in this watershed have been constructed for the purposes of water storage, aesthetics and/or recreation or are abandoned quarries. The majority of the natural wetlands that were present at the time of settlement have been drained for agriculture; however, most of the land that currently is wooded is poorly drained and saturated for a relatively large proportion of the year. Ground water supplies are ample throughout the watershed and wells are tapped in the underlying bedrock, or less often, into the unconsolidated glacial deposit aquifers.

Climate and Precipitation

This watershed falls within the temperate middle-west North American region which is cold in the winter and hot and humid in the summer. Weather changes typically occur every few days often depending upon the passing of cold fronts, warm fronts, or centers of high or low pressure. Tornadoes and severe thunderstorms occur occasionally, while thunderstorms are usually localized and of short duration. Table 3-5 shows each month's average daily temperatures in county seats for the six counties contributing most to the watershed's overall acreage. The average temperature across each municipality throughout the year is 50º F while the average mid-afternoon relative humidity is generally between 60% and 70%. Winds are typically from the south-southwest (County Soil Surveys).

Table 3-5. Temperature summary of six county seats

Average daily temperature (ºF) *							
Month	**Kenton**	**Marion**	**Delaware**	**Marysville**	**Bucyrus**	**Bellefon.**	**Average**
January	**24.3**	**24.6**	**24.1**	**27**	**25.4**	**26.2**	**25**
February	**28.0**	**28.0**	**27.0**	**30**	**27.6**	**29.4**	**28**
March	**36.9**	**37.5**	**37.9**	**37**	**36.0**	**38.0**	**37**
April	**49.2**	**49.6**	**48.8**	**49**	**48.5**	**50.5**	**49**
May	**59.9**	**60.7**	**59.2**	**60**	**58.6**	**60.4**	**60**
June	**68.8**	**69.6**	**68.3**	**69**	**68.5**	**69.6**	**69**
July	**72.6**	**72.9**	**72.3**	**72**	**71.9**	**72.7**	**72**
August	**70.8**	**71.2**	**70.4**	**72**	**70.0**	**71.3**	**71**
September	**64.1**	**64.6**	**63.7**	**64**	**63.7**	**65.4**	**64**
October	**52.8**	**52.5**	**51.7**	**54**	**52.6**	**54.5**	**53**
November	**40.7**	**41.2**	**40.9**	**40**	**40.2**	**41.2**	**41**
December	**29.6**	**29.9**	**29.8**	**30**	**29.6**	**30.6**	**30**
Yearly	**49.8**	**50.2**	**49.5**	**50**	**49.4**	**50.8**	**50**
*** From soil surveys: Kenton – 1951-84; Marion - 1951-80; Delaware - 1961-90; Marysville - no time period given; Bucyrus - 1951-74; Logan - 1951-74.**							

Precipitation in the watershed varies substantially from year to year. Table 3-6 illustrates the average monthly rain and snowfall in the six counties contributing most to the watershed's overall acreage. Also included is the average precipitation across each municipality throughout the year which is 34.82 inches and may be regarded as the watershed's average. January has the greatest amount of snowfall and the annual average for the watershed is 27 inches, however it does vary a great deal locally.

Table 3-6 Precipitation summary of six county seats

Average precipitation (inches) / snowfall (inches)*							
Month	**Kenton**	**Marion**	**Delaware**	**Marysville**	**Bucyrus**	**Bellefon.**	**Average**
January	**2.32 / 9.3**	**2.36 / 7.5**	**2.01 / 7.5**	**2.98 / 7.0**	**2.38 / 7.4**	**2.35 / 5.3**	**2.40 / 7**
February	**1.91 / 5.8**	**1.76 / 6.5**	**1.95 / 5.4**	**2.40 / 5.1**	**1.87 / 8.0**	**1.84 / 4.8**	**1.96 / 6**
March	**3.18 / 4.6**	**2.87 / 4.8**	**2.99 / 3.6**	**3.48 / 4.2**	**2.86 / 7.3**	**3.00 / 4.2**	**3.06 / 5**
April	**3.66 / 0.4**	**3.61 / 0.2**	**3.57 / 0.7**	**3.75 / 0.7**	**3.78 / 1.2**	**3.77 / 0.6**	**3.69 / 1**
May	**3.73**	**3.42**	**3.92**	**3.63**	**3.59**	**4.04**	**3.72**
June	**3.53**	**3.42**	**3.66**	**4.19**	**1.97**	**3.59**	**3.39**
July	**3.82**	**3.56**	**4.18**	**3.62**	**2.48**	**3.94**	**3.60**
August	**3.06**	**3.04**	**3.37**	**3.03**	**1.16**	**2.86**	**2.75**
September	**2.81**	**3.01**	**3.01**	**2.70**	**1.51**	**2.92**	**2.66**
October	**1.99**	**2.11**	**2.29**	**2.17**	**0.93**	**2.10 / 0.1**	**1.93 / 0**
November	**2.71 / 2.0**	**2.57/1.9**	**3.45 / 1.4**	**2.39 / 2.6**	**1.81 /2.4**	**2.61 / 2.2**	**2.59 / 2**
December	**2.42 / 6.7**	**2.33/5.0**	**2.83 / 5.1**	**2.24 / 5.9**	**1.27 / 7.2**	**2.61 / 4.7**	**2.28 / 6**
Entire year	**35.13/ 28.8**	**34.06/25. 9**	**37.23/23.7**	**36.58/25.5**	**30.28/33.5**	**35.63/21.9**	**34.82 / 27**
*** From soil surveys: Kenton – 1951-84; Marion - 1951-80; Delaware - 1961-90; Marysville - no time period given; Bucyrus - 1951-74; Logan - 1951-74.**							

The National Climatic Data Center (NCDC) collects information from several weather stations within the watershed (Prospect, Richwood, Marion, LaRue, Bucyrus, and Kenton) and several just outside the watershed. Refer to the bibliography section of this inventory to find out how to query and obtain these data (NOAA, 2004).

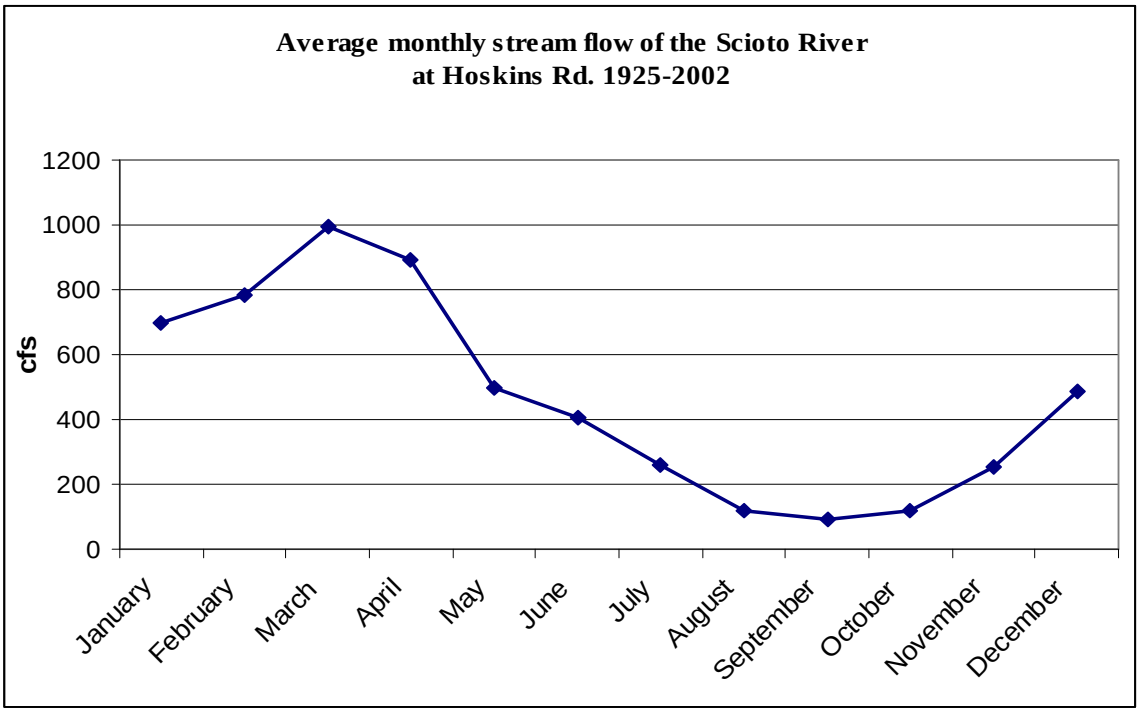
Surface Water

Most watercourses throughout the watershed flow over the glacial ground moraines that lie between the end moraines. The Scioto River mainstem begins in eastern Auglaize County and flows eastward into southwestern Hardin County. The river then turns north northeastward as it makes its way around the Bellefontaine Upland and through the Scioto Marsh, where as late as 1883 this part of the river was described as being lost due to its lateral expansion forming a marsh or lake (Unknown, 1883). However efforts to drain the Scioto Marsh in the earlier part of the twentieth century resulted in the construction of a very well defined trapezoidal channel that now flows through the muck soils of the former marsh. Beyond the Scioto Marsh the river continues north-northeast until reaching the Lima End Moraine, where it turns east-southeast until reaching its confluence with the Little Scioto River in central Marion County. The Little Scioto River subwatershed is narrow and drains an area beginning in southwest Bucyrus and extends in a southwest direction past the City of Marion. Just south of the Village of Green Camp the Little Scioto joins the Scioto mainstem which flows south from that point all the way to the O'Shaughnessy dam.

Data collected from the USGS gauging station (station number 03219500) located on the Scioto River south of the village of Prospect (near Hoskins Rd) gives an average discharge of 318 million gallons per day at that point. Figure 3-2 shows the average monthly stream flow velocity from 1925-2002, and Figure 3-3 shows the annual mean discharge from 1970 to 2001 for the

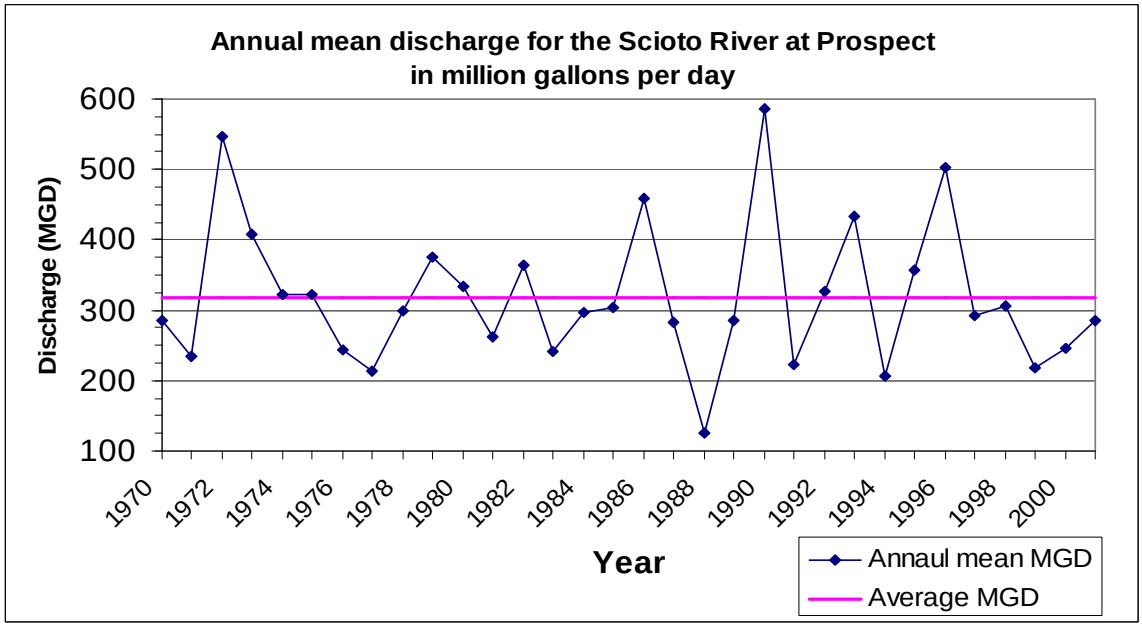
same station (USGS, 2004). The largest stream flows occur in March while the lowest occur in September.

Figure 3-2.



Source: USGS

Figure 3-3.



Source: USGS

Nearly all of the tributaries to the Scioto and Little Scioto Rivers', with the exception of Rush Creek, have fairly small watershed areas averaging 13.44 square miles (ODNR, 2001). The Scioto River mainstem flows closely to both its northern and eastern watershed boundaries so most of its tributaries join from the south and the west. These tributaries typically drain narrow valleys. The Bokes and Mill Creek (83.2 and 179 square miles respectively) are two large tributaries that join the Scioto River from the west in Delaware County. These two subwatersheds are not included in the Upper Scioto River Watershed Project; however there is an active watershed partnership for these areas which has created a watershed action plan.

Two large former lake plain areas in the watershed are naturally very poorly drained. The area of the Scioto Marsh in Hardin County has what appears to be a trellis drainage pattern due to systematic tile and ditch drainage. The Big Island Wildlife Area and an area to the west (which is a farmed part of the same ancient lake plain) are more poorly drained. Artificial drainage (subsurface and surface) drains a major portion of this watershed. This is discussed further in the section Channel and Floodplain Condition .

Streams: The watershed has been divided into 11 subwatersheds that are of sizes appropriate for watershed management. The ten subwatershed maps (Maps 3-12) include all surface water features in each subwatershed in detail. Tables 3-7 thru Tables 3-17 gives the streams name, length, and watershed size for each subwatershed. The stream length and watershed size were found in ODNR's Gazetteer of Ohio Streams (ODNR 2001), except for segments of the Scioto River and Little Scioto River mainstems. Those stream segments were determined using USGS/US EPA's NHD dataset arrayed on GIS. The river miles given for the Scioto River subwatershed segments are from the Ohio EPA's Division of Surface Water's river mile delineated USGS Topographic maps (OEPA 2003a). The sum of Scioto River segment river miles will not equal the given segment length, because the NHD data are much more accurate than the manner in which the river miles were determined. These tables also include the Ohio EPA aquatic life use designations for stream segments with designations, which are discussed further in the section Water Quality: Surface Water**.**

Table 3-7. Subwatershed 1- Scioto Marsh (Scioto River Upstream– RM 221.5)

Stream name	Length mi.	Watershed size mi.^{2}	Drains to	Use designation
Scioto River *	**21.0**	****96.32**	**-**	***Partial attainment WWH* (Upstream – 226.3)** ***Full attainment WWH* (226.3 – 222.8)** ***Partial attainment WWH* (RM 222.8 – 221.5)**
Wallace Fork	**6.0**	**10.24**	**Scioto River**	**Unassessed**
Poe Ditch	**2.0**	**2.56**	**Scioto River**	**Unassessed**
Dunlap Creek	**4.0**	**8.92**	**Scioto River**	**Unassessed**

Elder Creek	**4.8**	**6.56**	**Dunlap Creek**	**Unassessed**
Twin Branches	**5.2**	**5.08**	**Scioto River**	**Unassessed**
Cottonwood Ditch	**6.0**	**19.50**	**Scioto River**	***Full attainment MWH* Entire reach**
Total miles of open watercourses in subwatershed (NHD Hydrology): 112.403 *** Indicates only part of stream is in this subwatershed** **** Total subwatershed area**				

Table 3-8. Subwatershed 2- Upstream Kenton (Scioto River RM 221.5 – 213.07)

Stream name	Length mi.	Watershed size mi. ^{2}	Drains to	Use designation
Scioto River *	**9.73**	****63.38**	**-**	***Partial attainment WWH* (RM 221.5 – 220.8)** ***Full attainment WWH* (RM 220.8 – 215.05)** ***Partial attainment WWH* (RM 215.05 – 213.35)** ***Full attainment WWH* (213.35 – 213.07)**
Cooney Ditch	**3.80**	**3.24**	**Scioto River**	**Unassessed**
McCoy Run	**2.90**	**8.22**	**Scioto River**	**Unassessed**
Batchlet Run	**4.60**	**8.10**	**Scioto River**	**Unassessed**
Payden Run	**5.20**	**3.98**	**Scioto River**	**Unassessed**
Taylor Creek	**7.80**	**29.30**	**Scioto River**	**Unassessed (Upstream – RM 4.5)** ***Full attainment WWH* (RM 4.5 – mouth)**
Silver Creek (confluence with Taylor Creek is nearly at Scioto River confluence)	**7.30**	**12.30**	**Taylor Creek**	**Unassessed (Upstream – RM 2.4)** ***Partial attainment WWH* (RM 2.4 – mouth)**
Jordon Run	**0.30**	**0.84**	**Silver Creek**	**Unassessed**
Total miles of open watercourses in subwatershed (NHD Hydrology): 86.459 *** Indicates only part of stream is in this subwatershed** **** Total subwatershed area**				

Table 3-9. Subwatershed 3- Downstream Kenton (Scioto River RM 213.07 –203.56)

Stream name	Length mi.	Watershed size mi. ^{2}	Drains to	Use designation
Scioto River *	**9.12**	****63.21**	**-**	***Full attainment WWH* (RM 213.07 – 211.4)** ***Partial attainment WWH* (211.4 – 210.65)** ***Full attainment WWH* (RM 210.65 – 203.56)**
Gander Run	**4.30**	**5.32**	**Scioto River**	**Unassessed**
Manlove Run	**1.50**	**1.18**	**Gander Run**	**Unassessed**
Wolf Creek	**7.30**	**11.60**	**Scioto River**	**Unassessed**
Garwood Creek	**1.10**	**2.52**	**Wolf Creek**	**Unassessed**
Jims Creek	**2.20**	**4.88**	**Scioto River**	**Unassessed**
Panther Creek	**10.70**	**23.30**	**Scioto River**	**Unassessed (Upstream – RM 9.0)** ***Full attainment WWH* (RM 9.0 – 8.9)** ***Partial attainment WWH* (RM 8.9 – 5.7)** ***Full attainment WWH* (RM 5.7 – mouth)**
Unnamed tributary to Panther Creek drains through Ridgeway	**4.05**	**Unknown**	**Panther Creek**	**Some sampling has occurred on this tributary.**
Total miles of open watercourses in subwatershed (NHD Hydrology): 91.863 *** Indicates only part of stream is in this subwatershed** **** Total subwatershed area**				

Table 3-10. Subwatershed 4- LaRue / Big Island (Scioto River RM 203.56 – 177.35)

Stream name	Length mi.	Watershed size mi. ^{2}	Drains to	Use designation
Scioto River *	**24.9**	****81.03**	**-**	***Full attainment WWH* (In this reach)**
Wildcat Creek	**9.4**	**22.40**	**Scioto River**	**Unassessed (Upstream – RM 6.8)** ***Partial attainment WWH* (RM 6.8 – 0.6)** ***Full attainment WWH* (RM 0.6 – mouth)**
Ash Run	**1.2**	**3.66**	**Wildcat Creek**	**Unassessed**
South Wildcat Creek	**4.6**	**6.88**	**Wildcat Creek**	**Unassessed**
(Rush Creek flows into the Scioto River at this point, but is included in Subwatershed 5)				
Zeig Ditch	**4.6**	**5.56**	**Scioto River**	**Unassessed**
Long Branch	**4.6**	**4.88**	**Scioto River**	**Unassessed**
Total miles of open watercourses in subwatershed (NHD Hydrology): 108.075 *** Indicates only part of stream is in this subwatershed** **** Total subwatershed area**				

Table 3-11. Subwatershed 5- Rush Creek (Rush Creek entire stream)

Stream name	Length mi.	Watershed size mi. ^{2}	Drains to	Use designation
Rush Creek	**42.55**	****105.27**	**Scioto River**	**Unassessed**
Rocky Fork	**6.50**	**7.12**	**Rush Creek**	**Unassessed**
Big Swale	**5.00**	**11.60**	**Rush Creek**	**Unassessed**
Dudley Run	**1.40**	**5.38**	**Rush Creek**	**Unassessed**
McDonald Creek	**10.50**	**14.60**	**Rush Creek**	***NON attainment WWH* (RM 9.1 – 2.7)**
Total miles of open watercourses in subwatershed (NHD Hydrology): 146.866 *** Indicates only part of stream is in this subwatershed** **** Total subwatershed area**				

Table 3-12. Subwatershed 6- Upper Little Scioto River (L. Scioto Upstr. – RM 10.42)

Stream name	Length mi.	Watershed size mi. ^{2}	Drains to	Use designation
Little Scioto River*	**20.76**	****71.48**	**-**	**Unassessed (In this reach)**
Rock Fork	**9.70**	**23.90**	**Little Scioto**	**Unassessed (Upstream – RM 8.1)** ***Partial attainment WWH* (RM 8.1 – 1.3)** ***Full attainment WWH* (RM 1.3 – mouth)**
Unnamed tributary to Rock Fork	**4.26**	**Unknown**	**Rock Fork**	**There has been some sampling on this stream**
Total miles of open watercourses in subwatershed (NHD Hydrology): 87.828 *** Indicates only part of stream is in this subwatershed** **** Total subwatershed area**				

Table 3-13. Subwatershed 7- Lower Little Scioto River (L. Scioto RM 10.42– mouth)

Stream name	Length mi.	Watershed size mi. ^{2}	Drains to	Use designation
Little Scioto River*	**13.02**	****41.50**	**-**	**Unassessed (RM 10.42 – 9.2)** ***Partial attainment WWH* (RM 9.2 – 7.9)** ***NON attainment MWH* (RM 7.9 – 0.4)** ***Partial attainment MWH* (RM 0.4 – mouth)**
North Rockswale Ditch	**6.32**	**Unknown**	**Little Scioto River**	***Partial attainment WWH* (Upstream – RM 4.7)** ***Full attainment MWH* (RM 4.7 – 2.5)** ***NON attainment* MWH (RM 2.5 – mouth)**
Goose Creek	**1.34**	**Unknown**	**North Rockswale Ditch**	**Unassessed**
Rockswale Ditch	**2.78**	**Unknown**	**Little Scioto River**	**Unassessed (Upstream – RM 1.1)** ***NON attainment LRW* (RM 1.1 – mouth)**
Columbia Ditch	**2.93**	**Unknown**	**Rockswale Ditch**	**Unassessed**
Honey Creek	**2.30**	**7.38**	**Little Scioto River**	**Unassessed (Upstream – RM 2.5)** ***NON attainment WWH* (RM 2.5 – mouth)**
Total miles of open watercourses in subwatershed (NHD Hydrology): 46.328 *** Indicates only part of stream is in this subwatershed** **** Total subwatershed area**				

Table 3-14. Subwatershed 8-Downstream L. Scioto (Scioto R. RM 177.35 – 166.80)

Stream name	Length mi.	Watershed size mi. ^{2}	Drains to	Use designation
Scioto River *	**10.33**	****79.53**	**-**	***NON attainment WWH* (RM 177.35 – 170.8)** ***Full attainment WWH* (RM 170.8– 166.88)**
Davids Run	**1.40**	**1.92**	**Scioto River**	**Unassessed**
Patton Run	**3.00**	**15.80**	**Scioto River**	**WS Project sampling**
Beaver Run	**2.20**	**2.84**	**Patton Run**	**Unassessed**
Battle Run	**1.40**	**9.50**	**Scioto River**	**WS Project sampling**
Ottawa Creek	**4.10**	**8.08**	**Scioto River**	**WS Project sampling**
Kebler Run	**2.40**	**14.40**	**Scioto River**	**WS Project sampling**
Total miles of open watercourses in subwatershed (NHD Hydrology): 80.213 *** Indicates only part of stream is in this subwatershed** **** Total subwatershed area** **'WS Project sampling' indicates streams with water quality information being collected by this planning project**				

Table 3-15. Subwatershed 9- Fulton Creek area (Scioto River RM 166.80 – 161.88)

Stream name	Length mi.	Watershed size mi. ^{2}	Drains to	Use designation
Scioto River *	**4.97**	****60.47**	**-**	***Full attainment WWH* (In this reach)**
Utz Run	**4.00**	**4.76**	**Scioto River**	**Unassessed**
Fulton Creek	**16.60**	**47.00**	**Scioto River**	**WS Project sampling**
Big Run	**2.80**	**2.38**	**Fulton Creek**	**Unassessed**
Unnamed trib (AKA Ash Run)	**3.40**	**Unknown**	**Fulton Creek**	**WS Project sampling**
Elliot Run	**4.23**	**Unknown**	**Fulton Creek**	**WS Project sampling**
Total miles of open watercourses in subwatershed (NHD Hydrology): 64.312 *** Indicates only part of stream is in the subwatershed** **** Indicates total subwatershed area** **WS Project sampling indicates streams with WQ information being collected by this planning project**				

Table 3-16. Subws 10- Bokes/Mill Confluence [A] (Scioto R. RM 161.88 – 155.40)

Stream name	Length mi.	Watershed size mi. ^{2}	Drains to	Use designation
Scioto River *	**36.73**	****24.53**	**-**	***Full attainment WWH* (In this reach)**
Prairie Run	**3.60**	**5.08**	**Scioto River**	**Unassessed**
Eagon Run	**1.10**	**Unknown**	**Prairie Run**	**Unassessed**
Moors Run	**4.40**	**5.08**	**Scioto River**	**Unassessed**
Total miles of open watercourses in subwatershed (NHD Hydrology): 22.878 **[A] Bokes Creek and Mill Creek watersheds define the north and south boarder of this subwatershed on the west side of the Scioto River.** *** Indicates only part of stream is in this subwatershed** **** Total subwatershed area**				

Table 3-17. Subws 11- O'Shaughnessy Area [A] (Scioto River RM 155.40– 148.85)

Stream name	Length mi.	Watershed size mi. ^{2}	Drains to	Use designation
Scioto River *[A]	**45.18**	****30.20**	**-**	***Full attainment WWH* (In this reach)**
Eversole Run	**3.60**	**13.70**	**Scioto River**	
Total miles of open watercourses in subwatershed (NHD Hydrology): 29.334 **[A] This subwatershed includes the O'Shaughnessy Reservoir** *** Indicates only part of stream is in this subwatershed** **** Total subwatershed area**				

Entrenchment indices of a stream cross-section are found by taking the flood prone width (the width at twice the bank-full depth elevation) divided by the bank-full width (the width of a stream's cross-section when it's at its effective or channel forming discharge). This gives a positive number in which the closer to 1 the more entrenched the stream is; having less access to its floodplain. None of these measurements have been made on streams in this watershed. Sinuosity measurements of this watershed's streams are also not well documented. More on these measurements can be found in the section Channel and Floodplain Condition.

Wetlands**:** Maps 3-12 show areas of possible wetlands by subwatershed from the Ohio Wetland Inventory, a dataset that uses satellite imagery to suggest probable wetland areas. Prior to settlement, much of the ground moraine areas in this watershed were forested wetlands. The Scioto Marsh area and the southern half of the watershed within Auglaize County have been noted as freshwater marshes and fens from the Ohio Biological Society's Vegetation at the time of Earliest Surveys (Map 17). The vast majority of these forests have been cut down and the soils drained for agricultural or other land uses. However, still today the greatest amount of probable wetlands in the watershed are privately owned forests on hydric soils. Table 3-18 shows a breakdown of the amount of various types of wetlands in the watershed from the Ohio Wetland

Inventory. Big Island Wildlife Area in Marion County contains a large amount of shrubby and meadow wetlands. Subwatershed 4 has the highest amount of wetland due to the Big Island Wildlife area and privately owned potential wetlands surrounding that low land. The Wetlands Resource Center operates a mitigation bank along the Little Scioto River along state route 95 just west of the City of Marion. When this wetland mitigation site is built out the lands are to be turned over to the Ohio Division of Wildlife for management.

Land cover data created with 1997-2002 satellite and other data are presented in the section Land Use below (Table 3-25). Some of the land cover classifications of these data are types of wetlands (Map 18).

Table 3-18. Ohio Wetland Inventory

Percentage % of total land area in each type of wetland								
Sub-ws	Total wetland [A]	Woods on hydric soil	Shallow marsh [B]	Shrub/ scrub wetland [C]	Wet meadow [D]	Farmed wetland [E]	Open water	Upland areas
1	1.84	1.473	0.057	0.039	0.066	0.201	0.065	98.100
2	2.73	2.554	0.082	0.039	0.049	0.002	0.310	96.964
3	2.61	2.430	0.039	0.033	0.106	-	0.061	97.331
4	4.46	3.214	0.692	0.084	0.255	0.216	0.334	95.204
5	3.52	2.922	0.207	0.123	0.023	0.250	0.117	96.358
6	2.13	1.417	0.224	0.114	0.048	0.330	0.089	97.779
7	3.28	2.352	0.436	0.147	0.052	0.290	0.332	96.390
8	2.42	2.048	0.119	0.077	0.009	0.167	0.262	97.319
9	3.51	2.934	0.209	0.096	0.067	0.205	0.108	96.381
10	3.02	2.319	0.479	0.115	0.021	0.091	0.652	96.324
11	2.05	1.457	0.392	0.114	0.006	0.079	4.398	93.554
Whole WS	2.90	2.323	0.238	0.084	0.070	0.180	0.370	96.734

[A] This is a total percentage of the wetland categories which does not include open water or upland areas
[B] Marsh with emergent vegetation
[C] Wetland with emergent woody vegetation
[D] Meadow with grassy vegetation in water
[E] Wet meadow in agriculture

Non-forested wetlands are being installed through the Farm Bill 2002 Wetlands Reserve Program (WRP) and with the Continuous Conservation Reserve Program (CCRP). These programs offer incentives for land with a farming history to be put into a wetland by altering drainage and planting some emergent vegetation. The WRP requires landowners to put their wetlands into 30-year or perpetual easements. CRP offers incentives if wetlands are installed with a 10-year contract. Landowners often find benefit in this program because the land entered may be too difficult to drain properly and the wildlife habitat created is desirable to them. These wetlands have been installed and can be counted as definite acres of wetland or becoming a wetland. Table 3-19 gives a county breakdown of the wetlands that have been installed from the WRP or the CCRP.

Table 3-19. County breakdown of wetlands installed through USDA Programs in the Upper Scioto River Watershed Project area

County	Wetlands (in WS) in WPR	Acres in WRP	Wetlands (in WS) in CCRP	Acres in wetlands in CCRP	Total acres of these wetlands
Allen	**0**	**0**	**0**	**0**	**0**
Auglaize	**0**	**0**	**0**	**0**	**0**
Crawford	**0**	**0**	**0**	**0**	**0**
Delaware	**1**	**15.0**	**0**	**0**	**15.0**
Hardin	**5**	**877.0**	**1**	**50.0**	**927.0**
Logan	**0**	**0**	**0**	**0**	**0**
Marion*	**9**	**695.0**	**8**	**46.0**	**741.0**
Union	**5**	**91.1**	**6**	**50.7**	**141.8**
Wyandot	**0**	**0**	**0**	**0**	**0**
Total	**20**	**1,678.1**	**15**	**146.7**	**1824.8**

*** Marion County also has one WHIP wetland in the watershed with 5 acres (added onto total)**
Source: County NRCS offices 2003

Lakes, Reservoirs, Ponds**:** All lakes, reservoirs, and ponds in the watershed are man-made, however, some unidentified natural kettle ponds may exist. Table 3-20 lists the information known of the lakes larger than 10 acres. There are several smaller private ponds throughout the watershed. Lakes and ponds in the watershed can be seen on the subwatershed maps (Map 3-12) as a part of the Ohio Wetland Inventory's Ohio open water class.

Table 3-20. Lakes greater than 10 acres

Lake name [A]	Acres	County	Owner	Use	Misc.
Big Island Wildlife Area (5 lakes)	**31.92 16.50 7.41 7.41 6.13**	**Marion**	**ODNR, Division of Wildlife**	**Hunting, birding, fishing**	**Surrounded by managed wetlands**
Ohio American Water Co. in Marion	**11.07**	**Marion**	**Ohio American Water Co.**	**Water storage for some Marion city drinking water**	**At Holland Rd. in west side of Marion**
O' Shaughnessy Reservoir	**778.94**	**Delaware**	**City of Columbus**	**(With Griggs Reservoir) Providing water for downtown, west and northwest Franklin County ski, boating, and fishing**	**Retention of 6.3 bil gal storage in 12.5 days (including the Griggs Reservoir)**
Quarry Park lakes	**20.6 28.2**	**Marion**	**City of Marion**	**Old gravel quarries**	**Northwest side of city**
Richwood Lake	**23.92**	**Union**	**Village of Richwood**	**Fishing for minors under 14, part of city park**	**North side of village**
Rushcreek Lake	**18.38**	**Logan**	**Private**	**Old quarry formerly a private campgrounds.**	**60 acres of the whole park.**
Salisbury Lake (a.k.a. French Lake)	**86.74**	**Hardin**	**City of Kenton**	**Fishing, boating, camping. Old quarry lake area now a park.**	**Outside city limits; southwest of city**
Unnamed in Delaware Co.	**12.26**	**Delaware**	**Private**	**Unknown use Delaware Co.; E. of Scioto River; N. of Dildine Rd., W. of Meredith Rd.**	
Unnamed in Hardin County	**12.65**	**Hardin**	**Private**	**Unknown use East of Mt. Victory; just North of CR 230**	
3 Unnamed lakes north of Prospect	**39.83 15.97 27.26**	**Marion**	**Private**	**Old quarry pits. Use unknown Just W. of Scioto River, N. of Prospect**	
2 (or more) Unnamed quarry lakes northwest Delaware Co.	**TBA TBA**	**Delaware**	**City of Columbus**	**2 up-land reservoirs for extra water storage.**	**Pre-construction in 2004**
Unnamed lake in Marion Co.	**10.06**	**Marion**	**Private**	**Unknown use West of the SR 4 and SR 23 intersection**	
Unnamed lake south of Green Camp	**10.13**	**Marion**	**Private**	**Unknown South of Green Camp just west of SR. 203**	
White Sulfur Lake	**28.37**	**Delaware**	**City of Columbus**	**Reserve water for Columbus; Use for private water ski club**	**West of O' Shaughnessy Reservoir**
[A] Only the lake names in bold font are the official names.					

Ground Water

Natural ground water resources vary considerably, both in quantity and quality, with differences in the local glacial and bedrock geology. In the Upper Scioto River Watershed Project area, the significant aquifers occur primarily in the underlying bedrock formations. There are other minor

aquifers in glacial deposits that are suitable for farm and domestic supplies. In some areas, human-induced alterations have played a role in determining the quality and quantity of the ground water resource.

Ground water is an extremely important drinking water resource in this watershed. Aquifers throughout the glacial deposits and underlying bedrock are tapped by private watershed residents throughout the area.

A statewide study estimating ground/surface water interactions on stream-flow from USGS gauging station and other data (including precipitation, soil-infiltration rates, and glacial geology) indicates the Scioto River and Little Scioto River are gaining streams and the regional aquifer is retaining water. Findings from this study presented in Table 3-21 indicate the groundwater recharge, discharge, and mean base-flow index (the percent of groundwater that makes up stream base flow) for three stations in the watershed with long-term continuous records. In addition to those three sites, this study also examined gauging stations with low-flow partial records. Fulton Creek (at the stream's crossing with SR 257 in Delaware County), is the only stream in this project's watershed in this group. Due to much less data at this site a different, less-precise regression model was employed finding the mean base-flow index range of 5-7% for this site (Dumouchelle, 2002).

Table 3-21. Ground/surface water interaction estimates

Station name	Ground water recharge	Ground water discharge	Mean base-flow index (%)
Scioto River at La Rue	**5 in/yr**	**4 in/yr**	**33.3**
Little Scioto River above Marion	**5 in/yr**	**4 in/yr**	**43.3**
Scioto River near Prospect	**5 in/yr**	**4 in/yr**	**38.2**
Source: Dumouchelle, 2002			

Aquifers (location, recharge rates, uses): Table 3-22 lists the names, thickness, and yield ranges for aquifers of unconsolidated material throughout the watershed. As explained in the glacial section, this information is sourced in a dataset of georeferenced unconsolidated aquifers. Maps of these aquifers have not been created for this inventory however these aquifers generally follow the glacial deposits which are noted in Map 16.

Table 3-22. Unconsolidated aquifer names, general thickness, and yield in the watershed

Name	Thickness (ft)	Yield range (GPM[1])
Bellefontaine Complex Aquifer	**> 100**	**5 to 100**
Bellefontaine Ground Moraine Aquifer	**25 to 100**	**5 to 25**
Bellefontaine Thin Upland Aquifer	**< 25**	**<5**
Big Island Lacustrine Aquifer	**25 to 100**	**<5 to 25**
Broadway End Moraine Aquifer	**25 to 100**	**<5**
Galion End Moraine Aquifer	**25 to 100**	**5 to 25**
Galion Ground Moraine Aquifer	**25 to 100**	**5 to 25**
Galion Thin Upland Aquifer	**< 25**	**<5**
Jackson Center Ground Moraine Aquifer	**25 to 100**	**5 to 25**
Jackson Center Outwash/Kame Aquifer	**25 to 100**	**25 to 100**
Killdeer Plains Ground Moraine Aquifer	**25 to 100**	**5 to 25**
Lima Complex Aquifer	**> 100**	**5 to 25**
Lima End Moraine Aquifer	**25 to > 100**	**5 to 25**
Lima Ground Moraine Aquifer	**25 to >100**	**<5 to 25**
Lima Lacustrine Aquifer	**25 to 100**	**5 to 25**
Lima Thin Upland Aquifer	**< 25**	**<5**
Miami River Buried Valley Aquifer	**25 to >100**	**5 to 100**
Ostrander Thin Upland Aquifer	**< 25**	**<5**
Powell End Moraine Aquifer	**25 to > 100**	**5 to 25**
Richwood Ground Moraine Aquifer	**25 to 100**	**<5 to 25**
Richwood Thin Upland Aquifer	**< 25**	**<5**
Scioto Alluvial Aquifer	**< 25 to 100**	**<5 to 100**
Scioto Buried Valley Aquifer	**25 to > 100**	**5 to 100**
Scioto Outwash/Kame Aquifer	**25 to 100**	**25 to 100**
St Johns End Moraine Aquifer	**25 to > 100**	**5 to 100**
St Johns Outwash/Kame Aquifer	**> 100**	**25 to 100**
W Columbus Complex Aquifer	**> 100**	**5 to 25**
W Columbus Thin Upland Aquifer	**< 25**	**<5**
Waldo Ground Moraine Aquifer	**25 to 100**	**<5 to 25**
Waldo Outwash/Kame Aquifer	**< 25**	**<5 to 25**
Waldo Thin Upland Aquifer	**< 25**	**<5**

[1] GPM= Gallons per minute
Source: Unconsolidated aquifer dataset

Most likely a majority of the personal drinking water wells within the watershed are drilled and cased through the glacial deposits into underlying bedrock. However from a random sampling of the well logs throughout the watershed some, mostly older wells, only tap the unconsolidated glacial material. Most of these wells are shallow, however, as seen above in Table 3-1 of the Glacial History section. However, some very thick tills do exist in the watershed. Wells in thick till tap into a local unconsolidated aquifer that, in the case of the well logged in Table 3-1, is very well confined. Two other well log examples for this watershed are shown with Tables 3-23 and

3-24. These well logs show the depth and formations encountered from a well in thin-till northwestern Delaware County and a well in western Marion County respectively.

Table 3-23. Example of a northwestern Delaware County well

Well Log (Well # 489241) Well casing 28 ft.		
Formation description	**From (ft)**	**To (ft)**
Clay	**0**	**19**
Limestone	**19**	**42**
Source: ODNR, 2003		

Table 3-24. Example of a western Marion County well

Well Log (Well # 283667) Well casing 44 ft.		
Formation description	**From (ft)**	**To (ft)**
Yellow clay	**0**	**17**
Blue clay	**17**	**35**
Sand	**35**	**37**
Hardpan	**37**	**41**
Blue limestone	**41**	**65**
Brown limestone	**65**	**71**
Source: ODNR, 2003		

Flow Regime:
Georeferenced ground water potentiometric surface maps, maps that show the ground water flow gradient, for the regional carbonate aquifer and general glacial flow, have been obtained for use in this project. These lines indicate the regional and glacial ground water flow moves generally with the topography similar to the surface water (see the topography Map 13). The flow does not directly follow the turns of the streams however; rather it has more subtle direction changes. A map of these data has not been included in this inventory, but can be used in planning for any type watershed project.

Ground water quality is affected by geologic, climatic, and human-induced factors. Geologic factors include the physical and chemical composition of source materials and susceptibility to pollution or contamination from outside sources. The physical and chemical characteristics of groundwater as well as the quantities that can be withdrawn from individual wells have a direct bearing on groundwater use and suitability. The relatively high purity of groundwater in respect to biological quality and the ready availability at the point of use have resulted in extensive groundwater development through individual domestic water systems. Some of the mineral constituents in groundwater may account for undesirable characteristics. Most of the groundwater in this watershed has a high degree of hardness due to dissolved calcium and magnesium salts. Other mineral substances in certain waters may cause undesirable tastes and odors, staining, corrosiveness and scale formation in water systems. In most instances, however, these objectionable properties can be remedied by softening and other conventional water treatment processes.

IV. Land Use

Land cover data from Landsat satellite imagery and other surveys are presented in this section. The Ohio State University's Center for Mapping has recently made available draft data for the Ohio Gap Analysis Project, Ohio Land Cover map with georeferenced land cover data. These data were created using the Landsat satellite system from 1997 to 2002 and various ancillary data including some field testing. This most recent land cover data focus on a high level of classification of natural areas. Developed and agricultural areas are more coarsely subdivided than natural areas and therefore not as helpful as the following section will outline. A state land cover dataset from 1994 Landsat data is more widely used in Ohio and is also referred to in this section. These two land cover datasets, representing different time periods, are not comparable for trend analysis. This is because the manner of categorizing developed and agriculture land differs in these two datasets.

The protected areas in this section are all information collected by the watershed project. The status and trends of land use in this section contains the least amount of information for many reasons discussed below.

Land Cover Description

Table 3-25 includes a general summary of the land cover data for the subwatersheds, and watershed as a whole, from the 1997-2002 Ohio Land Cover dataset (see Land cover data for dataset citation). A land cover map for the watershed has been created for these data; Map 18. Official and detailed definitions of the natural area classifications are outlined in the document International Ecological Classification Standard: Terrestrial Ecological Systems of the United States Ohio GAP Subset II (NatureServe 2003). Definitions of these land uses except for Floodplain, Interior Wet Flatwoods, and SS – WM & AF are explained in the subsections below. The floodplain classification in this dataset, formally known as North-central interior floodplain, is summarized as the following environment, "This ecological system occurs in floodplains of medium to large rivers. It primarily is found on alluvial soils ranging from sandy to very dense clays." (NatureServe 2003). The authors of Ohio dataset have noted that defining the floodplains in western Ohio was difficult (Spener 2004). It is therefore inferred that some floodplain classifications are incorrect. The majority of the floodplain defined areas in Map 18 are visibly covered up by the stream lines. The Interior Wet Flatwoods, and SS – WM & AF land cover types are described in the Wetlands subsection of the Surface Water section above.

Table 3-25. Percentages of land cover type for 1997-2002

	Percent (%) of land covers in subwatershed							
Subws	**Open Water**	**Row Crop**	**Grass-land**	**Developed**	**Various upland wooded ***	**Floodplain**	**Interior Wet Flatwoods**	**SS – WM & AF [t]**
1	**0.06**	**74.52**	**12.41**	**1.91**	**5.82**	**5.07**	**0.11**	**.11**
2	**0.31**	**73.66**	**13.06**	**3.07**	**6.17**	**3.37**	**0.17**	**.19**
3	**0.16**	**69.00**	**14.59**	**6.29**	**5.08**	**3.79**	**0.61**	**.49**
4	**0.50**	**71.99**	**11.76**	**3.08**	**5.79**	**4.13**	**1.79**	**.95**
5	**0.12**	**73.03**	**14.13**	**1.66**	**5.91**	**3.57**	**0.93**	**.66**
6	**0.06**	**78.81**	**7.84**	**4.20**	**5.30**	**2.84**	**0.53**	**.41**
7	**0.37**	**57.62**	**12.29**	**20.15**	**5.38**	**3.09**	**0.67**	**.44**
8	**0.31**	**78.56**	**12.21**	**2.38**	**3.45**	**1.95**	**0.69**	**.44**
9	**0.16**	**81.69**	**9.98**	**1.37**	**3.08**	**2.34**	**0.80**	**.58**
10	**0.80**	**56.21**	**21.81**	**5.01**	**7.56**	**5.22**	**2.13**	**1.25**
11	**4.54**	**44.27**	**25.51**	**10.43**	**6.43**	**5.45**	**1.98**	**1.39**
Entire	**0.42**	**72.05**	**13.02**	**4.25**	**5.31**	**3.59**	**0.81**	**.54**

*** - Includes three land cover types (explained in Forest section below): 1) North-Central Interior Dry-Mesic Oak Forest and Woodland, 2) North-Central Interior Dry Oak Forest and Woodland , and 3) North-Central Interior Beech-Maple Forest.**

[t] - Includes two land cover types: 1) North-Central Interior Shrub Swamp - Wet Meadow and Marsh, and 2) North-Central Interior Shrub-Graminoid Alkaline Fen

Source: 2002 Ohio Gap Analysis Project, Ohio Land Cover Map.

Table 3-26 contains a subwatershed breakdown of land cover classification from the 1994 Landsat land cover dataset. As mentioned above, this dataset is not comparable to the more recent land cover data above. Each of these categories is discussed in the following sections except for 'shrub/scrub'. 'Shrub/scrub' is defined as: young, sparse, woody vegetation; typically areas of scattered young tree saplings (Landsat, Land use data, 1994).

Table 3-26. Percentages of land cover type from the 1994

Sub-ws	Open Water	Agriculture / Open Urban Areas	Shrub/ Scrub	Urban	Wooded	Non-Forested Wetlands	Barren
1	**0.08**	**91.74**	**0.42**	**0.14**	**7.19**	**0.43**	**0.00**
2	**0.23**	**88.50**	**0.71**	**0.34**	**10.02**	**0.20**	**0.00**
3	**0.04**	**87.21**	**0.91**	**1.54**	**10.03**	**0.25**	**0.03**
4	**0.32**	**86.59**	**0.83**	**0.21**	**10.74**	**1.30**	**0.02**
5	**0.10**	**86.89**	**0.66**	**0.10**	**11.63**	**0.61**	**0.01**
6	**0.09**	**88.23**	**0.81**	**0.76**	**8.90**	**0.81**	**0.40**
7	**0.59**	**78.32**	**1.88**	**6.93**	**10.85**	**1.34**	**0.08**
8	**0.40**	**91.18**	**0.57**	**0.27**	**7.08**	**0.45**	**0.05**
9	**0.19**	**92.09**	**0.39**	**0.15**	**6.52**	**0.60**	**0.07**
10	**0.88**	**76.62**	**1.53**	**0.14**	**18.22**	**0.81**	**1.80**
11	**4.47**	**73.60**	**1.16**	**1.14**	**18.37**	**0.76**	**0.50**
Entire	**0.41**	**87.32**	**0.78**	**0.79**	**9.91**	**0.65**	**0.14**
Source: 1994 Landsat land cover dataset							

Urban, General**:** Little is explained about the developed land cover areas in the 2002 Ohio Land Cover dataset. The creators of this dataset explain that cities, village, and towns were intended to be included in this class. It is stated that this class is in general "somewhat overstated" because of its classification manner, and it is planned to be subdivide in further drafts of the dataset (Spencer, 2004). Areas that are considered urban in the Landsat 1994 data are defined as, "open impervious surfaces: roads, buildings, parking lots and similar hard surface areas which are not obstructed from aerial view by tree cover". Table 3-27 includes the two different dataset's land cover subwatershed breakdown for urbanized areas and also includes the incorporated cities and villages. A full list of municipal areas (townships, incorporated and unincorporated cities and villages can be found in Appendix A1. The much higher percentage from the 2002 dataset is evident on Table 3-27. This is because the 1994 analysis in general did not include grass lawns and fields in urban areas as urban. On Map 18 areas such as the City of Marion are a solid gray color whereas a map of the 1994 data (not included in this report) shows a very fragmented city with urban and the 'agriculture and open urban lands' classification. Because the 2002 dataset does not group urban areas with agricultural areas it is likely more useable for watershed planning.

Table 3-27. Percentages of Urban and developed land cover from two datasets

Sub-ws	%Urban 1994*	%Developed 2002 t	Cities and incorporated villages
1	0.14	1.91	McGuffey, Roundhead, Alger
2	0.34	3.07	western edge of Kenton
3	1.54	6.29	Kenton
4	0.21	3.08	LaRue, Hepburn, Green Camp
5	0.10	1.66	Rushsylvania
6	0.76	4.20	Monnett, small amount of Bucyrus
7	6.93	20.15	Marion
8	0.27	2.38	Prospect, part of Radnor
9	0.15	1.37	Richwood, Byhalia, part of Radnor
10	0.14	5.01	none
11	1.14	10.43	Shawnee Hills
Entire	0.79	4.25	All of the above
* 1994 Landsat Land Cover data t 2002 Ohio Land Cover data			

Urban, Impervious Surfaces**:** Surfaces that do not allow water to infiltrate them, such as blacktop, concrete, roofs, etc. are considered impervious. No direct information has been collected about impervious surfaces for this watershed project. However the Landsat 1994 urban land cover's definition, in the subsection above, refers to indicated impervious surface areas (Table 3-27). Subwatershed 7, which includes most of the City of Marion, is the only subwatershed higher than 2%.

Forest**:** The forests of the upper Scioto River watershed are comprised of roughly 40% each of the oak-hickory and maple-beech forest types with 20% of the elm-ash-cottonwood forest. About 80% of this forest is younger than 40 years of age (Ervin, 2003). Forests are not a large economic resource in the watershed as they have been in its cultural history since much has been cleared for agricultural and residential land uses. Table 3-28 shows the forested land covers 1994 and 2002 land covers. In this table 2002 land cover is broken down into the 3 classifications from what is called "various upland wooded" in Table 3-25 above. These land cover classes are defined in the Ohio Gap subset report that can be downloaded (see NatureServe 2003 in works the citied). The floodplain classification and a total of wooded 2002 land classes are also included in Table 3-25. While the 1994 and 2002 data can not be compared to one another because of the different classification techniques, similar highs and lows of wooded subwatersheds exist. The exception to this is subwatershed 1.

Table 3-28. Percentages of wooded areas

	1994 *	2002 Land cover t				
Sub-ws	%Wooded	% Dry-Mesic Oak Forest & Woodland A	% Dry-Oak Forest and Woodland B	% Beech-Maple Forest C	% Flood-plain D	% Total 2002
1	7.19	0.99	4.51	.33	5.07	10.90
2	10.02	0.84	5.15	0.19	3.37	9.55
3	10.03	0.96	3.93	0.18	3.79	8.86
4	10.74	0.67	4.96	0.16	4.13	9.92
5	11.63	0.55	5.23	0.13	3.57	9.48
6	8.90	0.19	5.05	0.06	2.84	8.14
7	10.85	0.30	5.00	0.07	3.09	8.46
8	7.08	0.22	3.11	0.12	1.95	5.40
9	6.52	0.15	2.85	0.07	2.34	5.41
10	18.22	0.40	6.96	0.20	5.22	12.78
11	18.37	0.40	5.88	0.15	5.45	11.88
Entire	9.91	0.55	4.60	0.16	3.59	8.90

A - North-Central Interior Dry-Mesic Oak Forest and Woodland
B - North-Central Interior Dry-Oak Forest and Woodland
C - North-Central Interior Beech-Maple Forest
D - North-central interior floodplain

Source: * 1994 Landsat Land Cover data t 2002 Ohio Land Cover data

Lawrence Woods is a preserve of mature forest and open lands 4 miles south of Kenton managed by ODNR's Division of Natural Areas and Preserves. This 1,059 acre preserve is known for the large trees and rare plant and animal species. With the border of Subwatersheds 2 and 3 cutting through this preserve much of it is on higher land relative to its surroundings having an oak-hickory forest type on the highest areas. Some substantial buttonbush swamps are within the forest in areas which are inundated for most of the year. The Heart-leaf plantain (*Plantago cordata*) occurring in this preserve is only known in five sites in the state. Also, the grove sandwort (*Arenaria lateriflora*) is a state-listed species present in the preserve.

Agriculture, General**:** Agriculture is the largest land use of this watershed. Table 3-29 shows the subwatershed breakdown for agricultural land uses for the two datasets. The 2002 Ohio Land Cover data has two classes that include agricultural land covers. The Row crop class is indicated by the authors not to include hayfields. The Grasslands class includes natural areas such as prairies, CRP land, and human disturbed grass covered areas such as hayfields (Spencer, 2004). The 1994 Landsat land cover data defines agriculture/open areas as, "cropland and pasture; parks, golf courses, lawns and similar grassy areas not obstructed from view by tree cover." Unfortunately these datasets are not comparable for the time period for their time interval. This is because the 1994 agriculture / open urban lands class includes lawns that lie within developed/urban areas. The 2002 data has developed areas in large blocks categorized as developed areas (such as the City of Marion on Map 18).

Table 3-29. Percentages of agricultural and open land

	1994 *	2002 t		
Sub-ws	**%Ag/open**	**% Row Crops**	**% Grassland**	**%Total 2002**
1	**91.74**	**74.52**	**12.41**	**86.93**
2	**88.50**	**73.66**	**13.06**	**86.72**
3	**87.21**	**69.00**	**14.59**	**83.59**
4	**86.59**	**71.99**	**11.76**	**83.75**
5	**86.89**	**73.03**	**14.13**	**90.16**
6	**88.23**	**78.81**	**7.84**	**86.65**
7	**78.32**	**57.62**	**12.29**	**69.91**
8	**91.18**	**78.56**	**12.21**	**90.77**
9	**92.09**	**81.69**	**9.98**	**91.67**
10	**76.62**	**56.21**	**21.81**	**78.02**
11	**73.60**	**44.27**	**25.51**	**69.78**
Entire	**87.32**	**72.05**	**13.02**	**85.07**
Source: * 1994 Landsat Land Cover data t 2002 Ohio Land Cover data				

Agriculture, Crop Type**:** Soybeans are the most common crop in this watershed with corn a close second. Wheat and hay are the two other important crops. Showing crop type data for a watershed that includes parts of many counties is difficult because crop type data are not available on a township basis. Table 3-30 gives the acres in the top four crops in each of the watershed's counties for 2002 (ODA, 2002). This table also gives the percentage of each crop in each county.

Table 3-30. Acres in crops (% of county area in crop in 2002)

County	Corn (%)	Soy (%)	Wheat (%)	Hay (%)
Allen	**56,400 (22)**	**81,600 (31)**	**15,300 (6)**	**5,300 (2)**
Auglaize	**55,600 (22)**	**95,700 (37)**	**20,800 (8)**	**11,300 (4)**
Crawford	**68,400 (27)**	**98,900 (38)**	**23,500 (9)**	**7,000 (3)**
Delaware	**34,500 (12)**	**75,800 (26)**	**11,200 (4)**	**8,700 (3)**
Hardin	**66,000 (22)**	**118,800 (39)**	**18,700 (6)**	**7,800 (3)**
Logan	**56,300 (19)**	**92,000 (31)**	**10,400 (3)**	**12,900 (4)**
Marion	**51,600 (20)**	**111,500 (43)**	**15,100 (6)**	**5,100 (2)**
Union	**42,000 (15)**	**111,400 (40)**	**15,500 (6)**	**10,100 (4)**
Wyandot	**57,600 (22)**	**98,000 (38)**	**22,800 (9)**	**3,300 (1)**
Source: ODA, 2002				

Agriculture, Rotations**:** Crop rotations alternating corn to soybeans every year occur in about 65% of the watersheds grain fields. About 20% of the grain fields rotate a year of corn to two years of soybeans, and about 15% of the fields have one season of wheat every five years into a corn and soybeans alternating rotation.

Agriculture, Livestock Inventory**:** Livestock operations are present in the watershed. Table 3-31 shows the amount of livestock in each watershed county at the most recent livestock inventory

(ODA, 2002). Some large dairy, hog, and egg operations are present in the watershed. These are included in the Water Resource Quality section below. Poultry operations do exist in this watershed, however they are not included in Ohio Department of Agriculture's Livestock Inventory.

Table 3-31. Amount of livestock in watershed counties

County	Cattle & Calves (1/01/03)	Milk Cows (1/01/03)	Hogs & Pigs (12/01/03)	Sheep & Lambs (1/01/03)
Allen	**8,300**	**-**	**35,600**	**-**
Auglaize	**20,500**	**6,400**	**41,300**	**1,700**
Crawford	**9,900**	**1,200**	**42,400**	**1,600**
Delaware	**5,300**	**-**	**16,000**	**1,300**
Hardin	**10,000**	**2,200**	**39,700**	**2,000**
Logan	**14,300**	**2,800**	**18,500**	**2,400**
Marion	**8,00**	**1,600**	**25,100**	**2,600**
Union	**11,900**	**1,400**	**24,000**	**2,600**
Wyandot	**6,700**	**-**	**49,200**	**-**
Source: ODA, 2002				

The federal Farm Service Agency (FSA) Livestock Compensation Program of 2003 for Ohio was created due to the drought in 2002. Because of this program specific livestock numbers for any part of the watershed can be learned by working with FSA. If a geographic specific implementation project requires knowledge of livestock quantities this resource is available.

Agriculture, Grazing**:** Some grazing occurs throughout the watershed, though it is not widespread. Information about livestock grazing in stream channels can be found in the section Channel and Floodplain Condition.

Agriculture, Chemical Use Patterns**:** From the 2002 Ohio Agricultural Statistics and Ohio Department of Agriculture Annual Report, fertilizer product and nutrient ton deliveries for July 2001 to June 2002 have been determined. These numbers can be found in Table 3-32.

Table 3-32. Fertilizer product and nutrient ton deliveries by county, July 2001 to June 2002

County	Product Tons	Nitrogen Tons	P_2O_5 Tons	K_2O Tons
Allen	**22,779**	**4,711**	**1,695**	**1,687**
Auglaize	**34,918**	**5,916**	**2,876**	**4,061**
Crawford	**54,232**	**10,151**	**4,632**	**8,046**
Delaware	**17,611**	**2,514**	**1,715**	**2,940**
Hardin	**26,097**	**5,928**	**1,840**	**2,841**
Logan	**9,264**	**1,685**	**515**	**141**
Marion	**64,945**	**9,965**	**5,341**	**10,428**
Union	**72,395**	**11,845**	**1,593**	**2,312**
Wyandot	**42,001**	**7,908**	**4,280**	**6,978**
Source: ODA, 2002				

Agriculture, Irrigation**:** No irrigation is necessary in this watershed due to the amount of precipitation and relatively poorly drained soils.

Open Water**:** Information about lakes and wetlands in the watershed can be found in the Surface Water sub-section of the Water resource section of this inventory.

Non-forested Wetlands**:** Amount of land covered by non-forested wetlands can be found in the Surface Water sub-section of the Water resource section in this inventory.

Barren**:** The 2002 Ohio Land Cover Map has a non-natural class for barren lands however none of this classification was made for the watershed. The authors of this dataset indicate that there is a difficultly separating barren areas from developed areas (Spencer, 2004). The 1994 Landsat land cover data has the barren classification categorized as strip mines, quarries, sand and gravel pits, and beaches. It is noted that the Landsat on occasion classifies some urban areas as barren as well as some barren areas as urban. Subwatershed 10 (Bokes/Mill Confluence) has a higher amount of barren area due to a stone quarry in that relatively small subwatershed.

Table 3-33. Percentage of barren land

Sub-ws	Barren '94*
1	0.00
2	0.00
3	0.03
4	0.02
5	0.01
6	0.40
7	0.08
8	0.05
9	0.07
10	1.80
11	0.50
Entire	0.14
* 1994 Landsat land cover data	

Protected Lands

There are no known lands that have permanent protection status through a land trust or private foundation in the watershed. However, several village and city parks along with parks and preserves held by other municipalities and private citizens exist. The Big Island Wildlife Area managed by the Division of Wildlife which lies on the north side of the Scioto River in west-central Marion County and Lawrence Woods managed by the Division of Natural Areas and Preserves in Hardin County are both large natural areas in this watershed . A map of this wildlife area is attached in Appendix 3C.

Table 3-34 is a list of parks and preserves that offer some areas with natural vegetation. This list is not comprehensive of the areas owned privately or publicly and considered to be a park or preserve in the watershed. The subwatershed maps (Map 3-12) show, as points, the location of

all of the parks and preserves listed on Table 3-34. Smaller primarily recreation city parks are noted in Table 3-35.

Table 3-34. Parks or other land with some areas of natural vegetation

Name	Owner	Acres	Co	Sub WS	Uses ; Location information
Big Island Wildlife Area	**ODNR-Div. of Wildlife**	**5,032**	**Marion**	**4**	**Hunting, fishing, birding, many parking areas; SR 95 west of the City of Marion**
Lawrence Woods	**ODNR- Div. of Natural Areas and Preserves**	**1,059**	**Hardin**	**2, 3**	**Preserve of mature forest and open lands, several endangered and threatened plants; 4 mi. south of Kenton**
Mountain Lake Camp	**Private**	**Unknown**	**Logan**	**5**	**Former private campground. Current use unknown, includes old quarry Rushcreek Lake which Rush Creek flows through.**
Price Preserve	**Private**	**~ 5**	**Delaware**	**10**	**Hiking, picnicking with permission**
Park, village of Prospect	**Village of Prospect**	**~40**	**Marion**	**8**	**Battle Creek runs through south side of park with good stream access, ball fields, some part being farmed currently**
Quarry Park	**City of Marion**	**83 N. lake is 20.6 S. lake is 28.2**	**Marion**	**7**	**Two former quarry lakes, much of the park's land is in natural vegetation, walking trails, 2 shelters; NW side of city.**
Richwood Lake Park	**Village of Richwood**	**Park unknown Lake is 23.92**	**Union**	**9, 5**	**Wooded on the N, E, &S. sides of lake, ball fields, several shelter areas**
Salisbury Park (French Lake),	**City of Kenton**	**200 Lake ~80**	**Hardin**	**2**	**Hunting, birding, camping, fishing, paddle boats, bridge to island is an old culvert, have a shelter; out of town to the SW.**
Scioto Township Park	**Scioto Township, Delaware Co.**	**Unknown**	**Delaware**	**10**	**Mowed and wooded walking trails.**
Silver Creek Preserve	**Hardin SWCD**	**Unknown**	**Hardin**	**2**	**Meeting house, natural vegetation around stream, SR 67.**

Table 3-35 Smaller primarily recreational city parks

Name	Owner	Acres	County	Uses; Location information
Alger Park	**Village of Alger**	**Unknown**	**Alger**	**Recreation fields**
Bailey Park	**City of Kenton**	**10**	**Hardin**	**Natural wetlands, walking area; Near city pool, off SR 309.**
Baldauf Park	**City of Marion**	**2**	**Marion**	**Playground**
Blake St. Park	**City of Marion**	**3**	**Marion**	**Playground, basketball court**
Chateau Park	**City of Marion**	**9**	**Marion**	**Playground, volleyball court**
Cherry St. Park	**City of Kenton**	**½**	**Hardin**	**Basketball courts.**
Garfield Park	**City of Marion**	**16**	**Marion**	**Playground, basketball and ball fields, shelter**
Glenwood Park	**City of Marion**	**20**	**Marion**	**Walking trail, ball fields**
Kennedy Park	**City of Marion**	**26**	**Marion**	**Play area, ball fields, shelter**
LaRue Area Park	**Village of La Rue**	**23**	**Marion**	**Ball fields; outside village limits, N. of town;**
Lincoln Park	**City of Marion**	**89**	**Marion**	**Play area, ball fields, 5 shelters, swimming pool**
McKinley Park	**City of Marion**	**23 lake is .79**	**Marion**	**Has lake that outlets to Little Scioto River, basketball and volleyball courts, playground, fishing, 2 shelters; S. Prospect St and Lake St.**
Martin Luther King Park	**City of Marion**	**4**	**Marion**	**Playground, basketball court, 2 shelters**
Patterson Park	**City of Marion**	**5**	**Marion**	**Playground, ball field, shelter**
Pioneer Park	**City of Kenton**	**1**	**Hardin**	**Old cemetery**
Roosevelt Park	**City of Marion**	**3**	**Marion**	**Playground, basketball court**
Sawyer-Ludwig Park	**City of Marion**	**110**	**Marion**	**Playground, ball fields, 2 shelters, 3 building leased to service clubs**
Skate Park	**City of Kenton**	**½**	**Hardin**	**Skateboarding park.**
Veterans Park	**City of Marion**	**12**	**Marion**	**Veterans Memorial Park Committee keeps up capital improvements.**
Wharton Park	**City of Kenton**	**15**	**Hardin**	**On Scioto River, no shelter, picnic tables, rec. fields, small wooded area; off S. Layton St**

Status and Trends (Historical, Current, Projected)

No formal information has been gathered about the trends of land use. As stated above, the 1997 and 2002 land cover data can not be compared due to the manner of classification. The majority of land is used for agriculture and as in the past century this will likely not change. However with increased amount of conservation incentives for field/watercourse buffers a qualitative projection of increasing grass and wooded buffer strips can be made. Suburban development in the southern part of the watershed (Subwatersheds 11, 10, and part in 9) is an obvious presence.

B. Cultural Resources

The history of the upper Scioto River watershed is entrenched in hunting and farming. Native Americans used the Scioto River valley as a rich hunting land as far back as history has recorded (ODNR, 1977). The name 'Scioto' is believed to likely be a variation on the Wyandot word "oughscanoto" for "deer." Some earlier writers have noted that this word could be more closely translated to "hairy river" based on the large quantities of deer hair left on the surface by the thousands of deer who came down to the river in molting season (Lentz, 2002). Artifacts of tribes from all over Ohio, Michigan, and Pennsylvania have been found indicating winter deer hunting throughout the Scioto Valley. Natives Americans cultivating corn fields along the Scioto River are also noted by the earliest explorers (ODNR, 1977).

From the start of the Revolutionary War until the 1797, attempts to settle Ohio were met with varying resistance from Native American tribes. The Treaty of Paris, which ended the Revolutionary War in 1783, made Ohio part of the United States' Northwest Territory. At that time Virginia reserved the land between the Scioto and Little Miami Rivers to be given as a reward to its servicemen. This land became known as the Virginia Military District (VMD). The land to the east (and north) of the Scioto River was subdivided into rectangular townships and sections and then sold to pioneers. In 1790, when the VMD became available for servicemen to claim land, very little organization was enforced in tract dimensions and coordination. Because of this the roads and property lines to the west of the Scioto River have an appearance of a "crazy-quilt" today. The increasing frequency of conflicts between the Native Americans across the Ohio countryside were halted due to 1797's Battle of Fallen Timbers. From this came the Treaty of Greenville removing all Native American's land claims from Ohio (ODNR, 1977).

Land of dense wet hardwood forests that covered nearly the entire watershed (Map 17) were cleared for farming throughout the 19th Century. The clearing of these forests was often the first tasks of settlers. Much of the timber from these earliest clearings was used as charcoal for furnaces. By 1884, 82% of the trees were gone from the watershed. The trees that remained after initial settlement maintained a steady lumber source for many years. Native Americans had loosely managed forests for optimum game reserves, and this game continued to be a large source of substance for early settlers. Subsurface drainage for farming is recorded in Ohio as far back as the start of the 19th Century. Subsurface drainage and artificial open drainage channels continued to be created throughout the 19th and 20th centuries. With the vast removal of tree cover and tillage of fields, very damaging soil erosion developed in the upper Scioto River watershed, as in much of the United States. An extensive flood in 1913 caused the detrimental effect of these practices to be realized. Throughout the following 50 years, soil conservation and

flood control practices became firmly established and reduced the economic risk of farming the watershed (ODNR, 1977)

Industry in the upper Scioto River Watershed is present at a higher concentration in the cities of Marion and Kenton. Former industry sites create some of the most polluted conditions in the watershed. A notable example of this is the Baker Wood Preserving Company waste. Through the middle of the 20th Century the City of Marion was an important railroad crossroads in Ohio and thus grew its industrial base. The Baker Wood Preserving Company used creosote and other petroleum products to treat railroad ties and other wood products. The chemical waste from this site was discharged directly into a combined sewer that drained to a ditch which entered into the Little Scioto River less than half a mile away. The U.S. EPA is currently in the process of a stream sediment cleanup of the Little Scioto River and the tributary the Baker Wood Preserving Company's effluent went directly to. More information about this cleanup is in the Previous and Complementary Efforts section of this inventory.

With more precise permitting of industrial operations in the watershed, pollution concerns from current industrial processes and waste water treatment plants are less of a problem than they once were. The agricultural culture of this watershed has brought about some of the water quality concerns. Sections of the watershed in Hardin and Marion counties are listed as impaired by non-point source pollution for aquatic life uses due to agriculture and hydromodification (which includes channelization, dredging, bridge construction and stream bank modification). Historically, maximizing drainage with the externality of environmental degradation has been necessary to achieve economic prosperity given available technologies.

Industrial complexes in the watershed with permits to discharge effluent into surface water are discussed in the Water Resource Quality section of this inventory. Also agricultural complexes with permits from the Ohio Department of Agriculture are included in that section.

Sites of Historical, Cultural or Recreational Significance

In addition to the recreational significance of the parks listed in the Protected Lands sub-section of the land use section in this inventory there are several important historical and cultural sites in the Upper Scioto River Watershed Project area.

Fort McArthur (Hardin County):

This was a stockade erected during the War of 1812 in the northwest corner of Buck Township on the south bank of the Scioto River near present day Kenton.

Scioto Marsh (Hardin County):

The Scioto Marsh in west central Hardin County is the county's largest area of ancient lake plains; about 16,000 acres. This area was once a refuge for passenger pigeons, mastodons, and mentioned in the History of Hardin County, the 'legendary Giant Snake' (Warner, 1883). Once drained, a project that started in 1859, this area became a very rich agricultural resource with its high organic soils. For a time it was known as the Onion Capital of the World with the higher value 'muck crops' such as carrots, potatoes, and radishes. In support of the onion workers of

the Scioto Marsh, the American Federation of Labor (AFL) was part of creating the first chartered agricultural workers' union. In July of 1934 poor working conditions and low wages caused hundreds of workers in the Scioto Marsh to leave the fields and strike (AdaNet 2003). The Hardin SWCD has been successful in promoting landowners to grow lines of wind break trees in high clay soils to reduce wind erosion. Figure 3-4 is a picture of the Ohio Historical Societies' Historic Marker on SR 195; on land that once made up the Scioto Marsh.

Figure 3-4. Scioto Marsh Historic Marker

The Hardin County Courthouse (Hardin County):

The Hardin County Courthouse was built in the early twentieth century and is on the National Register of Historic Places. Standards, flags, equipment and weapons from the Civil, Spanish-American and First World wars are on display. A barreled vaulted skylight, over 1000 square feet of leaded stained glass are visible on the second floor with two large murals visible from the third floor.

The "Old Blockhouse" Site / Greenville Treaty Line (Marion County):

An Ohio Historical Society marker is posted on State Route 203 in Marion County north of the village of Green Camp. The text reads:

> "The U.S. Army built a two-story blockhouse on a nearby hill during the War of 1812. The blockhouse was one of a series of such structures erected along the Greenville Treaty line to guard against Native Americans who supported the British during the conflict. After the war, Daniel Markley, one of Green Camp Township's first white inhabitants, settled near the blockhouse.
>
> In 1963, the graves of twenty-five prehistoric Glacial Kame Indians and six white settlers were discovered near the blockhouse site. Seventeen War of 1812 veterans and eight others were also buried there. These bodies were subsequently removed and reinterred at Green Camp Cemetery. An abandoned right-of-way of the Erie Railroad, Dayton line, also passes through the area. Prairie grasses that once dominated parts of Marion County can still be found in the vicinity."

Native American Mounds (throughout):

Various Native American burial mounds from the ancient Native American cultures of the Adena, Hopewell, and Late Woodland, known as the Mound Builders, can be found throughout the state. The Ohio Historical Society has georeferenced the locations of numerous burial mounds throughout the state. The amount and location of these mounds have not been disclosed to this watershed project because most are on private property and unguarded (Ruffini, 2003). It is assumed if a project is planned for specific ground the historical society could be contacted to ensure no mounds or other artifacts are in proximity.

Harding Home (Marion County):

Warren G. Harding's "front porch campaign" was launched in 1920 in the City of Marion. Articles from Harding's successful White House campaign and the lifestyle of the first family are on display at the Victorian Home which has been restored with nearly all original furnishings. The Ohio Historical Society maintains the home and provides tours.

Figure 3-5. Harding Tomb in Marion County

(Picture property of Ohio Historical Society)

Harding Tomb (Marion County):

The Hardin Tomb is located on the south side of the City of Marion containing the remains of President and Mrs. Harding. The circular monument is made of white marble on a 10 acres ground. The Ohio Historical Society maintains this site (Figure 3-5).

C. Physical Attributes of Streams and Floodplain Areas

This section describes a variety of factors that contribute to habitat, recreation, and other land uses of the watershed as they relate to water quality and biodiversity.

I. Early Settlement Conditions

During the time of earliest settlement the entire watershed exhibited a distinctly different appearance than its present day features. In the upper reaches of the watershed there existed no well defined stream channel until around 1916 when channelization of the Scioto Marsh area began. Throughout the watershed there were no constructed levees or constructed wetlands or upground water impoundments to alter the natural flow of surface runoff. Fencerows and other property boundaries had not yet been established. Landscape or geomorphic units were unaltered by land clearing and the subsequent surveying of land into "unnatural" parcels, such as squares, rectangles, and other angular units of ownership or management. Rainfall and snowmelt had no artificial means of removal, such as surface and subsurface drainage or constructed

channels. Most of the soils throughout the watershed, such as Blount and Pewamo, were so wet during the growing season that crops could not be grown without artificial drainage.

Humans have dramatically altered and managed the landscape since early settlement in an attempt to meet their needs and improve their existence. In many areas the natural stream watercourses and their adjacent floodplain have undergone extensive changes as well as their surrounding landscapes. Cultivated crop fields rapidly replaced natural vegetation.

Vegetation from early land surveys by settlers has been compiled into a map by the Ohio Biological Survey for the State of Ohio (Gordon 1966). Since its creation, that map has been converted to digital data and its information can be found for this watershed (Map 17). The map shows that beech and elm-ash forests existed in the west and south of the Scioto River throughout a majority of the watershed. Freshwater marshes and fens occurred in the area known as the Scioto Marsh and a small area of the watershed in the southern part of Auglaize County. A transitional forest of oak-sugar maple existed along the mainstem of the Scioto River as it flows north-south from Marion to Delaware county. The map also shows areas of prairie grasslands along the Little Scioto River mainstem and in some areas throughout its watershed along with a mixed oak forest in the higher areas. Appendix 3E contains descriptions of each of these vegetation classes.

II. Channel and Floodplain Condition

The extent of stream meandering throughout much of the watershed, especially above the village of Prospect, can be attributed to the generally low relief and nearly level topography as well as to several other factors of stream dynamics.

Riparian Corridor Assessment:

An examination of the land cover of stream corridors has been carried out using the 2002 Land cover map data for the entire watershed. This analysis examined the area of land cover within a 10-foot buffer of all watercourses (that is watercourses visible on the Map 2-12). These data are presented in Table 3-36 below. The definition of the land cover classes can be found in the section Land Use. Row crops is the highest riparian land cover in all subwatersheds at 50.24% of entire watershed followed by grasslands (which includes naturally occurring and cultivated grasses such as hayfields) at 16.25%. Upland forests are within buffers 12.30% of the buffers in this analysis. A 10-foot buffer analysis was also carried out for the 1994 Landsat land cover data (Table 3-37). Both of these analyses did not measure off the edge of the O'Shaughnessy Reservoir in subwatershed 11 therefore a high percentage of open water is reported there in both tables.

Table 3-36 Percent land use type within 10-foot buffers of the open watercourses for each subwatershed and the whole watershed. 2002 Land cover map.

	Each subwatershed's percent (%) land use type within the 10' buffers[A]							
Subws	**Open Water**	**Row Crop**	**Grass-land**	**Developed**	**Various upland wooded ***	**Floodplain**	**Interior Wet Flatwoods**	**SS – WM & AF [t]**
1	0.16	60.88	16.36	2.35	10.22	9.50	0.39	0.14
2	1.57	53.33	15.72	5.86	13.06	9.99	0.02	0.45
3	0.93	46.20	15.66	6.34	10.13	16.31	3.06	1.37
4	1.66	47.27	14.30	5.28	13.57	12.23	4.40	1.30
5	0.27	48.02	16.91	2.23	15.58	14.20	1.84	0.96
6	0.04	60.66	12.39	3.34	14.24	7.37	0.82	1.14
7	0.05	44.04	14.16	9.26	13.36	16.60	1.60	0.93
8	2.80	53.36	19.92	8.12	8.37	5.78	1.02	0.62
9	1.77	54.92	17.96	3.55	8.82	10.38	1.28	1.32
10	9.87	24.00	19.99	16.12	14.34	11.25	2.66	1.77
11	14.92	15.93	21.15	14.16	11.81	13.29	4.00	4.73
Entire	1.68	50.24	16.25	5.29	12.30	11.45	1.78	1.00

[A] - Percentage values are rounded to the nearest hundredth.
* - Includes three land cover types (explained in Forest section below): 1) North-Central Interior Dry-Mesic Oak Forest and Woodland, 2) North-Central Interior Dry Oak Forest and Woodland , and 3) North-Central Interior Beech-Maple Forest.
[t] - Includes two land cover types: 1) North-Central Interior Shrub Swamp - Wet Meadow and Marsh, and 2) North-Central Interior Shrub-Graminoid Alkaline Fen

Table 3-37. Percent land use type within 10-foot buffers of the open watercourses for each subwatershed and the whole watershed. 1994 Land cover map.

	Each subwatershed's percent (%) land use type within the 10' buffers[A]						
Subws	**Ag/open urban areas**	**Barren**	**Non-Forested wetlands**	**Open water**	**Shrub/scrul**	**Urban**	**Wooded**
1	86.04	0.00	0.40	0.08	0.79	0.09	12.61
2	70.18	0.00	0.49	0.03	2.34	0.11	26.87
3	61.13	0.00	0.87	0.17	3.14	0.28	34.40
4	67.22	0.00	1.12	0.53	2.07	0.03	29.03
5	62.67	0.00	0.97	0.23	1.58	0.03	34.53
6	81.90	0.24	0.57	0.09	1.45	0.28	15.47
7	72.89	0.47	1.40	0.20	2.13	1.19	21.71
8	82.27	0.13	0.74	0.46	1.94	0.08	14.38
9	79.01	0.07	0.89	0.16	1.40	0.27	18.20
10	55.96	3.39	3.26	2.97	3.86	0.55	30.01
11	39.73	0.04	0.66	24.90	1.53	0.33	32.79
Entire	71.32	0.16	0.86	1.12	1.87	0.20	24.47

* Percentage values are rounded to the nearest tenth.
10-foot buffers on each side of hydrology lines created polygons of land use for this analysis.

Number of Miles with Permanent Protection:

There are no channels having permanent protection by means of Scenic River status or long term easements that this project is aware of. Refer to the Table 3-33 and 3-34 above within the Protected Lands section for information that describes parks and set-aside private lands that are being maintained with some natural vegetation.

Officially Classified and/or Petition Ditches:

Map 19 includes all of the ditches on maintenance throughout the watershed. Ditches that are maintained by county engineer offices, and in some counties in cooperation with the SWCD, are typically open channels with 2 to 1 side-slopes that are sprayed with herbicides to control any woody vegetation. A 15-foot easement (of grasses) is also typically required to allow for maintenance access. On occasion counties will perform bank work and/or 'dip' ditches by degrading sediment from the bed, and re-shaping the side slopes.

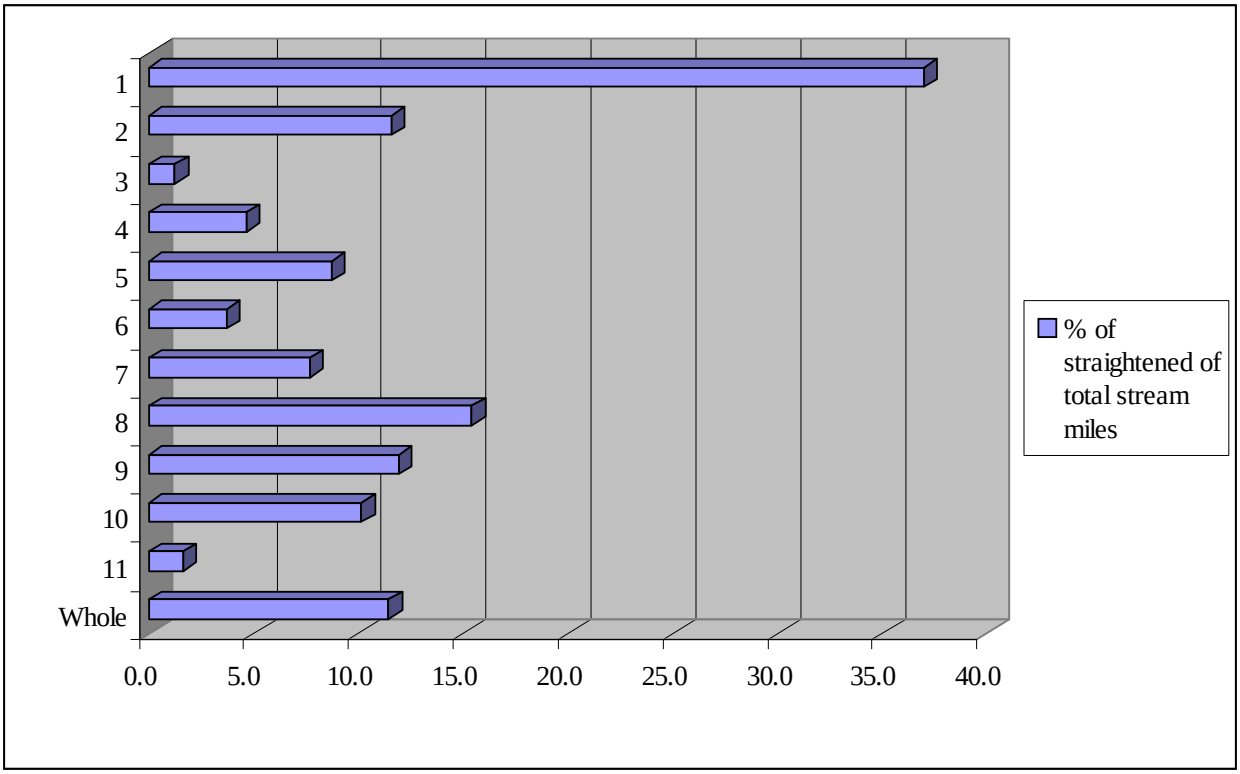
Miles and Location of Modified Channel/Channelized:

A geographic information system analysis of channel straightness has been carried out on the NDH hydrology dataset. This analysis determined the length of watercourses that had 1000 feet or more in between hydrology vectors (a straight line). This estimation is dependent on the accuracy of the hydrology dataset and only includes the water channels classified as having perennial flow. The stream segments that this analysis selected can be seen in Map 19 as pink in color. The percent and length of straightened reaches for subwatersheds and the whole watershed is presented in Table 3-38. Figure 3-6 shows the percentages of Table 3-38 as a bar chart. Clearly subwatershed 1 has the greatest amount of straightened streams, with 41.58 of the 100.22 miles in the subwatershed, 37%.

Table 3-38.

Stream length and % of watershed of straightened streams		
	Miles	**% of WS**
1	41.58	37.0
2	9.99	11.5
3	1.14	1.2
4	5.06	4.7
5	12.81	8.7
6	3.28	3.7
7	3.55	7.7
8	12.36	15.4
9	7.65	11.9
10	2.32	10.1
11	0.48	1.6
Whole	100.22	11.4
Source: NDH Hydrology- Vector analysis for 1000 feet straight intervals		

Figure 3-6. Percent of subwatersheds stream lengths straightened (see Map 19)



In Hardin County within subwatershed 2, Silver Creek used to flow into the Scioto River at a large stream meander upstream the Taylor Creek confluence. The Scioto River has since been channelized and the stream meander cutoff from its flow. Silver Creek still flows into that former Scioto River channel and joins Taylor creek just prior to its confluence with the Scioto River. The point where Silver Creek flows into the Scioto River's former channel is labeled on Map 3.

Figure 3-7. O'Shaughnessy Dam

In eastern Hardin County within subwatershed 4, a meander cutoff of the Scioto River took place in 2002. The linear feet of this project is unknown, but the project's furthest extent is at the river's crossing of township road T245. This Upper Scioto River Drainage and Conservancy District project was the object of some controversy due to wildlife habitat concerns.

Dams: (See map 19)

The Upper Scioto River Watershed Project area ends with the large

O'Shaughnessy dam which impounds the mainstem O'Shaughnessy Reservoir. Some low-head dams are also present throughout the watershed. Information about all known dams follows with dams listed from downstream to upstream.

-Scioto River; O'Shaughnessy Dam; Southwest Delaware County; w/ Glick Rd. over it. ODNR's Division of Water height, storage, and potential downstream hazard classes are unknown. The height class however is most likely class II (greater than 40 feet less than 60). Figure 3-7 shows this dam looking upstream from the spillway.

Figure 3-8.
Scioto River low-head dam at Del./Marion Co. line

-Scioto River; low-head dam; on the Delaware/Marion county line (just south of the village of Prospect). This dam has five grooves cut out of it that normally contains all the discharge. Figure 3-8 shows this dam looking at it from the east side of the river (River Rd).

-Battle Creek (tributary to the Scioto River); broken low-head dam; Marion County in the village of Prospect upstream Elm St. (accessible through city park). The stream has formed a channel around this old low-head.

-Little Scioto River; low-head dam; Marion County on northwest side of the City of Marion (just north of Holland Rd.) owned and operated by the Ohio American Water Company for part of Marion's drinking water.

-Rock Fork (tributary to Little Scioto River); two low-head dam; Marion County just upstream of the streams' crossing at SR 423 and just downstream of the Galion/Kenton Rd. Crossing. Both dams are within the Chapel Heights Memorial Garden.

-Little Scioto River; low-head dam; Crawford County; on private property just east of SR 4, south of Monnett-New Winchester Rd. north of county line.

-Scioto River; low-head dam; Marion County north of Green Camp owned and operated by the Ohio American Water Company for part of the City of Marion's drinking water.

Channelization:

The term stream channelization is one form of hydromodification (also called channel modification) describing river and stream channel engineering undertaken for the purpose of flood control, navigation, drainage improvement, and reduction of channel migration potential. Channelization includes activities such as straightening, widening, deepening, or relocating existing stream channels and clearing or snagging operations fall into this category. These forms

of hydromodification typically result in more uniform channel cross sections, steeper stream gradients, and reduced average pool depths (EPA, 2002).
A significant amount of the watercourses in the watershed have been channelized from naturally formed streams (of all sizes) or they are artificially constructed channels. In some areas constructed stream channels exist where there was no well defined channel before. In other areas channels have been constructed for the purpose of straightening or redirecting an existing stream channel. Many of these artificial channels as well as natural channels serve as outlets for subsurface agricultural drainage systems.

These measures were largely carried out to maximize drainage while taking up the least amount of tillable area for agricultural purposes. While channelization may bring about beneficial farming conditions when flooding does not occur, environmental externalities are also created. The most notable externality is reduced channel connection to the floodplain. Streams without (or with a lessened) connection to their floodplains lose some assimilative capacity of nutrients (and other pollutants) due to reduced floodplain vegetation (Groffman, 1992). Such stream confinement limits a system's ability to weaken higher energy flows thus increasing flooding and resulting in more bank and channel erosion (Trimble, 1997 and 2000; USDA, 1999).

Streams with Unrestricted Livestock Access:

There is a well distributed amount of livestock in the Upper Scioto River Watershed Project area. Evident in the Livestock Inventory data presented in the Land Use section of this inventory, no county in the watershed is lacking livestock. Inventory of stream locations with livestock access have not been conducted.

Eroding Banks (number and severity of sediment produced):

Eroding banks due to obstructing stream flow is a concern in this watershed. Woody debris is often citied as the cause of brooding banks. Eroding banks on county drainage maintenance watercourses are dredged and reshaped as apart of the maintenance programs. See Map 19 for point notations at these locations.

Floodplain Connectivity/Entrenched Miles:

Entrenchment indices of open watercourses throughout the watershed have not been measured. However in areas where channelization has occurred floodplains typically become disconnected and the stream has increased entrenchment. The Miles and Location of Modified Channel section above discusses an analysis of geographic distribution of channelization.

Riparian Levees:

There is no information about riparian levees available for this watershed. In subwatershed 1, where channelization is the greatest, unnatural riparian levees often accompany these modifications.

Culverted:

Map 19 has areas where parts of open channel streams become culverted and are believed to be underground. These notations are not comprehensive for the watershed. Many non-perennial water channels are most likely in culverts at several road crossings and other situations.

Woody Debris in Watercourses/ Logjams:

Woody debris in some watercourses builds up to create large surface flow impedance or log jams. In some watercourses floodwaters are dammed and high flow conditions can cause scouring of the bed and lateral (bank) erosion. This may cause new channels to form while the eroding process is taking place. The drainage impediments ability to create floods may be lessened downstream of the woody debris, however upstream backwater can cause damage to fields and/or structures.

Logjams may create storage of organic matter and nutrients thus keeping excess amounts from being exported downstream. This storage, along with the variety of hydrologic conditions caused by woody debris often creates advantageous conditions for diverse aquatic habitat. This more robust habitat in-turn uses up the stored organic matter and nutrients improving the streams water quality.

D. Water Resource Quality

Water resource quality information about the upper Scioto River watershed has primarily been collected by the Ohio EPA. The City of Columbus has collected information about a few parameters on the Scioto River mainstem, a couple tributaries, and the O'Shaughnessy Reservoir. The watershed project has obtained little water quality information about groundwater and the other lakes of the watershed. Generally, throughout the watershed further collection of water and sediment chemistry, biological and habitat integrity and other resource quality data are needed. Similar to other watershed projects, it may be most wise to collect the baseline data needed to carry out certain implementation projects as each project is being planned. This is because of the innumerable pollutant and indicator parameters that could be measured and compounded by such a large watershed.

I. Water Quality, Surface Water

Ohio EPA uses aquatic life uses criteria to determine the status of Ohio's rivers and streams. Bio-indicators are used to determine what aquatic life use each assessed reach of stream is in, and if that reach is meeting, partially meeting, or not meeting its use designation. Water chemistry, physical condition monitoring, and habitat assessments are used to determine the causes (pollutant or stressor) and their sources (point or non-point). Ohio EPA has found that focusing protection on aquatic life typically results in water quality suitable for all uses because it results in the most stringent protection and restoration requirements (OEPA, 1996).

Ohio EPA uses the Ohio Qualitative Habitat Evaluation Index (QHEI) to assess stream habitat conditions. In Technical Note 99-1, NRCS has found the Ohio QHEI to match its own Stream Visual Assessment Protocol with high correlation (.91 r^2). That same NRCS technical note indicates a "State water quality agency" developed intensive bioassessment protocol as the top

tier in the hierarchy of stream assessment protocols (USDA, 1999). Additionally, an NRCS case study using a fish index of biologic integrity found the index can, "…serve as a useful tool to assess the effectiveness of conservation programs that are targeted to solve specific watershed problems" (USDA, 2001).

Some water resource quality data are being collected by the watershed project. Nutrients, total suspended solids, fecal coliform and *E. Coli* bacteria, and some physical/habitat data are being sampled in the 8 and 9 subwatersheds. Monitoring in subwatershed 1 in western Hardin County and subwatershed 6 upper Little Scioto River in Marion and Crawford counties is also being carried by the watershed project and Ohio EPA's Northwest District Office. This monitoring is examining nutrients, metals, oxygen demand, organic chemicals, bacteria, and other physical parameters in these subwatersheds. Map 20 shows the locations of the water quality monitoring sites in the watershed. These data will be used to assist in planning action items, calibrate any simple non-point source models, and provide an opportunity for hands-on volunteering by watershed project participates (through the NRCS- Earth Team volunteering program).

Monitoring in the upper Scioto River watershed by Ohio EPA and the Agriculture Research Service (ARS) may be taking place in the near future. As mentioned in an earlier section of this inventory, the Ohio EPA has planned to perform a TMDL study in subwatershed 1, 2, 3, and 5. It is not known what the ARS plans to study and to what extent, but it will most likely complement that service's current work in the Upper Big Walnut Creek watershed examining nutrients and herbicides running off farm fields with varying degrees of conservation practices.

Locationally-Referenced Use Designations/Use Attainment:

Map 20 illustrates and the Table 3-7 thru Table 3-17 above describes all the aquatic-life use designations segments the Ohio EPA has created in the watershed. Use attainment is primarily measured for larger, named streams and only 17% of perennial streams, by length, of the watershed's watercourses have been assessed. Appendix 3F contains the Ohio EPA's description for much of the aquatic life use attainment categories.

Causes and Sources of Impairment or Threats as Presented in the 305(B) 303 (D) Integrated Water Quality Report:

The Ohio EPA's integrated report contains information about 11-digit subwatersheds from the technical support documents, TMDL, and any other surface water studies that have been carried out. This report breaks down aquatic life use attainment to this 11-digit subwatershed scale. A summary of that breakdown is below in Table 3-39. The integrated report also includes all of the causes and sources of surface water quality degradation. This is summarized below in Table 3-40.

Table 3-39. Aquatic Life Use Assessment for 11-digit HUC

050-60001…	Project Subws	<5-50 mi^2 WS sites				River 50-500 mi^2 WS Sites			
		Total sites	% Full	% Partial	% Non	Total mi.	% Full	% Partial	% Non
010	1, 2	11	41.7	39.6	18.7	24.9	34.6	65.4	0.0
020	5	0	-	-	-	0	-	-	-
030	3, 4	5	66.7	33.3	0.0	34.7	99.4	0.6	0.0
040	6, 7	8	37.5	25.0	37.5	11.6	0.0	17.2	82.8
050	8, 9	0	-	-	-	0	-	-	-
080[A]	11	10	10.0[A]	0.0[A]	90.0[A]	0	-	-	-

Project subwatershed 10 is within the 060 11-digit subwatershed, however, all of the information is for parts of the Bokes Creek watershed and do not apply to this project's area.
[A] Nearly all of the information for the 11-digit 050 subwatershed is downstream from this watershed project area, however some may be present for tributaries to the O'Shaughnessy Reservoir.
Source: Ohio EPA 2006 *Integrated Report* Appendix E.2

Table 3-40. Pollutant causes and sources from Ohio EPA *2006 Integrated Report* for 11-digit hydrologic units in the Upper Scioto River Watershed Project area

11-digit HUC Description	High Magnitude Causes	High Magnitude Sources	Advisory
05060001 010 Scioto River (headwaters to downstream Taylor Creek)	1. Direct Habitat Alterations	1. Channelization - Agriculture	
05060001 020 Rush Creek **Not assessed**			
05060001 030 Scioto River (downstream Taylor Creek to upstream Little Scioto River); excluding Rush Creek	1. Cause Unknown 2. Organic Enrichment/DO 3. Direct Habitat Alterations	1. Pasture Land 2. Onsite Wastewater Systems (Septic Tanks) 3. Channelization – Agriculture	Fish consumption
05060001 040 Little Scioto River	1. Priority Organics 2. Metals 3. Nutrients 4. Siltation 5. Organic Enrichment/DO 6. Flow Alteration 7. Direct Habitat Alterations 8. Oil and Grease	1. Combined Sewer Overflow 2. Nonirrigated Crop Production 3. Onsite Wastewater Systems (Septic Tanks) 4. Channelization – Agriculture 5. Channelization – Development 6. Removal of Riparian Vegetation – Ag. 7. Contaminanted Sediments 8. Natural	Fish consumption
05060001 050 Scioto River (downstream Little Scioto River to upstream Bokes Creek); **Not assessed.**			
05060001 060 Scioto River (upstream Bokes Creek to upstream Mill Creek); **There are several causes and sources of pollutants, but they all apply to the Bokes Creek Watershed.**			
05060001 080*Scioto River (downstream Mill Creek to upstream Olentangy River); excluding Scioto River mainstem	1. Cause Unknown 2. Unknown Toxicity 3. Priority Organics 4. Unionized Ammonia 5. Siltation 6. Organic Enrichment/DO 7. Other Habitat Alterations	1. Municipal Point Source and Source Unknown 2. Package Plant (Small Flows) 3. Nonirrigated Crop Production 4. Land Development/ Suburbanization 5. Channelization - Agriculture 6. Channelization - Development 7. Removal of Riparian Vegetation - Dev. And Spills	No advisories listed
	* **Most of these pollutants exist downstream of this watershed project area.**		
Source: OEPA 2002 (The same information is in the 2004 draft Integrated report)			

Subwatershed Surface Water Summaries

The following summaries of water quality are broken down by subwatershed with the various sources cited accordingly. It should be noted that all of the Ohio EPA information is from

documents published several years ago (referenced above in Previous and Complementary Efforts section). The Works Cited section of this inventory contains information on how to download the Ohio EPA documents from the internet. Locations of the Ohio EPA water chemistry sampling sites, the current watershed project sampling sites, and all of the aquatic life use designations are indicated on Map 20. Updated information about several water quality concerns from Ohio EPA reports has been obtained and is noted in the following sections.

Headwater/Scioto Marsh (Subwatershed 1):

This watershed is channelized throughout about 41.5% of the linear feet of watercourses, Miles and Location of Modified Channel section above, and this channelization is the main source of water quality impairment. These reaches are considered to have "severe physical habitat limitations" which is impacting the fish community. The approximately 9.3 river miles of the Scioto River are in partial attainment of the aquatic life use designation Warm Water Habitat (WWH) in this subwatershed. The unsewered Village of Roundhead was found to have no nutrient enrichment impact on the Scioto River (OEPA, 1997).

The village of McGuffey's wastewater treatment plant, on Cottonwood Ditch is noted as a large contributor of nutrient enrichment to the watershed. The macroinvertebrate community in this subwatershed scored much higher and did not indicate water quality impairments. Mostly due to extensive channelization Cottonwood Ditch has been assigned a lower aquatic life use designation expectation, Modified Warmwater Habitat (MWH). The stream is meeting these expectations or is at "full attainment" (OEPA 1997). UPDATE: In 2001 the Village of McGuffey repaired sewer infiltration problems and added more treatment to their wastewater treatment (Poffenbarger, 2004).

Current monitoring: Eight sampling sites have been established in the summer of 2004 for continuous, monthly water quality monitoring. This section will be updated as the data from this monitoring are analyzed.

Upstream Kenton (Subwatershed 2):

This subwatershed is listed as impaired from channelization with the majority of the channelization on the river mainstem. The Scioto River is in partial attainment of WWH at the upstream and downstream sections of this subwatershed.

Silver Creek is in partial attainment of WWH aquatic life use due mostly to intermittent stream flow.

Taylor Creek is listed as meeting expectations despite the Occidental Chemical Cooperation being noted for discharging effluent creating nutrient enrichment. In this subwatershed the closed Hardin County Landfill is very close to the Scioto River. While this landfill is known to be leaching elevated levels of toxic compounds, the leachate collection system appears to be working properly as there has been no bio-indication or chemical detection of these compounds. A healthy macroinvertebrate community and improved fish community from Subwatershed 1 were found in this subwatershed. Additionally, no toxicity was evident among the fish

community in the mixing zone of the Occidental Chemical outfall (OEPA 1997). UPDATE: The Occidental Chemical Cooperation is now known as Durez Cooperation and has no known problems with their discharge permits. Also the Hardin County Landfills leachate has a new retention wall at the site of the landfill built since the Ohio EPA 1997 report was published (Poffenbarger, 2004).

Downstream Kenton (Subwatershed 3):

The City of Kenton's wastewater treatment plant (WWTP) is cited as having several water quality impacts in the Ohio EPA 1997 report. Several raw sewage spills and wet weather flows bypassing much of plants treatment are the plant's main problems. The impact from the wastewater treatment plant has brought about eutrophic conditions with high nutrient concentrations and exceeded primary and secondary standards for fecal coliform. Nutrient enrichment and low dissolved oxygen due to the Kenton WWTP are cited as being evident in the Scioto River well into Marion County. Also macroinvertebrate communities bio-indicator assessments at the mixing zone of the Kenton WWTP were evaluated as fair, while the fish communities indicate only a small decline in quality. The macroinvertebrate community increases to good downstream the WWTP however it does not return to a high quality level it maintained upstream of the city (OEPA 1997).

The Kenton WWTP completed a new treatment facility in February 2001 and has closed its combined storm sewer overflow. This new facility has greatly improved the capacity of treatment effluent in addition to having an approved strategy for dealing with flows beyond its capacity (Poffenbarger, 2004).

Panther Creek is considered in partial attainment of WWH aquatic life use for 3.2 river miles as it receives an unnamed tributary that drains the village of Ridgeway. Intermediate drainage, septic systems effluents from the unsewered village have caused excessive nutrients, dissolved oxygen levels, and fecal coliform. The QHEI habitat scores for Panther Creek are the highest among all sites reported in the 1997 Ohio EPA document due to a variety of substrates, high in-stream cover with good morphology and riparian corridors at three sites (OEPA 1997).

The village of Ridgeway is still planning to provide centralized sewers, but is currently in the engineering phases (Poffenbarger, 2004).

La Rue/Big Island (Subwatershed 4):

The Scioto River is found to be in full attainment throughout this subwatershed. Once into Marion County, much less historic channelization has occurred, however several logjams are present. At the time of the 1995 monitoring for the 1997 report the villages of New Bloomington and Green Camp were unsewered. New Bloomington has since gone online with a sewage treatment plant.

Wildcat Creek is cited as being in partial attainment of WWH until just before its confluence with the Scioto River due to the unsewered village of Mount Victory and channelization. This tributary flows through the most concentrated Amish section of the watershed, and "gross habitat

impairment" from cattle in the water channels is noted (OEPA 1997). The village of Mt. Victory has installed a sewer system with treatment plant since the Ohio EPA 1997 report (Poffenbarger, 2004).

Rush Creek (Subwatershed 5):

In its upper reach Rush Creek has a very high gradient compared to the other streams in this watershed (Map 13). However, the gradient drops off as the stream turns to flow northwest near the SR 37 and SR 739 intersection near Essex in Union County. Flooding and channel erosion have been noted at that point in the subwatershed. An Ohio EPA biological reference site is on Rush Creek at Sager Road in Marion County. Unpublished fish and macroinvertebrate data have been collected from this site showing a decrease in both fish and bug indices (IBI and ICI respectively) from 1984 to 1999 (Mishne 2004). No statistical analysis or explanation has examined this trend.

Three sampling sites on the McDonald Creek tributary were created to assess the impacts from what was once the Buckeye Egg Farm's La Rue Egg Farm in 1995. These sites, which were all in nonattainment, were determined to have the capabilities of WWH. Fair macroinvertebrates and poor fish indices were found at these sites. Recent channelization, livestock manure, and nutrient enrichment are indicated as the sources of this impairment (OEPA, 1997).

Upper Little Scioto River (Subwatershed 6):

The Little Scioto River has not been assessed by the Ohio EPA within this subwatershed. Rock Fork is considered in partial attainment of WWH aquatic life use attainment primarily because of poor habitat due to channel modifications. Good macroinvertebrate and fish communities however indicate this tributary is not severely impacted (OEPA, 2000).

The watershed is almost exclusively agricultural with large fields of the principal row crops corn and soybeans and a small amount of wheat. Pastureland is rare as well as woodland. Nearly all areas that drain into the Little Scioto River are drained by traditional constructed open channel agricultural ditches. The Little Scioto River has not experienced channelization in this watershed and logjams are a common occurrence. The entire area is sparsely populated except at the most northern reach along the outskirts of Bucyrus and the small rural communities of Kirkpatrick, Monnet, and the Trachsel's subdivision on the northeast outskirts of the City of Marion. National Lime and Stone owns and operates a large limestone quarry extending over 500 acres in the southern reach of the watershed. To the east of the quarry along Likens Road is a small industrial area consisting of the Buckeye Corporation, Mat-Flo, and the Scioto Industrial Park.

Current sampling: Six sampling sites were established in the summer of 2004 for continuous, monthly water quality monitoring. This section will be updated as the data from this monitoring are analyzed.

Lower Little Scioto River (Subwatershed 7):

The water quality of this subwatershed has been studied in detail by Ohio EPA due to contaminants from the former Baker Creosote Preserving Co. and other industrial wastes. Near the Little Scioto River's crossing of SR 309 is the upstream extent of the river's severely impaired reach. The stream is impacted all the way to the river's mouth. Throughout this lower reach channel modifications have turned the river into a stagnant glide or pool. The intake for some of the cities' drinking water (the reminder comes from the Scioto River and a well field) is just upstream of the North Rockswale Ditch confluence at the Holland Road crossing. In addition to historically draining other industrial wastes, North Rockswale Ditch has drained the combined sewer overflow that received storm water polluted from the Baker Woods company. Creosote and other oily products have caused severe sediment contamination that extends to the Little Scioto River and to the Scioto River. The polluted sediments are well documented by Ohio EPA and USEPA at toxic levels most notably containing seventeen polycyclic aromatic hydrocarbons (PAHs), five of which are possible human carcinogens, other metals, and cyanide (OEPA 2000). As discussed in the Current Efforts to Meet Water Quality Standards section, a USEPA cleanup to remediate the polluted sediments of North Rockswale Ditch and several miles of the Little Scioto River is ongoing (Durno, 2003). The Little Scioto River is considered not in attainment of the lower expectation of MWH aquatic life use from North Rockswale Ditch to its mouth. North Rockswale Ditch itself is also in non-attainment of MWH. Just downstream the Little Scioto River from the North Rockswale Ditch confluence is the Marion wastewater treatment plant (WWTP) outfall. This plant is noted to add an excessive amount of nutrient enrichment to the stream (OEPA 2000). UPDATE: In the summer of 2003, the Marion WWTP carried out several improvements on their processing (Ko, 2004a). Downstream of the Marion WWTP is the confluence of Rockswale Ditch with the Little Scioto River. While Rockswale Ditch is noted for having some nutrient enrichment, its water flow is too low to assign it an aquatic life use designation and it is considered a Limited Resource Water.

Honey Creek flows into the Little Scioto River south of the City of Marion. The downstream section of this stream has had channel modifications. The stream also has documented water quality impacts from a wastewater treatment package plant and elevated nutrient and sediment levels. Honey Creek is considered in non-attainment of its WWH use designation (OEPA 2000).

Downstream Little Scioto River (Subwatershed 8):

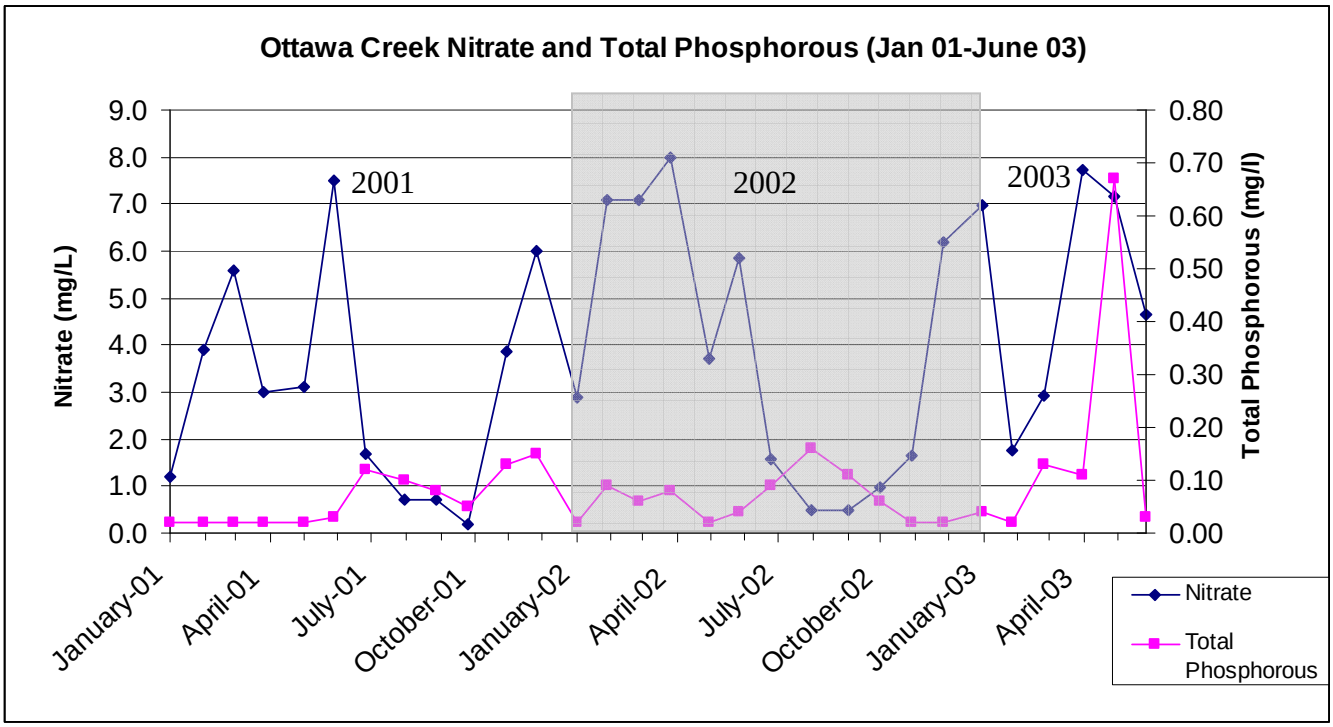
The Scioto River is impacted by the Little Scioto River at the confluence of the two rivers and downstream. From the Ohio EPA's study of Marion Area Streams and the Little Scioto River, 1.5 miles downstream the Scioto River from the confluence still has 'Severe Effect Level' concentrations of polycyclic aromatic hydrocarbon compounds (OEPA, 2000). Six and a half miles of the Scioto River downstream from the confluence is in non-attainment of its WWH aquatic life use designation. The river is impounded by a low-head dam just south of Prospect near the Delaware/Marion county line. This pool had poor macroinvertebrate scores and is the site of the lowest fish community score from the 1997 Ohio EPA document. The lack of a riffle in addition to contaminants and nutrient enrichment from the Little Scioto River were citied as sources of impairment for these poor bio-indicators. Downstream of this section the Scioto River is meeting the aquatic life use designation (OEPA, 1997).

Current monitoring: Within this watershed the City of Columbus samples nutrients from Ottawa Creek near its confluence with the Scioto River. Figure 3-9 shows nitrate-N and total phosphorous for a two and a half year period for this Ottawa Creek site. This figure can be compared to Figure 3-10 below showing the same parameters for the same time period for Fulton Creek near its mouth (also sampled by the city). These figures of near-by watersheds nutrient peaks occur at the same time indicating the nutrients are entering the streams from non-point sources flushed out by rainfall events (City of Columbus). Figure 3-11 shows the Scioto River discharge monthly average just north of Ottawa Creek's confluence during the time period of Figures 3-9 and 3-10. This watershed project has sampled for nutrients, total suspended solids, and bacteria at one site on Ottawa Creek, Patton Run, Battle Run, Kebler Run, and Ottawa Creek.

Fulton Creek (Subwatershed 9):

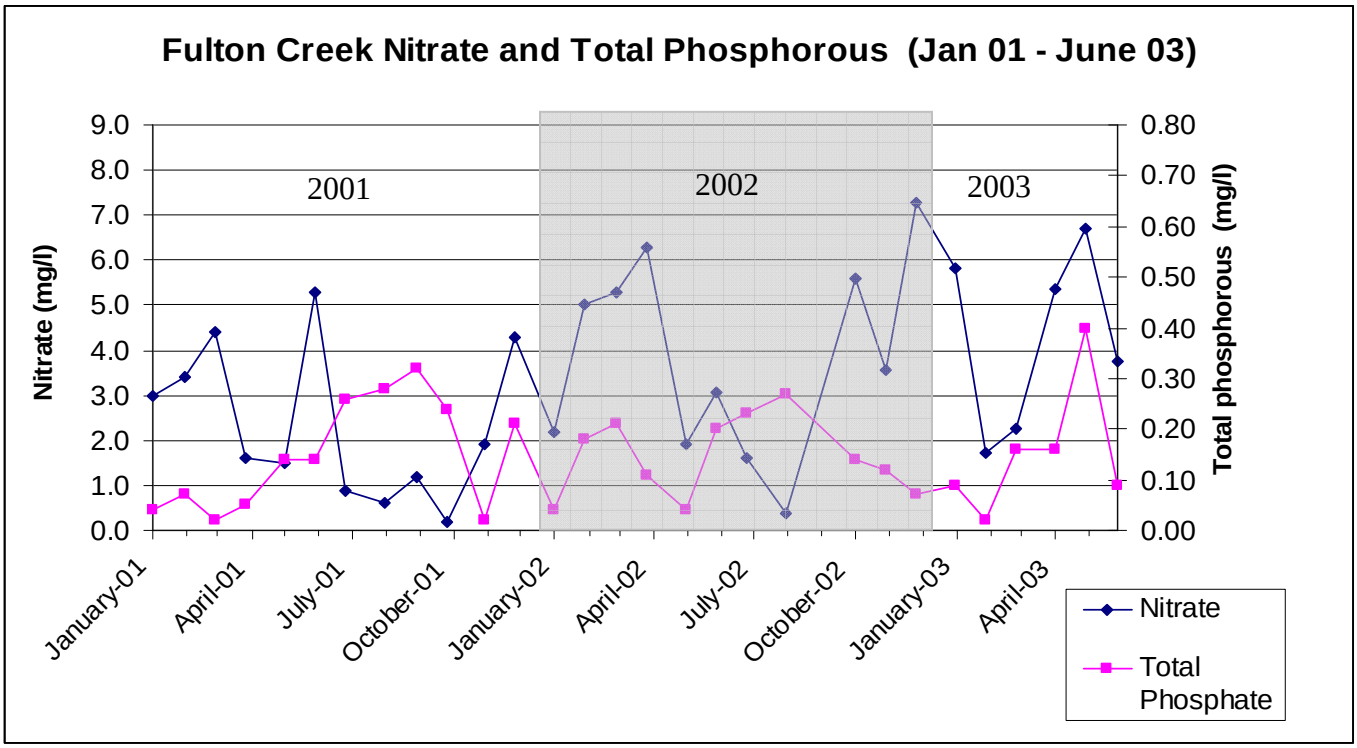
Current monitoring: This subwatershed is not assessed in the Ohio EPA's upper Scioto River technical support document. It has been sampled by the watershed project at eight sites. No data have been complied yet. The Village of Richwood sewage treatment plant has a permit to discharge treated wastewater into Fulton Creek on the south side of the village. As of January 2004 some violations have been reported from this plant, but no action from Ohio EPA has been taken (Sapp, 2004). The City of Columbus has sampled Fulton Creek for nutrients near its confluence with the Scioto River. Figure 3-10 shows the results for nitrate-N and total phosphorous for two and a half years. These data are described above in the Downstream Little Scioto River (subwatershed 8) section.

Figure 3-9. Ottawa Creek (please note the two vertical axis scales)



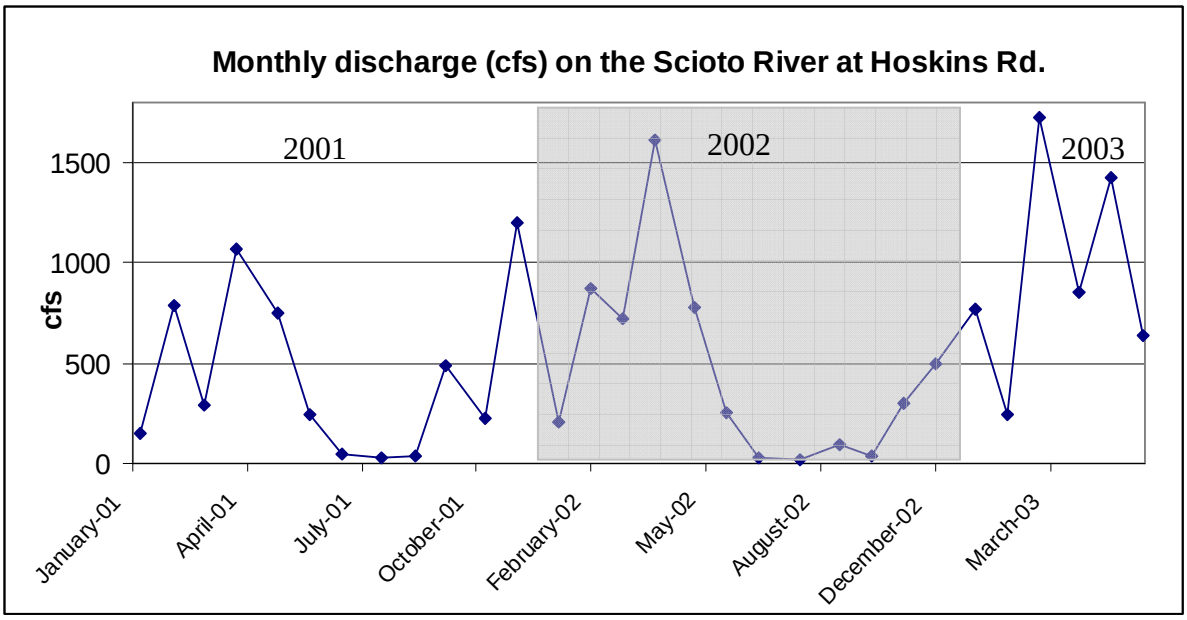
Source: City of Columbus, Division of Water

Figure 3-10. (please note the two vertical axis scales)



Source: City of Columbus, Division of Water

Figure 3-11.



Bokes/Mill Creek Confluence (Subwatershed 10):

This subwatershed includes a small area containing very few tributaries. The Bokes Creek flows in the Scioto River within this subwatershed. The Mill Creek's mouth is the most downstream extent of this subwatershed. Significant study has gone into both of those watersheds which are a part of a different watershed project.

O'Shaughnessy Area (Subwatershed 11):

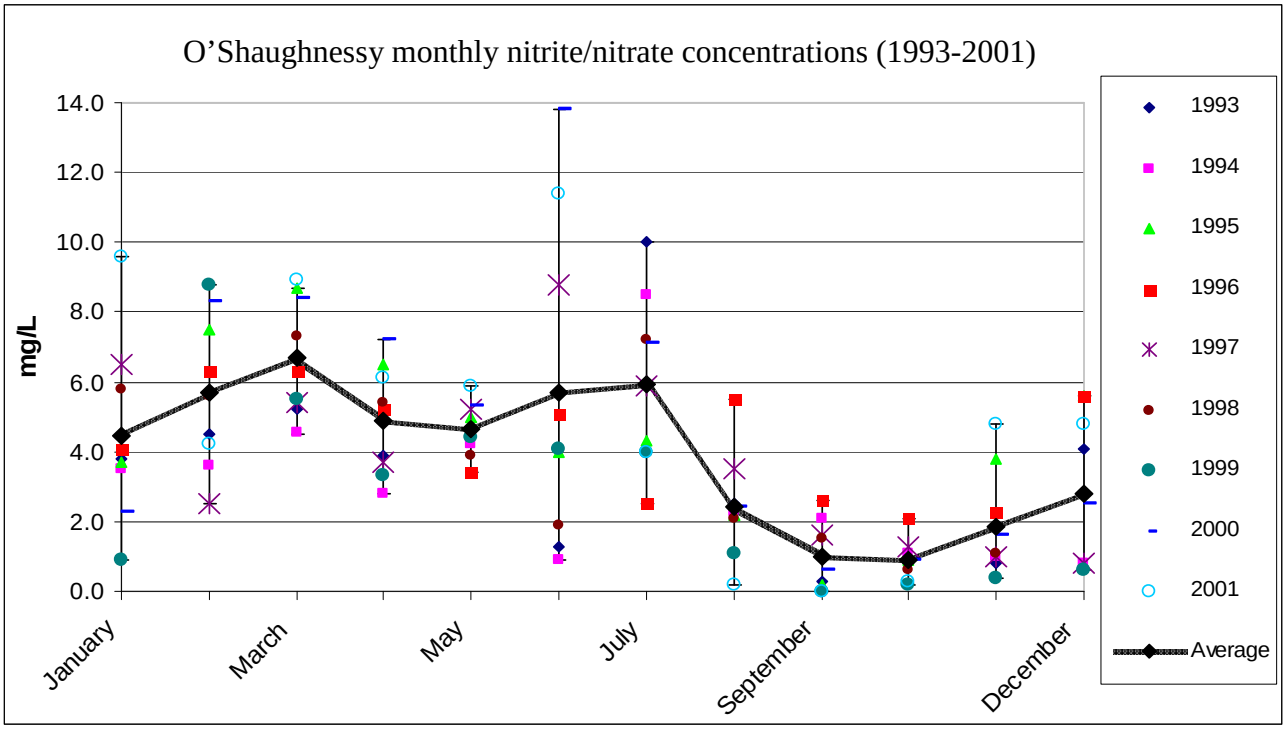
The Scioto River is impounded in this subwatershed and becomes the O'Shaughnessy Reservoir. The water quality of the reservoir is discussed in the Water quality: lakes section below, and much of the sources from these data are from upstream impacts. Along the reservoir's northwest side there is a wastewater treatment plant with a permit to discharge treated water for a Department of Youth facility. Just south of this facility is a rock quarry which has a permit to discharge excavated groundwater. Neither of these permitted discharges has been described as out of compliance in recent years (Sapp, 2004).

II. Water Quality, Lakes

Bodies of water greater than 10 acres in the watershed are described in Table 3-20 above, and shown on the subwatershed maps (Map 3-12). With the exception of O'Shaughnessy Reservoir no water quality data for these or other lakes are on file with the watershed project. All of the lakes listed on Table 3-20 are artificially created and, with the exception of O'Shaughnessy Reservoir have never been associated with water quality issues.

Water quality data for the O'Shaughnessy Reservoir and Griggs Reservoir (downstream and out of this project's area) have been collected by the City of Columbus to aid in the city's drinking water treatment and understand the trends in pollutant concentrations. Concentrations of nitrite/nitrate, ammonia, total and ortho-phosphorous have been tested from these reservoirs monthly since 1993. Figure 3-12 below shows the monthly average of nitrite-nitrate for nine years and an average of all nine years' monthly averages (these are connected with a line). While the deviations from mean are quite large, reduced concentrations during low-flow autumn months in addition to other tests have lead the City of Columbus to draw the conclusion that a great share of the nitrate loads are from non-point sources. Also the trend for the amount of nitrates entering the Scioto River reservoir system has been projected to be increasing (Binder, 2004). The drinking water concerns of elevated nitrite/nitrate in the Scioto River are discussed in the drinking water section below.

Figure 3-12. Monthly nitrite/nitrate data for O'Shaughnessy Reservoir



Source: City of Columbus- Water quality data

III. Water Quality, Wetlands:

The Wetland section describes the historical and current setting of the wetlands in the watershed. While more wetlands have been created in recent years, little information about the water quality of those particular wetlands is known.

Habitat and biologic quality of wetlands being installed by NRCS programs, which were outlined in the previous wetlands section, is not required to be monitored.

IV. Water Quality, Groundwater:

Groundwater as a resource is described in the Water Resources section. No information has been obtained about groundwater quality specific to the upper Scioto River watershed.

DRASTIC (Ground Water Pollution Potential) Maps:

Ground water pollution potential studies take many factors into consideration. Included in these factors are depth to ground water, recharge rate, aquifer material, soil material, topography (% slope), and hydraulic conductivity. These factors go into determining an overall pollution vulnerability rating. Logan and Crawford counties are the only counties in the watershed that have a DRASTIC study, and only Crawford's has been georeferenced in GIS. No map has been made for this inventory based on the Crawford County DRASTIC data, but these data can be used for planning projects in that county. Table 3-41 provides a range of the pollution potential vulnerability ratings (based on Ohio EPA's Division of Drinking and Ground Water) for the land area in the watershed in Crawford County. The watershed's area of Crawford County with high

ground water pollution potential follows the surface water channels. Logan County's DRASTIC data show a gradient of very low (<79) to higher (140-159) vulnerability to pollution generally from upstream to downstream Rush Creek. The most upstream end of the Rush Creek, and the majority of the Bellefontaine Upland, all have very low vulnerability.

Table 3-41. DRASTIC range of the Crawford County Upper Scioto River watershed

Vulnerability to pollution (Pollution rating range)	Acres	Percent (%)
Low (0-100)	6.0	0.034
Moderate (101-140)	17257.5	98.072
High (140-157)	333.2	1.894
Total	17596.6	100.000
Crawford County DRASTIC dataset		

V. Drinking Water and Source Water Assessment Plan (SWAP) Information:

There are eight municipal community public water systems in the Upper Scioto River Watershed Project area. Table 3-42 lists these communities, the counties, the subwatershed each lie in, and approximately how much water each treats. Source water assessment reports have been carried out for these municipal drinking water suppliers. High susceptibility to contamination exists for Richwood, Marion, and LaRue. Moderate susceptibility to contamination has been determined for Rushsylvania and Kenton. The susceptibility of the other three water suppliers (all in Hardin County) is rated as low. Potential contaminate sources used to make these assessments can be found on the subwatershed maps (Map 3-12).

La Rue:
The high susceptibility of source groundwater contamination in La Rue is due to the presence of significant potential contaminant sources in the protection area, and detection of manmade contaminants in treated water. In 1995 and 1996 xylene 'concentrations of concern' (0.85 to 2.46 µg/L) were detected in LaRue's drinking water indicating a human source. That contaminant stayed well below the drinking water standard of 10,000 µg/L and since then has leveled off at a much lower concentration 0.5 µg/L (OEPA, 2003c.)

Marion:
Ohio America Water Company supplies water to the City of Marion from two surface water sources and a well field. The Scioto River and the Little Scioto River are used as surface water sources southwest of the city and on the northwest side of the city respectively. Atrazine and nitrate have been detected in Marion's drinking water, but no maximum contaminant level (MCL) violations have occurred.

In 1998 the Ohio Department of Health and Ohio EPA together tested 21 private drinking water wells in Marion County for Volatile Organic Compounds (VOC) (which is a group of 35 chemicals) and a set of radiologic parameters. These tests were conducted to address public concerns of possible leukemogens in drinking water and included examining some wells used by graduates from Marion's River Valley High School with leukemia. The known leukemogens benzene (a VOC) and the radionuclide contamination from alpha and beta decay and radium-226

and 228 were not detected in any wells. Chloroform, a VOC was found in one well at a low level specified as "below the level typically present in municipal water supplies" (ODH 1998).

Richwood:
Different from the two water sources listed above, no water quality impacts have been detected in Richwood. The high susceptibility is based on model results.

Table 3-42. Municipal water supply information for upper Scioto River watershed

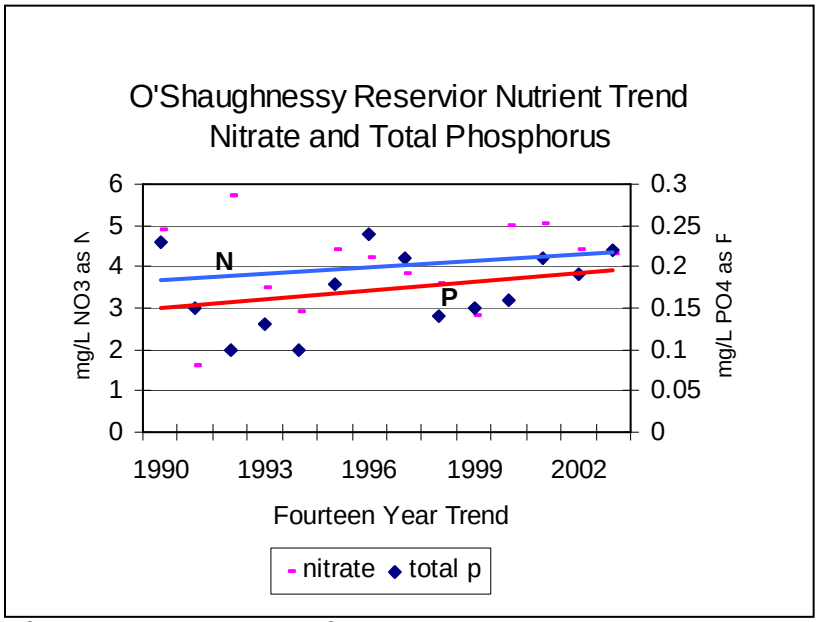
Municipal Water Supplier	County	Subws	Pop	Water source	Design capacity (gal/day)	Ave. Pump rate (gal/day)	Susceptibility to contamination
Alger	Hardin	# 1	880	Ground	360,000	200,000	Low
McGuffey	Hardin	# 1	600	Ground	115,000	100,000	Low
Kenton	Hardin	# 2, 3	8,500	Ground	3,000,000	1,290,000	Moderate
Mt. Victory	Hardin	# 3, 4	575	Ground	130,000	45,000	Low
La Rue	Marion	# 4	775	Ground	144,000	74,000	High
Rushsylvania	Logan	# 5	600	Ground	46,000	40,000	Moderate
Marion	Marion	# 7	48,000	Ground Surface (Scioto and L. Scioto)	9,100,000	5,953,000	High
Richwood	Union	# 5, 8, 9	2,186	Ground	374,000	193,000	High
Source: Raymond, 2004							

City of Columbus, Division of Power and Water
High nitrate concentrations in the Scioto River source water is a concern for the City of Columbus. Downstream of O'Shaughnessy Reservoir the Scioto River becomes impounded again in the Griggs Reservoir. Both the O'Shaughnessy and Griggs reservoirs are maintained by the City of Columbus creating a combined storage capacity of 8 billion gallons. The City of Columbus treats the water drained from this reservoir for drinking water at its Dublin Rd. Water Treatment Plant. About 55 million gallons a day are drawn by this plant serving about 38% of the city's service area or about 200,000 individuals in western Franklin County and the downtown Columbus. The maximum contaminant level (MCL) of a nitrite/nitrate concentration greater than 10 mg/L has been exceeded in the Scioto River water several times in recent years seen on Table 3-43. A public health warning must be issued when this MCL is exceeded due to the known problems nitrates can cause. The City of Columbus has determined a trend for both nitrate and total phosphorous is increasing in the Scioto River at the two reservoirs that contain water for the Dublin Rd. Water Treatment Plant. These best fit trends can be seen in the Figure 3-13 and 3-14. Note that these graphs and trends have been created by the City of Columbus (Columbus, 2004).

Table 3-43. Nitrate/nitrate alerts issued by the City of Columbus for the Dublin Rd. Water Treatment Plant

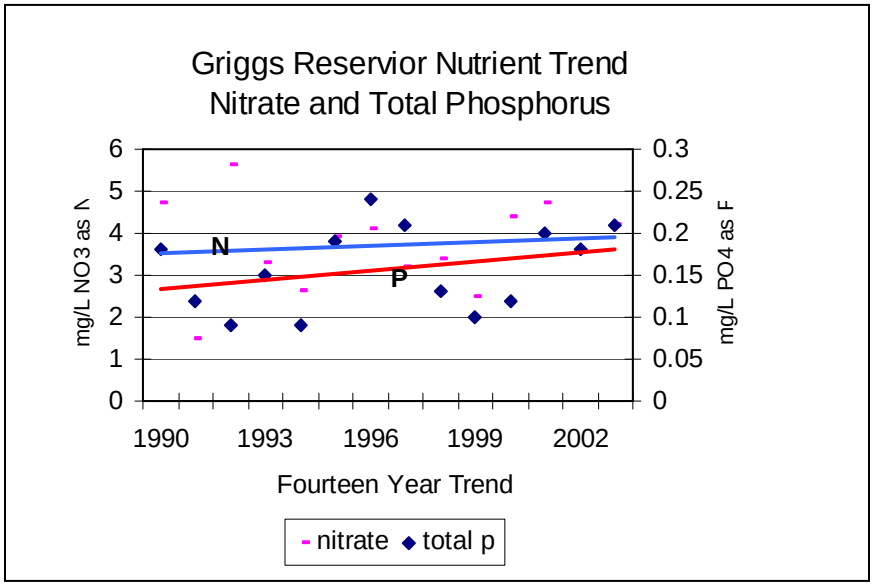
Month/year	Duration
July/1994	10 days
June/ 1998	6 days
June/July 2000	23 days

Figure 3-13.



Source: City of Columbus, Division of Power and Water, 2004

Figure 3-14



Source: City of Columbus, Division of Power and Water, 2004

VI. Point sources

The National Pollution Discharge Elimination System (NPDES) require permits to be issued for surface water effluent with parameters limits. Some permitted facilities with surface water effluent are discussed in the above surface water quality section on the subwatershed breakdown. Appendix 3G is a list that has been complied containing all of the permits believed to be in the watershed. This list groups the permits by subwatershed and, if known, indicates the stream final effluent outfall (OEPA 2003). These permits are not cataloged by the Ohio EPA on a watershed basis, and Appendix 3G may not include all of the permits in the Upper Scioto River Watershed Project area. Information such as parameter limits for specific permits can be obtained by contacting the Ohio EPA, Division of Surface Water.

Some facilities that are required to have an NPDES permit have been found in the watershed not to have been included when the permitting rules began. Elgin High School in subwatershed 4 on Keener Pike Rd. and LaRue-Prospect Road is one of the facilities. A package plant treating the school's waste water is on the west side of the campus between the school building and Glade Run. Glade Run receives the effluent from this package plant approximately half river from its confluence with the Scioto River. Ridgedale High School also in Marion County has an unpermitted wastewater package plant located north of the City of Marion. This system discharges to the Little Scioto River via a 24 inch storm sewer (Ko, 2004-B).

Potential environmental containment sources and oil and gas wells have been compiled by the Ohio EPA for the state. These data are compiled from multiple sources and georeferenced. The subwatershed Maps 3-12 show these potential containment sources and oil and gas wells. While much effort has gone into creating and mapping these data, it is well known that some of these potential contaminant sources and wells are no longer present or are located incorrectly. These data should be used as an indicator for this watershed project, and when planning for specific projects, can be used as a starting point for detailed monitoring/observation (Potential Contaminate Sources, Oil and Gas wells GIS data).

Spills and Illicit Discharges:

The Ohio EPA, Division of Emergency and Remedial Response track the spills and illicit discharges for the state. The Upper Scioto River Watershed Project has obtained the information from all reported spills and illicit discharges from 1997 to April 2003. These data indicate stream, date, type, cause, quantity, and responsible party if known for each record. These records do include air discharges. Based on the information supplied for the nine counties in the watershed the records have been narrowed down to 349. Appendix 3H includes all of these records with the entries that have been determined to have taken place in the watershed in bold face, and the entries that may have been in the watershed in regular type (Gara, 2003).

VII. Non-point Sources

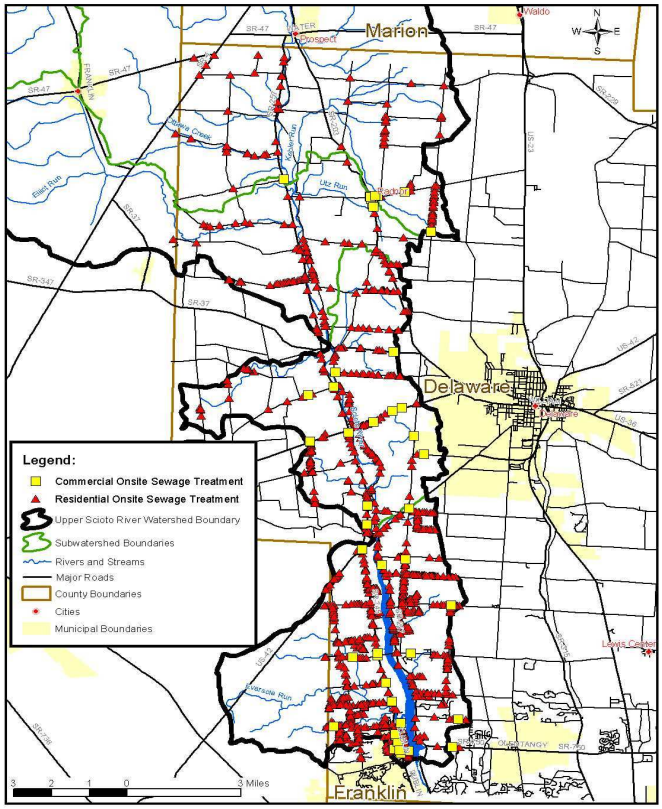
Non point sources of pollutants or other stressing factors are present throughout this watershed as they are the entire state. Table 3-40 above in the Water Quality: Surface Water section includes several non point sources the Ohio EPA has determined.

Inventory of Home Sewage Treatment Systems, and Projected Number of Failing Systems
There is a large difference in what each county in the watershed knows about the amount and condition of home swage treatment systems. Population data is available for incorporated and unincorporated areas allowing for estimations of home sewage treatment systems. These estimations have not been carried out for the whole watershed however as efforts of better targeting problem areas are taking place.

Delaware County:
Delaware General Health District has geo-coded all the home sewage treatment systems they have records of into GIS. Within this watershed project's area 1537 units are within this dataset (1479 residential and 58 commercial units). These are shown in Figure 3-15. Delaware General Health District has created a Home Sewage Treatment System plan to address areas of concern. Much of this plan outlines areas in the county in which a county commission has agreed could be covered by a central sewerage treatment system. This health district has also applied for a Section 319 Ohio EPA grant in 2004 for monetary assistance in addressing items indicated in the plan.

Marion County:
The Marion County Health Department has no database or comprehensive list of septic systems. The Health Department does have a goal of digitizing septic systems but believes that information will not be available for several years. No immediate critical areas have been identified by the environmental health director. The health department has expressed interest in working with this watershed project to create a Home Sewage Treatment System Plan (Work, 2004).

Figure 3-15. Watershed area from the Delaware General Health District's home sewage treatment dataset



Crawford County:
The Crawford County General Health District is in the process of creating a comprehensive database of the home sewage treatment systems for that county. That county, with the cooperation of the Sandusky River Watershed Coalition, has created a Home Sewage Treatment System Plan (HSTS) which has been submitted to the Ohio EPA for various assistance programs. In that HSTS thirteen critical areas of Crawford County with failing systems are identified. Only one of those critical areas, the village of Monnett, is located in this watershed project area. The HSTS recommends a municipal sewer system be installed for the approximately 28 homes, township facilities, and fertilizer distribution company in that village (Ward, 2003).

Hardin County:
The Hardin County Health Department has indicated that Hardin County does not have an increased problem of malfunctioning onsite household sewage treatment systems.

Union County:
The Union County Health Department is currently keeping a master list of newly installed onsite waste systems; however they do not have a comprehensive list of systems in their county. In the future a georeferenced database for the entire county's systems is planed, but no projection date has been estimated. This county implements annual inspections on all aeration discharging systems. The environmental health director reported that 85% of all aeration systems in the county passed inspection in 2003 (Pryor, 2004).

Logan County:
The Logan County Health Department has not responded to requests sent from this watershed project about the status of Logan County's household sewage treatment systems.

Number of New Homes Being Built
This information has not been categorized to a great degree in any parts of the watershed.

Number and Size of Animal Feeding Operations
Ohio Department of Agriculture regulates large animal feeding operations requiring manure management, odor control, and various other pollution prevention measures to be outlined in a permit. Ohio Fresh Eggs, Mt. Victory Layer #5 in Hardin County, DeVries Dairy in Marion County, and Foos Hog Farm on the Union/Marion County line all lie within the upper Scioto River watershed. Information from those permits and some other operations just outside of the watershed, where manure application within the upper Scioto River watershed is likely, are listed below.

Ohio Fresh Eggs, LLC:
A permit to operate the Northern Facilities of Buckeye Egg Farms which includes 30 high-rise deep pit manure handling houses at three locations. The Mt. Victory Layer and Goshen Pullet are outlined below. The Marseilles Layer is located in Wyandot well out of the watershed. Combined these facilities currently manage 5.3 million hens. The current permit change is not proposing increasing the capacity of animals at each site and in fact have plans to increase the cage space per in several phases. Cage size for each animal is planed to increase in phases from less than 59 square inches (for the current 172,617 birds per building at Mt. Victory) to 67 square inches (for 144,277 birds per building at Mt. Victory) in 4 and a half years.

Ohio Fresh Eggs, LLC-Mt. Victory Layer #5:
Located in Subwatershed 5, Hardin County, Hale Township. This operation on the eastern Hardin County CR 245 just south of its intersection with CR230. McDonald Creek, a tributary to Rush Creek joining it in Marion County east of La Rue (subwatershed 5), lies on this property east of the egg barns. At this point the stream runs north. A small unnamed tributary to Rush Creek (RM 7.63) joins it on the north side of this property. The Mt. Victory facility has 14 high-rise layer houses (666' x 68' each) housing 172,617 egg producing birds each with manure pits. In increase

in the amount of pit aeration fans to continuously blow air across manure has been proposed. Manure is turned starting one week after manure removal and then turned two to three times a week. Manure will be removed for each pit annually (half the pits in the spring half in the fall). Manure is to be handled as a solid material with 30% or less moisture content. There will be 20,464 tons of dry manure produced annually from this facility. All manure will be sold or gifted to other farmers or brokers for their own use. This permit indicates odor will be controlled by "enhanced cleaning of exhaust fans, and timely pickup and disposal of mortalities. The additional pit fans will promote drier manure faster, resulting in less odors." An 18,013,710 gallons (275' x 520' x 17') capacity egg wash lagoon is present on the west side of this facility. This lagoon is adjacent to 67 acres of a 125 acre field with a center pivot irrigation system at a high rate. The permit indicates the field, which is in three years alfalfa hay/three years grass hay rotation, will be tilled before application of wastewater or immediately worked in after application. This facility also has a drinking water permit for its well, due to having over 24 employees, and a storm water retention pond.

Ohio Fresh Eggs, LLC-Goshen Pullet #5:
Located in Subwatershed 5, Hardin County, Dudley Township. This facility is just outside of the watershed north of La Rue on the Hardin County (west) side of the county line/Co. Rd. 225 and south of SR 309. This facility consists of ten high-rise layer houses containing 197,000 birds each and manure storage lagoons. This facility has proposed increased amount of manure aeration fans and similar onsite manure management as the Mt. Victory facility above. The 10 houses have manure storage capacity of over 28 months and 6,687 tons of dry manure. All manure will be sold or gifted to other farmers or brokers for their own use. This permit does not indicate what fields the manure will be applied on. Identical odor controls as the Mt. Victory facility also appear in this facilities permit.

DeVries Dairy:
Located in Subwatershed 5, Marion County, Bowling Green Township (pictured in Figure 3-16): This dairy farm is permitted to operate with 2500 mature dairy cows (with 500 dry at any given time). These cows are contained in two enclosed buildings. A clay-lined manure containment structure that is 600' x 601' x 11.5' and has about 20,000,000 gallons annual working volume and is just north of the two buildings. About 29,000,000 gallons of liquid manure/wastewater and 17,400 tons of sand separated solids are expected to be produced annually. Solids are to be land applied April through November by a manure spreader. About 17 million gallons of liquid wastewater will be applied to fields by towable central irrigation pivots (8 days a year of applying 160 acres/day at .5" per acre). The remaining 12 million gallons annually will be applied through portable tank or drag-lines in various applications. This permit indicates that field tile outlets will be monitored when liquid application occurs and tile plugs will be available in case of manure entering the tile systems.

Figure 3-16.- DeVries Dairy

Foos Hog Farm:
Located in Subwatershed 5, Union County, Jackson Township. This hog farm received a permit to expand to 5000 finishing hogs (at about 180 pounds each) in 6 barns located in Jackson Township, Union County in 1997. This permit indicates the location of 1081.4 acres on ten farms that manure will be applied all in Jackson Township (with one 143 acre field partially in Green Camp Township, Marion County).

Frisian Hijma Dairy:
Located in Hardin County, Cessna Township: This dairy is located just outside of the watershed northwest of Kenton on TR 100 just east of TR 135. Manure land application is included in this dairy's permits and involves land application on local farms. Because of this it is likely that some of this manure is applied within the Scioto River watershed.

Near Watershed Farms
There are other permitted livestock farms near the upper Scioto River watershed that may apply manure or provide to producers who apply manure on fields within the watershed. Four of these farms are Mad River Egg Farm, Daylay Pullet Farm, KSM Dola, and Sunfall Heifers.

Acres of Highly Erodible Land and Potential Soil Loss
The Food Security Act of 1985 required all cropland classified as being highly erodible land (HEL) to be protected from excessive erosion. Because of this and subsequent Farm Bills, all fields within farm tracts known by the Farm Service Agency have been determined HEL or non-HEL (NHEL). HEL is determined for areas based on the Revised Universal Soil Lose Equation (RUSLE) (USDA, 2004). An estimated 85-90% of farmland acres in the State of Ohio have HEL/NHEL status determined. Up until 2004 the HEL status of farm fields has existed in the

aerial photo libraries of county Farm Service Agency offices, however in 2004 the state's farm fields HEL status will be digitized for GIS use (Henry, 2004).

Water Impounded by Dams (see map 19)
O'Shaughnessy Dam:
The most downstream extent of the watershed, the O'Shaughnessy Dam is the only large water impoundment in the watershed. From the dam to the confluence with Mill Creek is 6.60 river miles (based on the Ohio EPA river mile maps).

Scioto River Low-Head Dam Near Prospect on the Delaware/Marion County Line:
Water impounded by this dam, while not creating an impaired aquatic life use attainment, is a water quality impairment (discussed in the surface water quality subwatershed 8 section above). The hydrologic extent of water being impounded is unknown. This dam was created to pool water for a power plant north of the village of Prospect (SR 4 and SR 203).

Battle Creek:
This small low-head dam is broken and it seems to be impounding no waters at all.

Rock Fork (tributary to Little Scioto River):
Two low head dams are located in Marion County just upstream of SR 423 and just downstream of the Kenton-Galion Road bridge, both within the Chapel Heights Memorial Garden.

Little Scioto River, Crawford County:
This small dam is on private property.

Little Scioto North of Holland Rd. and Scioto River North of Green Camp:
These dams are used as water supply for the City of Marion by the Ohio American Water Company. No information has been obtained about these dams.

VIII. Status and Trends

As discussed in the surface water quality section's subwatershed breakdown, many of the stream reaches that Ohio EPA has determined impaired may indicate improvements on the next survey. Several wastewater treatment plants (including the cities of Marion and Kenton) and larger permitted facilities (including the former Occidental Chemical) have improved since the last analysis. There is little quantitative data about non point sources of pollution in this watershed. Because of this no status or trend has been predicted.

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Map/GIS Data Source:

8-Digit HUC Overview (Map 1) developed from the National Hydrology Dataset (NHD) shows the location of the Upper Scioto River Watershed Project area boundary in the 8-digit hydrologic unit code (HUC) Upper Scioto River watershed. The map identifies selected political subdivision boundaries and locations and major rivers and streams.

Project Area Overview (Map 2) shows the Upper Scioto River Watershed Project boundary and the boundaries of the 11 subwatersheds. Also shown are selected political subdivision boundaries and locations, major roads, rivers and streams.

Subwatersheds (Maps 3-12) contain information on potential contaminate sources from data layers created by Ohio EPA using the following sources:

BUSTR: LUST Database (geocoded);	BUSTR: UST Database (geocoded);
OEPA RIPFLEX Database;	US EPA Envirofacts
OEPA Landfill GIS Layer	USGS Geonames;

Ohio EPA-DERR Sites GIS Layer; OEPA Livestock GIS Coverage;
OEPA Town Gas Sites GIS Layer; Class 5: OEPA-DDAGW UIC5 GIS Layer;
OEPA-DSW Surface Impoundment GIS Layer

Also included on each subwatershed map is information on the location of oil and gas wells from Ohio Department of Natural Resources, Division of Mineral Resources. Information on the location of karst areas from the Ohio Department of Natural Resources, Division of Geological Survey and the Ohio Wetland Inventory, 1985 Landsat Thematic Mapper Data.

Topography (Map 13)
Geographically Referenced Information Program.

Geology Bedrock (Map 14):
ODNR, Division of Geological Survey, Bedrock Geology Maps 4/1/00
ODNR, Division of Water, Ground Water Resources Maps 4/1/00
ODNR, Division of Water, Water well logs 4/1/00
Supplied to the watershed project by Ohio EPA Division of Drinking and Groundwater.

Prime Farmland by Soil Type (Map 15):
U.S. Deptartment of Agriculture, Natural Resources Conservation Service. National Cooperative Soil Survey.

Glacial Features (Map 16):
1999. Quaternary Geology of Ohio, Ohio Department of Natural Resources, Division of Geologic Survey.

Vegetation at the Time of Earliest Surveys (Map 17):
Original map: A Cooperative Project of the Ohio Biological Survey And The Natural Resources Institute of the Ohio State University 1966. Revised 2001. Ohio Department of Natural Resources, Division of Natural Areas and Preserves (White Pine-Red Maple Swamp forests). Appendix 3E contains the definitions of the primary data field for this dataset.

Land Cover 1994 (Map 18):
2003. Ohio Gap Analysis Ohio Land Cover Map. Data author: Spencer, Lawrence, and Huang, Mingjuan. July 19.

Drainage Features (Map 19):
This map shows the location of the watershed boundary, subwatershed boundaries, rivers, streams, major roads and selected political boundaries and municipal locations. The map indicates the location of open ditches in Marion, Crawford, Auglaize, Hardin, Union and Delaware Counties. The information on ditch maintenance activities is not for survey, detailed planning, or assessment purposes. The map also includes the location of straightened channels derived from the analysis of the NHD data. This analysis selected stream reaches that were at least 1000 feet of straight line (having no turns within the resolution of the data). This analysis was created to serve as a general planning mechanism for the watershed project. This dataset is limited in accuracy by the

resolution of the NHD and should not be used for survey, detailed planning, or assessment purposes.

Aquatic Life Use Attainment (Map 20):
Data from the OEPA 1997 and OEPA 2000 studies. Digital data Delaware SWCD 2003 on NHD hydrology reaches. This analysis was created to serve as a general planning mechanism for the watershed project. This dataset is limited in accuracy by the resolution of the NHD and should not be used for survey, detailed planning, or assessment purposes.

Ohio EPA water quality testing locations are from stations in the US EPA STORET water quality repository and were digitized by Delaware SWCD 2003 using the latitude/longitude from station identifications. All of these sites were created by Ohio EPA and the latitude/longitude accuracy may vary. Individual sites may be verified by checking geo-referenced position with the site description (typically at a road bridge); however this has not been done to all of these sites.

Slope > 6% (Map 21):
U.S. Department of Agriculture, Natural Resources Conservation Service, National Cooperative Soil Survey, Soil Survey Geographic database.

STATSGO – General Soil Associations (Map 22):
U.S. Department of Agriculture, Natural Resources Conservation Service, National Cooperative Soil Survey, State Soil Geographic database.

Flooding Frequency (SSURGO) (Map 23):
U.S. Department of Agriculture, Natural Resources Conservation Service, National Cooperative Soil Survey, Soil Survey Geographic database.
Unconsolidated aquifer dataset (Not used in a map):
Date unknown. Unconsolidated Aquifer dataset. Ohio DNR. Supplied to the watershed project by Ohio EPA Division of Drinking and Groundwater.

Bedrock and glacial groundwater potentiometric surfaces (Not used in a map):
These data were supplied to the watershed project from Ohio EPA Division of Drinking and Groundwater.

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Chapter 4
Watershed Impairments, Restoration and Protection Goals, and Implementation

Introduction

This chapter links each major cause with its source of impairment, lays out restoration and protection goals, and describes actions that should be taken to reach those goals. These items are organized according to smaller watershed areas, which for the most part correspond to the subwatersheds described in the inventory in Chapter 3. Each area described has a suite of resource concerns and action items to be implemented to improve the water resource. Impairments are listed based on the best information available, which consists primarily of assessments by Ohio EPA, City of Columbus, Division of Power and Water, watershed project staff, and local stakeholder input. On-going monitoring has augmented or supported this pool of information. The restoration and protection goals as well as implementation actions have been developed by the project's advisory committee and a variety of work groups and other resource management specialists. The goals have been set by weighing the level of impairment of the water resources with the likelihood that the proposed improvements can be achieved. Action items to improve the water resources have then been selected for their effectiveness in reducing or mitigating the causes of impairments as well as by what the advisory committee believes would be acceptable to watershed stakeholders. Resources that will be used to implement these action items are also included in this chapter.

Plan of Action for Resource Improvements

Upper Scioto River Watershed Project
HUC: 05060001 (northwestern portion)

Drainage area	**718.7 mi.^{2}**	**459,965 ac.**		
Straightened channels	**37.0%**			
Relief	**620 ft.**			
Land cover (2002)	**Row crop**	**72.1%**	**Grasslands**	**13.0%**
	Floodplain	**3.6%**	**Developed**	**4.3%**
	Various upland wooded	**5.3%**		

The information in this section provides an overview of the entire Upper Scioto River Watershed Project area. Concerns, problems, goals, and actions are general in nature and are a composite of the various stakeholder concerns gathered throughout the entire project area. Detailed causes and sources of impairments, descriptions of nonpoint source management measures, and implementation plans are described under the subwatersheds in this chapter.

Stakeholder Water Quality Concerns Based on Composite of Eleven Subwatersheds Encompassed in Plan

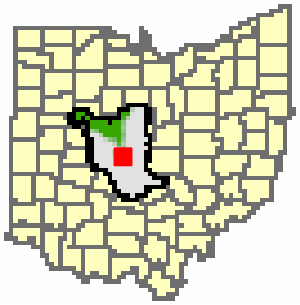


Figure 4-1. The Upper Scioto River watershed (HUC-05060001) with the watershed project area highlighted in green. The red square denotes the City of Columbus.

• Excessive soil particle sediment loads to surface waters and excessive in-streambed sedimentation • Excessive nutrient loading in streams (nitrogen and phosphorus) • Poor aquatic life habitat in streams • Trash and refuse in streams and along stream corridors	• Poor riparian habitats • Excessive pesticide loading in streams (atrazine) • Pollutants in streams (toxins and carcinogens) • Ground water contamination (nutrients and pesticides) • Urban stormwater runoff contaminates	• High levels of pathogens in streams and wells • Water quality concerns beyond the project area boundary (Gulf of Mexico hypoxia)

Problem statements (causes and sources)

1. The annual export of dissolved nutrients and over 350,000 metric tons of sediment from the Scioto River watershed is believed to contribute to the Gulf of Mexico's hypoxia episodes. Hypoxia, or depleted oxygen levels in the Gulf of Mexico force native marine organisms to migrate to other areas.

2. Nonpoint source pollution from the Upper Scioto River Watershed Project (USRWP) area has resulted in periodic high nitrate concentrations in the source water supply for the City of Columbus. These nitrates are primarily attributed to agricultural usage of nitrogen-based fertilizers and failing wastewater treatment plants and household sewage treatment systems. Other water quality and public health concerns expressed by the City

of Columbus, Division of Power and Water include phosphate loading and atrazine levels.

3. Excessive nutrients (primarily nitrates and phosphates) from agriculture, failing sewage treatment systems, and urban runoff negatively impair the stream habitat quality and result in nonattainment to partial attainment of Clean Water Act attainment status.

4. High levels of pathogens from various sources within the watershed, such as, failing or non-existent household sewage treatment systems, municipal waste water treatment plants and package plants, and various livestock operations pose health threats to drinking water supplies from wells, rivers and reservoirs. Manure from various animal feeding operations outside the watershed may be transported into the watershed for land application and are cause for concern.

5. Various carcinogens and other toxic substances from industrial sites within the Little Scioto River watershed have resulted in the closure of stream segments to public use and raised public health and environmental health concerns over the extent of the affected areas.

6. Decomposition of trash and refuse causes discoloration of water and contribute unknown contaminants.

7) Low-head dams in the Scioto mainstem can result in increased stream temperatures, decreased dissolved oxygen levels, premature sediment deposition and embedded substrates, reduced “flushing” flows, and prevention of up-stream migration and spawning of aquatic species.

8. Poor aquatic life habitat and riparian habitat are often attributed to the effects of intensive stream channelization projects and channel maintenance activities.

9. Accelerated erosion from unprotected soils and from streambank erosion contributes to excessive in-stream sediment loading and sedimentation.

Impairment Reduction Goals

1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30% annually.

3. Reduce level of pathogens from failing household sewage treatment systems, small-flow semi-public sewage treatment systems, WWTPs and package plants, and livestock operations to ensure water quality standards in accordance with the Clean Water Act throughout the watershed project area

4. Restore areas of streams polluted with toxic and carcinogenic contaminants to ensure water quality standards in accordance with the Clean Water Act throughout the watershed project area.

5. Reduce the amount of trash and refuse in streams and along stream corridors to levels manageable by one annual river sweep per year.

6. Removal of non-essential low-head dams throughout the watershed

7. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status

8. Reduce nitrate, phosphate, and atrazine levels to a level that does not exceed the maximum contaminant level (MCL) for safe drinking water.

Other Goals

1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the watershed.

2. Develop on-going water quality monitoring program throughout the watershed to support implementation efforts and stimulate a variety of academic interests.

Specific Actions

1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), Wildlife Habitat Incentives Program (WHIP), Water Pollution Control Loan Fund (WPCLF) program, and Agricultural Watershed Awareness Resource Evaluation (AWARE) program throughout the USRWP area.

2. Develop and implement a nitrate management program throughout the watershed that incorporates components of education and outreach, livestock waste management, crop management practices, drainage water management, and land use changes.

3. Continue monitoring and assessment of water quality along the Scioto River mainstem and its tributaries within the watershed to determine impairment trends.

4. Promote the use of resource management plans, conservation programs, conservation tillage practices, and incentive bonus programs that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals loading to surface waters.

5. Increase the diversity and quality of both in-channel and riparian habitats along the Scioto River mainstem and tributaries.

6. Explore the impacts of dam removal projects on the Scioto River mainstem

7. Implement stream restoration projects to remediate water quality impairments caused by contaminated soils contributing pollutants to surface water and ground water resources.

8. Quantify the level of pathogens, TSS, and BOD from failing household sewage treatment systems, small-flow semi-public sewage systems, WWTPs and package plants, and livestock operations throughout the watershed.

9. Organize, coordinate and participate in stream sweeps, litter indexing, and other litter reduction efforts.

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s); information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

Action Items

▶ **ACTION ITEM 1 - Supports goals 1, 2, 7 and 8**

Create over 9,000 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Wetland Reserve Program (WRP), and the Wildlife Habitat Incentive Program (WHIP) in the form of filter strips, wildlife habitat, shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale

Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wetland wildlife habitat.

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the management measure(s); sources of funding; and describes the method(s) used to implement the NPS practice.

Resources	• Upper Scioto River Watershed CRP, CREP, WRP, and WHIP implementation staff – (NRCS, SWCD, FSA) • Heart of Ohio Resource Conservation and Development (HoO RC&D) – (Board and staff) • Watershed coordinator

Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, WHIP Programs
Information/Education Component	• Public event speaking engagements, workshops, display booths at county fairs and Farm Science Review, informational fliers and/or other written materials, and written and verbal correspondence with potential CREP enrollees, Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from SWCDs, NRCS, ODNR, FSA, RC&Ds
Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CRP, CREP, WRP and WHIP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ ACTION ITEM 2 - Supports goal 1, 2, 3, 7 and part of 8

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies.

Rationale

Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminate the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Health Department and General Health District Environmental Health staffs; • Wastewater treatment plant operators; • Division of Environmental and Financial Assistance (DEFA) linked deposit loans if available; • Water Pollution Control Fund (WPCLF) linked deposit loan program; • OEPA 319 funding.
Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected

	officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate such information as year of HSTS installation, type of HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs; • Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education Component	• The project plans to have an organized educational component in order to educate communities about steps that they can take to improve water quality within the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's

	HSTS program. • The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the life of the system.
Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures, identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented; • Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders; • A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented; • Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

▶ ACTION ITEM 3 - Supports goal 6

Carry out a feasibility study for the removal of a low-head dam located on the Scioto River south of Prospect. Proceed with removal if appropriate.

Rationale

Low-head dams are known to lead to increased stream temperatures, decreased dissolved oxygen levels, premature sediment deposition and embedded substrates, reduced "flushing" flows, and prevention of up-stream migration and spawning of aquatic species.

Expected outcomes from the removal of the dam at Prospect include reduced total suspended solids (TSS), increased density and diversity in aquatic macroinvertebrate communities, increased diversity and distribution of fish communities, higher dissolved oxygen levels (DO), reduced embedded substrate occurrence, improved habitat conditions, higher low flow velocities, increased biological index scores and likely attainment of eco-region WQS biocriteria.

Resources	Potential funds generated from: Ohio Department of Transportation (ODOT) mitigation; Ohio Environmental Protection Agency (OEPA), Water Resource Restoration Sponsor Program (WRRSP); Section 319 grants, Natural Resources Conservation Service (NRCS), Wildlife Habitat Incentives Program (WHIP); U.S. Army Corps of Engineers (USACE), Huntington District thru the Aquatic Ecosystem Restoration – Section 206, Water Resources Development Act; U.S. Fish and Wildlife Service (USFWS) thru the Fish Passage Grant Program; the National Fish and Wildlife Foundation (and other private sources), Wildlife Conservation and Appreciation Fund established by the Partnerships for Wildlife Act. Heart of Ohio Resource Conservation and Development (HoO RC&D); City of Columbus, Division of Power and Water Watershed Coordinator
Method	Partner with Heart of Ohio Resource Conservation and Development (HoO RC&D), Marion SWCD, ODNR, City of Columbus, Division of Power and Water, and the Village of Prospect to secure feasibility study and, if appropriate, secure funds for dam removal and the logistics of removal (e.g., 404 permit).
Information/Education Component	Public meetings, local news coverage, Delaware SWCD newsletter and website. Active information/education partners include community volunteers, and staff from Delaware and Marion SWCDs, ODNR, HoO RC&D
Performance indicators	Organization of partnership group to coordinate dam removal efforts. Completion of the ODNR-Division of Water, Dam Safety "Lowhead Dam Removal Framework for Decision Making" Completion of dam property title search and dam removal feasibility study. Completion and submission of all necessary reports for all approving and funding agents of the project. Scioto River mainstem improves its aquatic life use attainment status, increased reach of the naturally flowing stream segment, improves public safety in this area of the river.
Time frame	January 2007 to December 2008

▶ ACTION ITEM 4 - Supports goal 7
Increase the diversity and quality of habitat within the channel and riparian zone along the Scioto River mainstem and its tributaries.

Rationale
The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a "healthier" ecosystem. Stream habitat such as meanders and in-stream structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • WRRSP contract with Scioto Conservancy Distinct or other groups. • Watershed Coordinator
Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met. • Partner with the Conservancy Districts to identify locations that are appropriate for restoring stream habitat and to secure funding for the efforts. Explore idea that habitat restoration (i.e., through increased floodplain connection) may result in an increase in the carrying capacity of the channel which can serve to reduce flooding in immediate areas and even improve stormwater retention in the upper watershed. An increase in retention in the upper watershed may alleviate flooding issues for downstream landowners. Wildlife habitat plan created and implemented by conservancy district or another group in areas where the Scioto River is in partial attainment.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and staff from SWCDs, NRCS, RC&Ds, OEPA
Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI). • Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ ACTION ITEM 5 - Supports goal 5

Promote and implement an annual stream sweep of the Little Scioto River and Scioto River mainstem and conduct a litter index throughout subwatersheds 7 and 8. Explore and evaluate the effectiveness of other litter reduction efforts throughout the Upper Scioto River Watershed Project area.

Rationale

Trash and refuse in streams can decompose to cause discoloration of water and contribute unknown contaminants. Litter in streams and along corridors and roadsides lower the aesthetic appeal and value of the area generate unnecessary workloads for cleanup. Litter indexing is an effective method of generating public involvement and participation in watershed activities. Indexing can be used to determine the effectiveness of litter prevention campaigns and assist in targeting areas where additional efforts are needed to maintain the watershed in good condition.

Resources	• Marion and Delaware County SWCDs and Marion and Delaware County General Health District staffs • Watershed Coordinator
Method	• Watershed coordinator would organize, coordinate, and participate with Marion and Delaware County SWCDs, and Marion and Delaware County General Health District staffs to conduct an annual river sweep and litter indexing activity.
Information/Education Component	• Delaware SWCD newsletter and website. Event flier. Active information/education partners include volunteers, and staff from Marion and Delaware County SWCDs and Marion and Delaware County General Health Districts
Performance indicators	• Reduction in the amount of trash and refuse in streams and along corridors to levels manageable by one event per year.
Time frame	• September 2007. Annually thereafter until no longer necessary.

Subwatershed 1: Headwaters/ Cottonwood Ditch

HUC: 05060001010-010 -020

Drainage area	**96.3 mi.^{2}**	**61,649 ac.**		
Straightened channels	**37.0%**			
Relief	**155 ft.**			
Land cover (2002)	**Agriculture and open urban**	**91.7%**	**Wooded**	**7.2%**

Soils: Blount-Glynwood-Pewamo on ground moraines and end moraines. Roundhead and McGuffey on marshes.
Note: This subwatershed includes parts of Allen, Auglaize, and Hardin Counties.

Figure 4-2. Scioto River near the Auglaize/Hardin County border

Water Quality Concerns Based on Stakeholder Input

• Excessive soil particle sediment loads to surface waters and excessive in-streambed sedimentation • Excessive nutrient loading in streams (nitrogen and phosphorus)	• Poor aquatic life habitat in streams • Poor riparian habitats	• Ground water contamination (nutrients and pesticides) • High levels of pathogens in streams and wells

Problem statements (causes and sources)

1. Over 7 percent of the soils or about 4,484 acres of soil have slopes greater than 6 percent. Accelerated erosion from unprotected soils and from streambank erosion contributes to excessive in-stream sediment loading and sedimentation.

2. Channel maintenance activities facilitate the downstream transport of silt. Channel maintenance activities along the Cottonwood Ditch has created poor physical habitat for aquatic life uses. The poor quality or lack of in-stream and riparian habitat has impaired

biological communities resulting in a full biological use attainment of Modified Warmwater Habitat (MWH).

3. Surface runoff from unprotected soils and poor filtration of nutrients contribute to excessive nutrient loads and exacerbate phosphorus loadings to the Scioto River mainstem.

4. Discharges from wastewater treatment plant (WWTP) in the Village of Alger have impacted the water quality upstream from the Village of McGuffey. Mean annual discharge had exceeded design capacity in 6 of the 11 years from 1984 to 1995. Trends in loadings of total suspended solids (TSS) and ammonia nitrogen (NH_3-N) roughly parallel the increases in discharge over design capacity. Past TSS violations have been attributed to excessive algae discharging from the final effluent.

5. Severe water quality impacts associated with the Village of McGuffey WWTP were observed at RM 0.68. Violations of the minimum dissolved oxygen (D.O.) and average D.O. criterion have been documented along with increased concentrations of NH_3 –N, P, and BOD compared to upstream. The treatment plant has a history of numerous violations of D.O., TSS, $cBOD_5$, fecal coliform, and total residual chlorine (TRC). Excessive infiltration and inflow into the collection system and sludge not returning to the oxidation ditch are the suspected causes of violations.

6. Stakeholders have expressed concerns that untreated effluent from failing HSTS is leading to high levels of pathogens and excessive nutrients in ditches and streams. To date credible data does not exist to support these concerns

Impairment Reduction Goals

1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30% annually.

3. Reduce the level of pathogens from failing household sewage treatment systems, WWTPs and package plants, and livestock operations to ensure water quality standards in accordance with the Clean Water Act throughout the subwatershed.

4. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status

Other goals

1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the subwatershed

2. To better understand current water quality conditions of the water resources and identify areas that are performing well and those that need improvement.

Specific Actions

1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) throughout the subwatershed.

2. Continued monitoring and assessment of water quality along the Scioto River mainstem and its tributaries within this subwatershed to determine impairment trends.

3. Promote the use of resource management plans, conservation programs and conservation tillage practices that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals loading to surface waters.

4. Promote and implement the use of drainage water management systems for nitrate reduction where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

5. Increase the diversity and quality of both in-channel and riparian habitats along the Scioto River mainstem and its tributaries.

6. Quantify and reduce the level of pathogens, TSS, and BOD from failing HSTS, WWTPs and package plants, and livestock operations throughout the subwatershed

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s); information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

▶ ACTION ITEM 1 - Supports goals 1, 2 and 4

Create at least 350 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) and the Wetland Reserve Program (WRP) in the form of filter strips, wildlife habitat, shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale

Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wildlife habitat.

Resources	• Hardin County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Wildlife Habitat Incentive Program and implementation staff • Watershed coordinator
Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, and WHIP Programs
Information/Education Component	• Public event speaking engagements, display booths at county fairs and Farm Science Review, informational fliers and/or other written materials, and written and verbal correspondence with potential CREP enrollees, Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Allen, Auglaize, Hardin, and Delaware SWCDs, NRCS, ODNR, FSA
Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CREP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ **ACTION ITEM 2 - Supports goal 6 and "Other Goals" 1 & 2**
Monitor and quantify water quality and bio-indicators along the Scioto River mainstem and its tributaries in this subwatershed.

Rationale
Monitoring water quality and biological indicators will provide information that can be used to assess the overall function, performance and quality of the water resources. It will also provide a basis of comparison to other areas within the Upper Scioto River Watershed Project area as well as other watersheds throughout the Midwest. Such data will add to a current pool of information and can be used for trend analyses.

Resources	• Support provided by the Ohio EPA for equipment, personnel, laboratory analyses, and expertise • City of Columbus, Division of Water, Water Quality Lab • USGS 03219500 Scioto River near Prospect OH • USGS 03220000 Mill Creek near Bellpoint OH • Farm Bureau, Agriculture Ecology Committees –

	AWARE Program • Watershed Coordinator
Method	• In addition to stationary sites, water quality sampling will take place regularly at locations that are appropriate for providing baseline information as well as monitoring the effectiveness of action items (these specific locations are yet to be determined). The frequency of sampling will be determined based on the usefulness of the data as well as the availability of resources. Biological monitoring will be conducted at a select number of sites each year, which will be determined as information needs arise.
Information/Education Component	• USGS Ohio real-time water data website, Delaware SWCD newsletter and website.
Performance indicators	• An assessment of river and stream quality that is adequate to update Ohio EPA aquatic life use designations by 2007 (in compliance with the credible data rules).
Time frame	• Field sampling and monitoring summer 2006 – 2007. Stationary sites on-going.

▶ **ACTION ITEM 3 - Supports goal 1 & 4**
Promote and implement soil erosion management programs that reduce the potential for nonpoint source sediment loading to surface waters.

Rationale
Conservation tillage or no-tillage, planting warm season grasses on highly erodible land, planting cover crops, conservation crop rotations, pasture and hayland plantings, and pasture and grazing management all help to reduce the potential for soil loss from erosion in farm fields and improve soil quality.

Resources	• Hardin County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • DEFA-WPCLF implementation staff • Watershed Coordinator
Method	• Hardin SWCD and Ohio EPA-DEFA partner to provide low interest loans to landowners for the implementation of projects that result in a reduction of agricultural nonpoint source pollution problems (sediment). • Continue to use cost share incentives currently provided through CRP, CREP, and EQIP for

	agricultural BMPs.
Information/Education Component	• Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Allen, Auglaize, Hardin, and Delaware SWCDs, NRCS, ODNR, FSA
Performance indicators	• Reduction in the total suspended solid load in mainstem (as measured through grab sample data). • QHEI substrate scores improve.
Time frame	• Ongoing, suspend date dependent on funding

▶ **ACTION ITEM 4 - Supports goal 2**

Promote and implement the use of drainage water management systems where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and where SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

Rationale

Research has shown that drainage water management systems can reduce annual nitrate loads by as much as 30 to 40 %. Drainage management systems can improve water quality by preventing the discharge of manure or nutrient laden water carried through subsurface drainage into waters of the state. Other water quality benefits may be derived from a reduction in wind eroded organic soil depositing in streams and other water bodies and by providing a mechanism to pump and treat or divert polluted sub-surface drain water. Phosphorus reduction can also be substantial during dry periods when soil cracks can occur from the surface level to the depth of the subsurface drain. Phosphorus can also be a significant issue when rainfall or flooding causes liquid manure to reach the drainage system.

Resources	• USDA – NRCS and ARS staff • Hardin County EQIP and implementation staff • Scioto River Watershed CREP and implementation staff • Watershed Coordinator
Method	• Provide up to 90% cost share assistance for the installation of permanent drainage water management structures where determined suitable to the CREP contract acreage site and needed to achieve water quality objectives. Provide access to a BMP risk management instrument for producers to offset yield loss and/or costs for subsurface drainage system repair that has resulted from the employment and/or installation of the water table management infrastructure. • Provide EQIP funding (50-75% cost-share) when available for the installation of permanent drainage

	water management structures where determined suitable to the site and needed to achieve water quality objectives
Information/Education Component	• Utilize a comprehensive promotional effort that includes radio programs, farm magazine articles, revised CREP brochures and literature, and public meetings, Delaware SWCD newsletter and website. Review local EQIP ranking sheet to determine the amount of points available to drainage water management practices. Active information/education partners include volunteers, and staff from Allen, Auglaize, Hardin, and Delaware SWCDs, NRCS, ODNR, FSA, ARS
Performance indicators	• Reports provided by USDA-ARS, NRCS, SWCD staff, City of Columbus, Division of Water, Water Quality Assurance Laboratory, and producers that indicate a trend towards lower nitrate levels in the ambient water downstream of drain outlets during non-growing season (e.g., November through March)
Time frame	• Initiate promotional efforts January 2006. Begin installation of practices as early as summer 2006.

▶ **ACTION ITEM 5 - Supports goal 4**

Increase the diversity and quality of habitat within the channel and riparian zone along the Scioto River mainstem and its tributaries.

Rationale

The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a "healthier" ecosystem. Stream habitat such as meanders and in-stream structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • WRRSP contract with the Upper Scioto Drainage and Conservancy Distinct or other group. • Watershed Coordinator
Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met. • Partner with the Upper Scioto Drainage and Conservancy Distinct to identify locations that are

	appropriate for restoring stream habitat and to secure funding for the efforts. Explore idea that habitat restoration (i.e., through increased floodplain connection) may result in an increase in the carrying capacity of the channel which can serve to reduce flooding in immediate areas and even improve stormwater retention in the upper watershed. An increase in retention in the upper watershed may alleviate flooding issues for downstream landowners. Wildlife habitat plan created and implemented by conservancy district or another group in areas where the Scioto River is in partial attainment.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and staff from Allen, Auglaize, Hardin, and Delaware SWCDs and NRCS.
Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI). • Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ **ACTION ITEM 6 - Supports goal 3**

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies and aquatic life habitat

Rationale

Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Health Department and General Health District Environmental Health staffs; • Wastewater treatment plant operators;

	• Division of Environmental and Financial Assistance (DEFA) linked deposit loans if available; • Water Pollution Control Fund (WPCLF) linked deposit loan program; • OEPA 319 funding.
Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate such information as year of HSTS installation, type of HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs; • Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education	• The project plans to have an organized educational

Component	component in order to educate communities about steps that they can take to improve water quality within the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's HSTS program. • The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the life of the system.
Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures, identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented; • Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders; • A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented; • Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

Subwatershed 2: Upstream Kenton

HUC: 05060001010-030 -040 & -050

Drainage area	**63.4 mi.^{2}**	**40,564 ac.**		
Straightened channels	**11.5%**			
Relief	**195 ft.**			
Land cover (2002)	**Agriculture & open urban**	**88.5%**	**Wooded**	**10.0%**

Soils: End moraines surrounding (except to the east) Blount-Glynwood-Pewamo centered in lake deposits with muck soils (Roundhead, McGuffey) and silty clay loams. **Note:** This subwatershed occurs entirely within the boundaries of Hardin County.

Water Quality Concerns Based on Stakeholder Input

• Excessive soil particle sediment loads to surface waters and excessive in-streambed sedimentation • Excessive nutrient loading to streams (nitrogen and phosphorus)	• Poor aquatic life habitat in streams • Poor riparian habitats • Drinking water contamination	• High levels of pathogens in streams and wells

Problem statements (causes and sources)

1. Over 8 percent of the soils or about 3,278 acres of soil have slopes greater than 6 percent. Accelerated erosion from unprotected soils and from streambank erosion contributes to excessive in-stream sediment loading and sedimentation.

2. Channel maintenance activities facilitate the downstream transport of silt. The poor quality or lack of in-stream and riparian habitat has impaired biological communities resulting in a full biological use attainment of Modified Warmwater Habitat (MWH).

3. Surface runoff from unprotected soils and poor filtration of nutrients contribute to excessive nutrient loads and exacerbate phosphorus loadings to the Scioto River mainstem.

4. Discharges from wastewater treatment plant (WWTP) for the Village of Alger have impacted the water quality upstream from the village of McGuffey. Mean annual discharge had exceeded design capacity in 6 of the 11 years from 1984 to 1995. Trends in loadings of total suspended solids (TSS) and ammonia nitrogen (NH_3-N) roughly parallel the increases in discharge over design capacity. Past TSS violations have been attributed to excessive algae discharging from the final effluent.

5. Severe water quality impacts associated with the Village of McGuffey WWTP were observed at RM 0.68. Violations of the minimum dissolved oxygen (D.O.) and average

D.O. criterion have been documented along with increased concentrations of NH_3–N, P, and BOD compared to upstream. The treatment plant has a history of numerous violations of D.O., TSS, $cBOD_5$ fecal coliform, and total residual chlorine (TRC). Excessive infiltration and inflow into the collection system and sludge not returning to the oxidation ditch are the suspected causes of violations.

6. Stakeholders have expressed concerns that untreated effluent from failing HSTS is leading to high levels of pathogens and excessive nutrients in ditches and streams. To date credible data does not exist to support these concerns

Impairment Reduction Goals

1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30% annually.

3. Reduce level of pathogens from failing household sewage treatment systems, WWTPs and package plants, and livestock operations to ensure water quality standards in accordance with the Clean Water Act throughout the subwatershed.

4. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status

Other goals

1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the subwatershed

2. To better understand current water quality conditions of the water resources and identify areas that are performing well and those that need improvement.

Specific Actions

1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) throughout the subwatershed.

2. Continued monitoring and assessment of water quality along the Scioto River mainstem and its tributaries within this subwatershed to determine impairment trends.

3. Promote the use of conservation programs and conservation tillage practices that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals loading to surface waters.

4. Promote and implement the use of drainage water management systems for nitrate reduction where practice conditions apply per Ohio Nonpoint Source Pollution

Management Plan, NRCS FOTG and SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

5. Increase the diversity and quality of both in-channel and riparian habitats along the Scioto River mainstem and its tributaries.

6. Quantify the level of pathogens from failing HSTS, WWTPs and package plants, and livestock operations throughout the subwatershed

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s);information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

▶ ACTION ITEM 1 - Supports goal 1, 2, and 4
Create at least 700 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) and the Wetland Reserve Program (WRP) in the form of filter strips, wildlife habitat, shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale
Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wildlife habitat.

Resources	• Hardin County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Wildlife Habitat Incentive Program and implementation staff • Watershed coordinator
Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, and WHIP Programs
Information/Education Component	• Public event speaking engagements, display booths at county fairs and Farm Science Review, informational fliers and/or other written materials, and written and

	verbal correspondence with potential CREP enrollees, Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Hardin, and Delaware SWCDs, NRCS, ODNR, FSA
Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CREP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ **ACTION ITEM 2 - Supports goal 6 and "Other Goals" 1 & 2**
Monitor and quantify water quality and bio-indicators along the Scioto River mainstem and its tributaries in this subwatershed.

Rationale
Monitoring water quality and biological indicators will provide information that can be used to assess the overall function, performance and quality of the water resources. It will also provide a basis of comparison to other areas within the Upper Scioto River Watershed Project area as well as other watersheds throughout the Midwest. Such data will add to a current pool of information and can be used for trend analyses.

Resources	• Support provided by the Ohio EPA for equipment, personnel, laboratory analyses, and expertise • City of Columbus, Division of Water, Water Quality Lab • USGS 03219500 Scioto River near Prospect OH • USGS 03220000 Mill Creek near Bellpoint OH • Farm Bureau, Agriculture Ecology Committees – AWARE Program • Watershed Coordinator
Method	• In addition to stationary sites, water quality sampling will take place regularly at locations that are appropriate for providing baseline information as well as monitoring the effectiveness of action items (these specific locations are yet to be determined). The frequency of sampling will be determined based on the usefulness of the data as well as the availability of resources. Biological monitoring will be conducted at a select number of sites each year, which will be determined as information needs arise.
Information/Education Component	• USGS Ohio real-time water data website, Delaware SWCD newsletter and website.
Performance	• An assessment of river and stream quality that is

indicators	adequate to update Ohio EPA aquatic life use designations by 2007 (in compliance with the credible data rules).
Time frame	• Field sampling and monitoring summer 2006 – 2007. Stationary sites on-going.

▶ **ACTION ITEM 3 - Supports goal 1, 2, and 4**
Promote and implement soil erosion management programs that reduce the potential for nonpoint source sediment loading to surface waters.

Rationale
Conservation tillage or no-tillage, planting warm season grasses on highly erodible land, planting cover crops, conservation crop rotations, pasture and hayland plantings, and pasture and grazing management all help to reduce the potential for soil loss from erosion in farm fields and improve soil quality.

Resources	• Hardin County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • DEFA-WPCLF implementation staff • Watershed Coordinator
Method	• Hardin SWCD and Ohio EPA-DEFA partner to provide low interest loans to landowners for the implementation of projects that result in a reduction of agricultural nonpoint source pollution problems (sediment). • Continue to use cost share incentives currently provided through CRP, CREP, and EQIP for agricultural BMPs.
Information/Education Component	• Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Hardin, and Delaware SWCDs, NRCS, ODNR, FSA, OEPA
Performance indicators	• Reduction in the total suspended solid load in mainstem (as measured through grab sample data). • QHEI substrate scores improve.
Time frame	• Ongoing, suspend date dependent on funding

▶ **ACTION ITEM 4 - Supports goal 2**
Promote and implement the use of drainage water management systems where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG

and where SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

Rationale
Research by USDA Natural Resources Conservation Service (NRCS) and Agriculture Research Service (ARS) has shown that drainage water management systems can reduce annual nitrate loads by as much as 30 to 40%. Drainage water management systems can improve water quality by preventing the discharge of manure or nutrient laden water carried through subsurface drainage into waters of the state. Other water quality benefits may be derived from a reduction in wind eroded organic soil depositing in streams and other water bodies and by providing a mechanism to pump and treat or divert polluted sub-surface drain water.

Resources	• USDA – NRCS and ARS staff • Hardin County EQIP and implementation staff • Scioto River Watershed CREP and implementation staff • Watershed Coordinator
Method	• Provide up to 90% cost share assistance for the installation of permanent drainage water management structures where determined suitable to the CREP contract acreage site and needed to achieve water quality objectives. Provide access to a BMP risk management instrument for producers to offset yield loss and/or costs for subsurface drainage system repair that has resulted from the employment and/or installation of the water table management infrastructure. • Provide EQIP funding (50-75% cost-share) when available for the installation of permanent drainage water management structures where determined suitable to the site and needed to achieve water quality objectives
Information/Education Component	• Utilize a comprehensive promotional effort that includes radio programs, farm magazine articles, revised CREP brochures and literature, and public meetings, Delaware SWCD newsletter and website. Review local EQIP ranking sheet to determine the amount of points available to drainage water management practices. Active information/education partners include volunteers, and staff from Hardin, and Delaware SWCDs, NRCS, ODNR, FSA, ARS
Performance indicators	• Reports provided by USDA-ARS, NRCS, SWCD staff, City of Columbus, Division of Water, Water Quality Assurance Laboratory, and producers that indicate a

	trend towards lower nitrate levels in the ambient water downstream of drain outlets during non-growing season (e.g., November through March)
Time frame	• Initiate promotional efforts January 2006. Begin installation of practices as early as summer 2006.

▶ **ACTION ITEM 5 - Supports goal 4**

Increase the diversity and quality of habitat within the channel and riparian zone along the Scioto River mainstem and its tributaries.

Rationale

The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a "healthier" ecosystem. Stream habitat such as meanders and in-stream structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • WRRSP contract with the Upper Scioto Drainage and Conservancy Distinct or other group. • Watershed Coordinator
Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met. • Partner with the Upper Scioto Drainage and Conservancy Distinct to identify locations that are appropriate for restoring stream habitat and to secure funding for the efforts. Explore idea that habitat restoration (i.e., through increased floodplain connection) may result in an increase in the carrying capacity of the channel which can serve to reduce flooding in immediate areas and even improve stormwater retention in the upper watershed. An increase in retention in the upper watershed may alleviate flooding issues for downstream landowners. Wildlife habitat plan created and implemented by conservancy district or another group in areas where the Scioto River is in partial attainment.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and

	staff from Hardin and Delaware SWCDs and NRCS.
Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI). • Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ **ACTION ITEM 6 - Supports goal 3**

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies.

Rationale

Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Staff from local public health agencies • OEPA 319 funding • Water Pollution Control Loan Fund, Ohio Environmental Protection Agency • Watershed coordinator
Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate such information as year of HSTS installation, type of HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality

	impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs; • Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education Component	The project plans to have an organized educational component in order to educate communities about steps that they can take to improve water quality within the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's HSTS program. The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the life of the system.
Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures,

	identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented; • Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders; • A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented; • Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

Subwatershed 3: Downstream Kenton

HUC: 05060001010-030 -040 & -050

Drainage area	**63.2 mi.^{2}**	**40,457 ac.**		
Straightened channels	**1.2%**			
Relief	**275 ft.**			
Land cover (2002)	**Agriculture & open urban**	**87.2%**	**Wooded**	**10.1%**
	Urban	**1.5%**		

Soils: End to ground moraine, Blount-Glynwood and Pewamo
Note: This subwatershed includes parts of Hardin and Logan Counties.

Water Quality Concerns Based on Stakeholder Input

• Excessive soil particle sediment loads and excessive in-streambed sedimentation • Excessive nutrient loading to streams (nitrogen and phosphorus)	• Poor aquatic life habitat in streams • Poor riparian habitats • Drinking water contamination	• High levels of pathogens in streams and wells • Industrial and municipal discharges

Problem statements (causes and sources)
1. Over 3 percent of the soils or about 1,395 acres of soil have slopes greater than 6 percent. Accelerated erosion from unprotected soils and from streambank erosion contributes to excessive in-stream sediment loading and sedimentation.

2. Channel maintenance activities facilitate the downstream transport of silt. The poor quality or lack of in-stream and riparian habitat has impaired biological communities resulting in a full biological use attainment of Modified Warmwater Habitat (MWH).

3. Surface runoff from unprotected soils and poor filtration of nutrients contribute to excessive nutrient loads and exacerbate phosphorus loadings to the Scioto River mainstem.

4. Stakeholders have expressed concerns that untreated effluent from failing HSTS is leading to high levels of pathogens and excessive nutrients in ditches and streams. To date credible data does not exist to support these concerns.

Impairment Reduction Goals
1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30% annually.

3. Reduce level of pathogens from failing household sewage treatment systems, WWTPs and package plants, and livestock operations to ensure water quality standards in accordance with the Clean Water Act throughout the subwatershed.

4. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status

Other Goals
1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the subwatershed

2. To better understand current water quality conditions of the water resources and identify areas that are performing well and those that need improvement.

Specific Actions
1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) throughout the subwatershed.

2. Continued monitoring and assessment of water quality along the Scioto River mainstem and its tributaries within this subwatershed to determine impairment trends.

3. Promote the use of conservation programs and conservation tillage practices that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals loading to surface waters.

4. Promote and implement the use of drainage water management systems for nitrate reduction where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

5. Increase the diversity and quality of both in-channel and riparian habitats along the Scioto River mainstem and its tributaries.

6. Quantify the level of pathogens from failing HSTS, WWTPs and package plants, and livestock operations throughout the subwatershed

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s);information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

▶ ACTION ITEM 1 - Supports goals 1, 2, and 3

Create at least 850 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) and the Wetland Reserve Program (WRP) in the form of filter strips, wildlife habitat, shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale

Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wildlife habitat.

Resources	• Hardin and Logan County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Wildlife Habitat Incentive Program and implementation staff • Watershed coordinator
Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, and WHIP Programs
Information/Education Component	• Public event speaking engagements, display booths at county fairs and Farm Science Review, informational fliers and/or other written materials, and written and verbal correspondence with potential CREP enrollees.
Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CREP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ ACTION ITEM 2 - Supports goal 6 and "Other Goals" 1 & 2

Monitor and quantify water quality and bio-indicators along the Scioto River mainstem and its tributaries in this subwatershed.

Rationale
Monitoring water quality and biological indicators will provide information that can be used to assess the overall function, performance and quality of the water resources. It will also provide a basis of comparison to other areas within the Upper Scioto River Watershed Project area as well as other watersheds throughout the Midwest. Such data will add to a current pool of information and can be used for trend analyses.

Resources	• Support provided by the Ohio EPA for equipment, personnel, laboratory analyses, and expertise • City of Columbus, Division of Water, Water Quality Lab • USGS 03219500 Scioto River near Prospect OH • USGS 03220000 Mill Creek near Bellpoint OH • Farm Bureau, Agriculture Ecology Committees – AWARE Program • Watershed Coordinator
Method	• In addition to stationary sites, water quality sampling will take place regularly at locations that are appropriate for providing baseline information as well as monitoring the effectiveness of action items (these specific locations are yet to be determined). The frequency of sampling will be determined based on the usefulness of the data as well as the availability of resources. Biological monitoring will be conducted at a select number of sites each year, which will be determined as information needs arise.
Information/Education Component	• USGS Ohio real-time water data website, Delaware SWCD newsletter and website.
Performance Indicators	• An assessment of river and stream quality that is adequate to update Ohio EPA aquatic life use designations by 2007 (in compliance with the credible data rules).
Time frame	• Field sampling and monitoring summer 2006 – 2007. Stationary sites on-going.

▶ **ACTION ITEM 3 - Supports goals 1 & 2**
Promote and implement soil erosion management programs that reduce the potential for nonpoint source sediment loading to surface waters.

Rationale
Conservation tillage or no-tillage, planting warm season grasses on highly erodible land, planting cover crops, conservation crop rotations, pasture and hayland plantings, and pasture and grazing management all help to reduce the potential for soil loss from erosion in farm fields and improve soil quality.

Resources	• Hardin and Logan County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • DEFA-WPCLF implementation staff • Watershed Coordinator
Method	• Hardin SWCD and Ohio EPA-DEFA partner to provide low interest loans to landowners for the implementation of projects that result in a reduction of agricultural nonpoint source pollution problems (sediment). • Continue to use cost share incentives currently provided through CRP, CREP, and EQIP for agricultural BMPs.
Information/Education Component	• Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Hardin, and Delaware SWCDs, NRCS, ODNR, OEPA
Performance indicators	• Reduction in the total suspended solid load in mainstem (as measured through grab sample data). • QHEI substrate scores improve.
Time frame	• Ongoing, suspend date dependent on funding

▶ **ACTION ITEM 4 - Supports goal 2**

Promote and implement the use of drainage water management systems where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and where SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

Rationale

Research by USDA Natural Resources Conservation Service (NRCS) and Agriculture Research Service (ARS) has shown that drainage water management systems can reduce annual nitrate loads by as much as 30 to 40%. Drainage water management systems can improve water quality by preventing the discharge of manure or nutrient laden water carried through subsurface drainage into waters of the state. Other water quality benefits may be derived from a reduction in wind eroded organic soil depositing in streams and other water bodies and by providing a mechanism to pump and treat or divert polluted sub-surface drain water.

Resources	• USDA – NRCS and ARS staff • Hardin and Logan County EQIP and implementation staff

	• Scioto River Watershed CREP and implementation staff • Watershed Coordinator
Method	• Provide up to 90% cost share assistance for the installation of permanent drainage water management structures where determined suitable to the CREP contract acreage site and needed to achieve water quality objectives. Provide access to a BMP risk management instrument for producers to offset yield loss and/or costs for subsurface drainage system repair that has resulted from the employment and/or installation of the water table management infrastructure. • Provide EQIP funding (50-75% cost-share) when available for the installation of permanent drainage water management structures where determined suitable to the site and needed to achieve water quality objectives
Information/Education Component	• Utilize a comprehensive promotional effort that includes radio programs, farm magazine articles, revised CREP brochures and literature, and public meetings, Delaware SWCD newsletter and website. Review local EQIP ranking sheet to determine the amount of points available to drainage water management practices. Active information/education partners include volunteers, and staff from Hardin and Delaware SWCDs, NRCS, ODNR, FSA
Performance indicators	• Reports provided by USDA-ARS, NRCS, SWCD staff, City of Columbus, Division of Water, Water Quality Assurance Laboratory, and producers that indicate a trend towards lower nitrate levels in the ambient water downstream of drain outlets during non-growing season (e.g., November through March)
Time frame	• Initiate promotional efforts January 2006. Begin installation of practices as early as summer 2006.

▶ ACTION ITEM 5 - Supports goal 4

Increase the diversity and quality of habitat within the channel and riparian zone along the Scioto River mainstem and its tributaries.

Rationale

The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a “healthier” ecosystem. Stream habitat such as meanders and in-stream

structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • WRRSP contract with the Upper Scioto Drainage and Conservancy Distinct or other group. • Watershed Coordinator
Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met. • Partner with the Upper Scioto Drainage and Conservancy Distinct to identify locations that are appropriate for restoring stream habitat and to secure funding for the efforts. Explore idea that habitat restoration (i.e., through increased floodplain connection) may result in an increase in the carrying capacity of the channel which can serve to reduce flooding in immediate areas and even improve stormwater retention in the upper watershed. An increase in retention in the upper watershed may alleviate flooding issues for downstream landowners. Wildlife habitat plan created and implemented by conservancy district or another group in areas where the Scioto River is in partial attainment.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and staff from Hardin and Delaware SWCDs and NRCS.
Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI). • Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ **ACTION ITEM 6 - Supports goal 3**

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies.

Rationale
Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Health Department and General Health District Environmental Health staffs; • Wastewater treatment plant operators; • Division of Environmental and Financial Assistance (DEFA) linked deposit loans if available; • Water Pollution Control Fund (WPCLF) linked deposit loan program; • OEPA 319 funding.
Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate such information as year of HSTS installation, type of HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study

	with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs; • Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education Component	• The project plans to have an organized educational component in order to educate communities about steps that they can take to improve water quality within the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's HSTS program. • The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the life of the system.
Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures, identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented;

	• Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders; • A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented; • Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

Subwatershed 4: La Rue/Big Island

HUC: 05060001010-030 -040 -050 & -060

Drainage area	**81.0 mi.^{2}**	**51,861 ac.**		
Straightened channels	**1.2%**			
Relief	**175 ft.**			
Land cover (2002)	**Agriculture & open urban**	**86.6%**	**Wooded**	**10.7%**

Soils: End to ground moraine till- silt loam and silty clay loam soils, Blount-Glynwood Pewamo. Milford-Del Rey- Shinrock lake plain soils north of the mainstem (around Big Island WA)
Note: This subwatershed includes parts of Logan, Hardin, Marion, and Union Counties.

Water Quality Concerns Based on Stakeholder Input

• Excessive soil particle sediment loads and excessive in-streambed sedimentation • Excessive nutrient loading to streams (nitrogen and phosphorus)	• Poor aquatic life habitat in streams • Poor riparian habitats • Ground water contamination (nutrients and pesticides)	• High levels of pathogens in streams and wells • Industrial and municipal discharges

Problem statements (causes and sources)
1. Accelerated erosion from unprotected soils and from streambank erosion contributes to in-stream sediment loading and sedimentation.

2. Channel maintenance activities facilitate the downstream transport of silt. The poor quality or lack of in-stream and riparian habitat has impaired biological communities resulting in a full biological use attainment of Modified Warmwater Habitat (MWH).

3. Surface runoff from unprotected soils and poor filtration of nutrients contribute to excessive nutrient loads and exacerbate phosphorus loadings to the Scioto River mainstem.

4. Stakeholders have expressed concerns that untreated effluent from failing HSTS is leading to high levels of pathogens and excessive nutrients in ditches and streams. To date credible data does not exist to support these concerns.

Impairment Reduction Goals
1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30% annually.

3. Reduce level of pathogens from failing household sewage treatment systems, WWTPs and package plants, and livestock operations to ensure water quality standards in accordance with the Clean Water Act throughout the subwatershed.

4. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status

Other goals
1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the subwatershed

2. To better understand current water quality conditions of the water resources and identify areas that are performing well and those that need improvement.

Specific Actions
1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) throughout the subwatershed.

2. Continued monitoring and assessment of water quality along the Scioto River mainstem and its tributaries within this subwatershed to determine impairment trends

3. Promote the use of conservation programs and conservation tillage practices that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals loading to surface waters.

4. Promote and implement the use of drainage water management systems for nitrate reduction where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

5. Increase the diversity and quality of both in-channel and riparian habitats along the Scioto River mainstem and its tributaries.

6. Quantify the level of pathogens from failing HSTS, WWTPs and package plants, and livestock operations throughout the subwatershed

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s);information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

▶ ACTION ITEM 1 - Supports goal 1, 2, and 4

Create at least 1500 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) and the Wetland Reserve Program (WRP) in the form of filter strips, wildlife habitat, and shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale

Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wildlife habitat.

Resources	• Logan, Hardin, Union, and Marion County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Wildlife Habitat Incentive Program and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, and WHIP Programs
Information/Education Component	• Public event speaking engagements, display booths at county fairs and Farm Science Review, informational fliers and/or other written materials, and written and verbal correspondence with potential CREP enrollees, Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Logan, Hardin, Marion, Union, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CREP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ ACTION ITEM 2 - Supports goal 6 and "Other Goals" 1 & 2
Monitor and quantify water quality and bio-indicators along the Scioto River mainstem and its tributaries in this subwatershed.

Rationale
Monitoring water quality and biological indicators will provide information that can be used to assess the overall function, performance and quality of the water resources. It will also provide a basis of comparison to other areas within the Upper Scioto River Watershed Project area as well as other watersheds throughout the Midwest. Such data will add to a current pool of information and can be used for trend analyses.

Resources	• Support provided by the Ohio EPA for equipment, personnel, laboratory analyses, and expertise • City of Columbus, Division of Water, Water Quality Lab • USGS 03219500 Scioto River near Prospect OH • USGS 03220000 Mill Creek near Bellpoint OH • Farm Bureau, Agriculture Ecology Committees – AWARE Program • Elgin High School Sandusky Plains Project • Watershed Coordinator
Method	• In addition to stationary sites, water quality sampling will take place regularly at locations that are appropriate for providing baseline information as well as monitoring the effectiveness of action items (these specific locations are yet to be determined). The frequency of sampling will be determined based on the usefulness of the data as well as the availability of resources. Biological monitoring will be conducted at a select number of sites each year, which will be determined as information needs arise.
Information/Education Component	• USGS Ohio real-time water data website, Delaware SWCD newsletter and website.
Performance indicators	• An assessment of river and stream quality that is adequate to update Ohio EPA aquatic life use designations by 2007 (in compliance with the credible data rules).
Time frame	• Field sampling and monitoring summer 2006 – 2007. Stationary sites on-going.

▶ ACTION ITEM 3 - Supports goal 1 and 2
Promote and implement soil erosion management programs that reduce the potential for nonpoint source sediment loading to surface waters.

Rationale
Conservation tillage or no-tillage, planting warm season grasses on highly erodible land, planting cover crops, conservation crop rotations, pasture and hayland plantings, and pasture and grazing management all help to reduce the potential for soil loss from erosion in farm fields and improve soil quality.

Resources	• Logan, Union, Marion and Hardin County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • DEFA-WPCLF implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Marion and Hardin SWCD and Ohio EPA-DEFA partner to provide low interest loans to landowners for the implementation of projects that result in a reduction of agricultural nonpoint source pollution problems (sediment). • Continue to use cost share incentives currently provided through CRP, CREP, and EQIP for agricultural BMPs.
Information/Education Component	• Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Logan, Hardin, Marion, Union, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D, OEPA
Performance indicators	• Reduction in the total suspended solid load in mainstem (as measured through grab sample data). • QHEI substrate scores improve.
Time frame	• Ongoing, suspend date dependent on funding

▶ ACTION ITEM 4 - Supports goal 2
Promote and implement the use of drainage water management systems where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and where SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

Rationale
Research by USDA Natural Resources Conservation Service (NRCS) and Agriculture Research Service (ARS) has shown that drainage water management systems can reduce annual nitrate loads by as much as 30 to 40%. Drainage water management systems can improve water quality by preventing the discharge of manure or nutrient laden water

carried through subsurface drainage into waters of the state. Other water quality benefits may be derived from a reduction in wind eroded organic soil depositing in streams and other water bodies and by providing a mechanism to pump and treat or divert polluted sub-surface drain water.

Resources	• USDA – NRCS and ARS staff • Marion and Hardin County EQIP and implementation staff • Scioto River Watershed CREP and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Provide up to 90% cost share assistance for the installation of permanent drainage water management structures where determined suitable to the CREP contract acreage site and needed to achieve water quality objectives. Provide access to a BMP risk management instrument for producers to offset yield loss and/or costs for subsurface drainage system repair that has resulted from the employment and/or installation of the water table management infrastructure. • Provide EQIP funding (50-75% cost-share) when available for the installation of permanent drainage water management structures where determined suitable to the site and needed to achieve water quality objectives
Information/Education Component	• Utilize a comprehensive promotional effort that includes radio programs, farm magazine articles, revised CREP brochures and literature, and public meetings, Delaware SWCD newsletter and website. Review local EQIP ranking sheet to determine the amount of points available to drainage water management practices. Active information/education partners include volunteers, and staff from Logan, Hardin, Marion, Union, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Reports provided by USDA-ARS, NRCS, SWCD staff, City of Columbus, Division of Water, Water Quality Assurance Laboratory, and producers that indicate a trend towards lower nitrate levels in the ambient water downstream of drain outlets during non-growing season (e.g., November through March)
Time frame	• Initiate promotional efforts January 2006. Begin installation of practices as early as summer 2006.

▶ ACTION ITEM 5 - Supports goal 4

Increase the diversity and quality of habitat within the channel and riparian zone along the Scioto River mainstem and its tributaries.

Rationale

The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a "healthier" ecosystem. Stream habitat such as meanders and in-stream structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • WRRSP contract with the Upper Scioto Drainage and Conservancy Distinct, the Scioto Conservancy District, or other group. • Watershed Coordinator
Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met. • Partner with the Upper Scioto Drainage and Conservancy Distinct District and Scioto Conservancy District to identify locations that are appropriate for restoring stream habitat and to secure funding for the efforts. Explore idea that habitat restoration (i.e., through increased floodplain connection) may result in an increase in the carrying capacity of the channel which can serve to reduce flooding in immediate areas and even improve stormwater retention in the upper watershed. An increase in retention in the upper watershed may alleviate flooding issues for downstream landowners. Wildlife habitat plan created and implemented by conservancy district or another group in areas where the Scioto River is in partial attainment.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and staff from Marion, Hardin, Logan, Union, and Delaware SWCDs and NRCS.
Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI).

	• Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ **ACTION ITEM 6 - Supports goal 3**

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies.

Rationale

Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Health Department and General Health District Environmental Health staffs; • Wastewater treatment plant operators; • Division of Environmental and Financial Assistance (DEFA) linked deposit loans if available; • Water Pollution Control Fund (WPCLF) linked deposit loan program; • OEPA 319 funding.
Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate such information as year of HSTS installation, type of HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality

	impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs; • Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education Component	• The project plans to have an organized educational component in order to educate communities about steps that they can take to improve water quality within the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's HSTS program. • The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the life of the system.
Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures,

	identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented; • Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders; • A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented; • Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

Subwatershed 5: Rush Creek

HUC: 05060001020-010 -040

Drainage area	**105.3 mi.^{2}**	**67,377 ac.**		
Straightened channels	**8.7%**			
Relief	**570 ft.**			
Land cover (2002)	**Agriculture & open urban**	**86.9%**	**Wooded**	**11.6%**

Soils: Moderately fine to fine texture till deposited on uplands (St. Clair-Nappanee) downstream to ground moraine silt and silty clay loam (Blount-Pewamo)
Note: This subwatershed includes parts of Logan, Hardin, Marion, and Union Counties.

Water Quality Concerns Based on Stakeholder Input

• Excessive soil particle sediment loads and excessive in-streambed sedimentation • Excessive nutrient loading to streams (nitrogen and phosphorus)	• Poor aquatic life habitat in streams • Poor riparian habitats • Drinking water contamination	• High levels of pathogens in streams and wells

Problem statements (causes and sources)

1. Over 5 percent of the soils or about 3,822 acres of soil have slopes greater than 6 percent. Accelerated erosion from unprotected soils and from streambank erosion contributes to excessive in-stream sediment loading and sedimentation.

2. Channel maintenance activities facilitate the downstream transport of silt. Channel maintenance activities along McDonald Creek has created poor physical habitat for aquatic life uses. The poor quality or lack of in-stream and riparian habitat has impaired biological communities resulting in a full biological use attainment of Modified Warmwater Habitat (MWH).

3. Surface runoff from unprotected soils and poor filtration of nutrients contribute to excessive nutrient loads and exacerbate phosphorus loadings to the Scioto River mainstem.

4. High levels of pathogens from various sources within the subwatershed, such as, failing or non existent household sewage treatment systems and various livestock operations pose health threats to the drinking water supplies from wells and reservoirs. Potentially, manure from animal feeding operations (AFOs) outside the watershed may be transported into the watershed for land application.

Impairment Reduction Goals
1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30% annually.

3. Reduce level of pathogens from failing household sewage treatment systems and livestock operations to ensure water quality standards in accordance with the Clean Water Act throughout the subwatershed.

4. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status

Other goals
1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the subwatershed

2. To better understand current water quality conditions of the water resources and identify areas that are performing well and those that need improvement.

Specific Actions
1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) throughout the subwatershed.

2. Continued monitoring and assessment of water quality along the Scioto River mainstem and its tributaries within this subwatershed to determine impairment trends.

3. Promote the use of conservation programs and conservation tillage practices that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals loading to surface waters.

4. Promote and implement the use of drainage water management systems for nitrate reduction where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

5. Increase the diversity and quality of both in-channel and riparian habitats along the tributaries to the Scioto River.

6. Quantify the level of pathogens from failing HSTS and livestock operations throughout the subwatershed

7. Encourage animal feeding operation (AFO) owners/operators to take voluntary actions to minimize potential water pollutants from confinement facilities and land application of

manure and organic by-products. Request additional management practices or activities in areas where downstream stream segments or water bodies are nutrient impaired. Meet NRCS technical standards as contained in the Field Office Technical Guide (FOTG) and Ohio Nonpoint Source Pollution Management Plan – Guides to Management Practices and Measures, Animal Waste Practices

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s);information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

▶ ACTION ITEM 1 - Supports goals 1, 2, and 4

Create at least 1800 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) and the Wetland Reserve Program (WRP) in the form of filter strips, wildlife habitat, and shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale

Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wildlife habitat.

Resources	• Logan, Hardin, Marion, and Union County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Wildlife Habitat Incentive Program and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, and WHIP Programs
Information/Education Component	• Public event speaking engagements, display booths at county fairs and Farm Science Review, informational fliers and/or other written materials, and written and verbal correspondence with potential CREP enrollees,

	Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Logan, Hardin, Marion, Union, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CREP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ **ACTION ITEM 2 - Supports goal 6 and "Other Goals" 1 & 2**
Monitor and quantify water quality and bio-indicators along the Scioto River mainstem and its tributaries in this subwatershed.

Rationale
Monitoring water quality and biological indicators will provide information that can be used to assess the overall function, performance and quality of the water resources. It will also provide a basis of comparison to other areas within the Upper Scioto River Watershed Project area as well as other watersheds throughout the Midwest. Such data will add to a current pool of information and can be used for trend analyses.

Resources	• Support provided by the Ohio EPA for equipment, personnel, laboratory analyses, and expertise • City of Columbus, Division of Water, Water Quality Lab • USGS 03219500 Scioto River near Prospect OH • USGS 03220000 Mill Creek near Bellpoint OH • Farm Bureau, Agriculture Ecology Committees – AWARE Program • Watershed Coordinator
Method	• In addition to stationary sites, water quality sampling will take place regularly at locations that are appropriate for providing baseline information as well as monitoring the effectiveness of action items (these specific locations are yet to be determined). The frequency of sampling will be determined based on the usefulness of the data as well as the availability of resources. Biological monitoring will be conducted at a select number of sites each year, which will be determined as information needs arise.
Information/Education Component	• USGS Ohio real-time water data website, Delaware SWCD newsletter and website.
Performance indicators	• An assessment of river and stream quality that is adequate to update Ohio EPA aquatic life use

	designations by 2007 (in compliance with the credible data rules).
Time frame	• Field sampling and monitoring summer 2006 – 2007. Stationary sites on-going.

▶ **ACTION ITEM 3 - Supports goal 1 and 2**
Promote and implement soil erosion management programs that reduce the potential for nonpoint source sediment loading to surface waters.

Rationale
Conservation tillage or no-tillage, planting warm season grasses on highly erodible land, planting cover crops, conservation crop rotations, pasture and hayland plantings, and pasture and grazing management all help to reduce the potential for soil loss from erosion in farm fields and improve soil quality.

Resources	• Logan, Hardin, Marion, and Union County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • DEFA-WPCLF implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Logan, Hardin, Marion, and Union SWCD and Ohio EPA-DEFA partner to provide low interest loans to landowners for the implementation of projects that result in a reduction of agricultural nonpoint source pollution problems (sediment). • Continue to use cost share incentives currently provided through CRP, CREP, and EQIP for agricultural BMPs.
Information/Education Component	• Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Logan, Hardin, Marion, Union, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D, OEPA
Performance indicators	• Reduction in the total suspended solid load in mainstem (as measured through grab sample data). • QHEI substrate scores improve.
Time frame	• Ongoing, suspend date dependent on funding

▶ ACTION ITEM 4 - Supports goal 2

Promote and implement the use of drainage water management systems where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and where Scioto River watershed CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

Rationale

Research by USDA Natural Resources Conservation Service (NRCS) and Agriculture Research Service (ARS) has shown that drainage water management systems can reduce annual nitrate loads by as much as 30 to 40%. Drainage water management systems can improve water quality by preventing the discharge of manure or nutrient laden water carried through subsurface drainage into waters of the state. Other water quality benefits may be derived from a reduction in wind eroded organic soil depositing in streams and other water bodies and by providing a mechanism to pump and treat or divert polluted sub-surface drain water.

Resources	• USDA – NRCS and ARS staff • Logan, Hardin, Marion, and Union County EQIP and implementation staff • Scioto River Watershed CREP and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Provide up to 90% cost share assistance for the installation of permanent drainage water management structures where determined suitable to the CREP contract acreage site and needed to achieve water quality objectives. Provide access to a BMP risk management instrument for producers to offset yield loss and/or costs for subsurface drainage system repair that has resulted from the employment and/or installation of the water table management infrastructure. • Provide EQIP funding (50-75% cost-share) when available for the installation of permanent drainage water management structures where determined suitable to the site and needed to achieve water quality objectives
Information/Education Component	• Utilize a comprehensive promotional effort that includes radio programs, farm magazine articles, revised CREP brochures and literature, and public meetings, Delaware SWCD newsletter and website. Review local EQIP ranking sheet to determine the amount of points available to drainage water

	management practices. Active information/education partners include volunteers, and staff from Logan, Hardin, Marion, Union, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Reports provided by USDA-ARS, NRCS, SWCD staff, City of Columbus, Division of Water, Water Quality Assurance Laboratory, and producers that indicate a trend towards lower nitrate levels in the ambient water downstream of drain outlets during non-growing season (e.g., November through March)
Time frame	• Initiate promotional efforts January 2006. Begin installation of practices as early as summer 2006.

▶ **ACTION ITEM 5 - Supports goal 4**

Increase the diversity and quality of habitat within the channel and riparian zone along tributaries to the Scioto River.

Rationale

The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a "healthier" ecosystem. Stream habitat such as meanders and in-stream structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • WRRSP contract with the Upper Scioto Drainage and Conservancy Distinct, Scioto Conservancy District, or other group. • Watershed Coordinator
Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met. • Partner with the Upper Scioto Drainage and Conservancy Distinct and Scioto Conservancy District to identify locations that are appropriate for restoring stream habitat and to secure funding for the efforts. Explore idea that habitat restoration (i.e., through increased floodplain connection) may result in an increase in the carrying capacity of the channel which can serve to reduce flooding in immediate areas and even improve stormwater retention in the upper watershed. An increase in retention in the upper

	watershed may alleviate flooding issues for downstream landowners. Wildlife habitat plan created and implemented by conservancy district or another group in areas where the Scioto River is in partial attainment.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and staff from Marion, Logan, Union, Hardin, and Delaware SWCDs and NRCS.
Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI). • Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ ACTION ITEM 6 - Supports goal 3

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies.

Rationale

Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Health Department and General Health District Environmental Health staffs; • Wastewater treatment plant operators; • Division of Environmental and Financial Assistance (DEFA) linked deposit loans if available; • Water Pollution Control Fund (WPCLF) linked deposit loan program; • OEPA 319 funding.
Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected

	officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate such information as year of HSTS installation, type of HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs; • Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education Component	• The project plans to have an organized educational component in order to educate communities about steps that they can take to improve water quality within the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's

	HSTS program. • The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the life of the system.
Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures, identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented; • Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders; • A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented; • Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

▶ ACTION ITEM 7 - Supports goals 1, 2 and 3

Promote, implement, and maintain Resource Management Plans that include Conservation Nutrient Management Plans (CNMPs) according to Ohio Nonpoint Source Pollution Management Plans and NRCS technical standards as outlined in the Field Office Technical Guide (FOTG) for each livestock operation in the subwatershed.

Rationale There are a large number of livestock and poultry identified in the inventory for this subwatershed. Large amounts of animal wastes, if not properly managed, can

contaminate surface and ground waters used as drinking sources. Pathogens, nitrates, and other pollutants, such as, metals, antibiotics, pesticides, and hormones pose human health risks. In addition, oxygen-demanding substances can lead to fish kills and degrade water quality. Solids from animal wastes can increase turbidity and adversely affect the taste and odor of waters. Scientific evidence shows that CNMPs can significantly reduce the impact of waste from livestock, poultry, and horses on water supplies and in-stream habitat diversity for aquatic life.

Resources	• CRP, CREP, and EQIP implementation staff • USDA, NRCS and ARS staff • ODNR Nonpoint Source Pollution staff • ODA staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Utilizing data and other information from the watershed inventory the district conservationist works with AFO owners/operators to develop and implement CNMPs consistent with the plan outlined in the Ohio Nonpoint Source Pollution Management Plan and FOTG. EQIP provides technical assistance and cost-share payments to producers to adopt projects that offer the greatest level of environmental benefits. A plan of operations, developed with the producer, receives funding for nutrient management plans and projects as approved by the local agriculture committee.
Information/Education Component	• Ohio Nonpoint Source website, Ohio EPA, Cooperative Extension, and NRCS fact sheets, EQIP, CRP, and CREP brochures, Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Logan, Hardin, Marion, Union, and Delaware SWCDs, NRCS, ODNR, HoO RC&D
Performance indicators	• All AFOs in the project area have current CNMPs consistent with the FOTG and Ohio Nonpoint Source Pollution Management Plan – Guides to Management Practices and Measures and are not in violation of clean water standards.
Time frame	• January 2006-2008

Subwatershed 6: Upper Little Scioto River

HUC: 05060001010-020 & -040

Drainage area	**71.5 mi.^{2}**	**45,744 ac.**		
Straightened channels	**3.7%**			
Relief	**135 ft.**			
Land cover (2002)	**Agriculture & open urban**	**88.2%**	**Wooded**	**8.9%**

Soils: End moraine on the edges (Luray-Tiro) mostly ground moraine (Blount-Pewamo)
Note: This subwatershed includes parts of Crawford, Wyandot, and Marion Counties.

Water Quality Concerns Based on Stakeholder Input

• Excessive soil particle sediment loads and excessive in-streambed sedimentation • Excessive nutrient loading to streams (nitrogen and phosphorus)	• Poor aquatic life habitat in streams • Poor riparian habitats • Drinking water contamination	• High levels of pathogens in streams and wells

Figure 4-3. Tributary to the Little Scioto River at Isaac Beal Road in Crawford Co (just south of Bucyrus)

Problem statements (causes and sources)

1. Accelerated erosion from unprotected soils and from streambank erosion contributes to in-stream sediment loading and sedimentation. Less than 1 percent of the soils, or about 322 acres have slopes greater than 6 percent.

2. Channel maintenance activities facilitate the downstream transport of silt. Channel maintenance activities along Rock Fork has created poor physical habitat for aquatic life uses. The poor quality or lack of in-stream and riparian habitat has impaired biological communities resulting in a partial aquatic life use attainment of Warmwater Habitat (WWH).

3. Surface runoff from unprotected soils and poor filtration of nutrients contribute to excessive nutrient loads and exacerbate phosphorus loadings to the Little Scioto River mainstem.

4. High levels of pathogens from various sources within the subwatershed, such as, failing or non existent household sewage treatment systems, and various livestock operations pose health threats to the drinking water supplies from wells and reservoirs. Potentially, manure from animal feeding operations (AFOs) outside the watershed may be transported into the watershed for land application.

Impairment Reduction Goals

1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30% annually.

3. Reduce level of pathogens from failing household sewage treatment systems, WWTPs and package plants, and livestock operations to ensure water quality standards in accordance with the Clean Water Act throughout the subwatershed.

4. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status

Other goals

1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the subwatershed

2. To better understand current water quality conditions of the water resources and identify areas that are performing well and those that need improvement.

3. Monitor and study relationships of BMPs to water quality.

Specific Actions

1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) throughout the subwatershed.

2. Develop and implement a nitrate management program throughout the watershed that incorporates components of education and outreach, livestock waste management, crop management practices, drainage water management, and land use changes.

3. Continue monitoring and assessment of water quality along the Little Scioto River mainstem and its tributaries within the watershed to determine impairment trends.

4. Promote the use of conservation programs and conservation tillage practices that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals loading to surface waters.

5. Increase the diversity and quality of both in-channel and riparian habitats along the Little Scioto River mainstem and its tributaries.

6. Implement stream restoration projects to remediate water quality impairments caused by contaminated soils contributing pollutants to surface water and ground water resources (currently underway).

7. Quantify the level of pathogens from failing household sewage treatment systems, small-flow semi-public sewage systems, WWTPs and package plants, and livestock operations throughout the watershed.

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s);information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

▶ ACTION ITEM 1 - Supports goals 1, 2 and 4

Create at least 800 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) and the Wetland Reserve Program (WRP) in the form of filter strips, wildlife habitat, and shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale

Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients, such as nitrates and phosphates, and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wildlife habitat.

Resources	• Crawford, Marion, and Wyandot Counties EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Wildlife Habitat Incentive Program and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, and WHIP Programs
Information/Education Component	• Public event speaking engagements, display booths at county fairs and Farm Science Review, informational fliers and/or other written materials, and written and verbal correspondence with potential CREP enrollees, Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Crawford, Wyandot, Marion, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CREP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ ACTION ITEM 2 - Supports goal 6 and "Other Goals" 1 & 2
Monitor and quantify water quality and bio-indicators along the Scioto River mainstem and its tributaries in this subwatershed.

Rationale
Monitoring water quality and biological indicators will provide information that can be used to assess the overall function, performance and quality of the water resources. It will also provide a basis of comparison to other areas within the Upper Scioto River Watershed Project area as well as other watersheds throughout the Midwest. Such data will add to a current pool of information and can be used for trend analyses.

Resources	• Support provided by the Ohio EPA for equipment, personnel, laboratory analyses, and expertise • City of Columbus, Division of Water, Water Quality Lab • USGS 03219500 Scioto River near Prospect OH • USGS 03220000 Mill Creek near Bellpoint OH

	• Farm Bureau, Agriculture Ecology Committees – AWARE Program • Watershed Coordinator
Method	• In addition to stationary sites, water quality sampling will take place regularly at locations that are appropriate for providing baseline information as well as monitoring the effectiveness of action items (these specific locations are yet to be determined). The frequency of sampling will be determined based on the usefulness of the data as well as the availability of resources. Biological monitoring will be conducted at a select number of sites each year, which will be determined as information needs arise.
Information/Education Component	• USGS Ohio real-time water data website, Delaware SWCD newsletter and website.
Performance indicators	• An assessment of river and stream quality that is adequate to update Ohio EPA aquatic life use designations by 2007 (in compliance with the credible data rules).
Time frame	• Field sampling and monitoring summer 2006 – 2007. Stationary sites on-going.

▶ **ACTION ITEM 3 - Supports goals 1 and 2**
Promote and implement soil erosion management programs that reduce the potential for nonpoint source sediment loading to surface waters.

Rationale
Conservation tillage or no-tillage, planting warm season grasses on highly erodible land, planting cover crops, conservation crop rotations, pasture and hayland plantings, and pasture and grazing management all help to reduce the potential for soil loss from erosion in farm fields and improve soil quality.

Resources	• Crawford, Marion, and Wyandot Counties EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • DEFA-WPCLF implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Crawford, Marion, and Wyandot County SWCDs and Ohio EPA-DEFA partner to provide low interest loans to landowners for the implementation of projects that

	result in a reduction of agricultural nonpoint source pollution problems (sediment). • Continue to use cost share incentives currently provided through CRP, CREP, and EQIP for agricultural BMPs.
Information/Education Component	• Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Crawford, Wyandot, Marion, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Reduction in the total suspended solid load in mainstem (as measured through grab sample data). • QHEI substrate scores improve.
Time frame	• Ongoing, suspend date dependent on funding

▶ **ACTION ITEM 4 - Supports goal 2**

Promote and implement the use of drainage water management systems where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and where SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

Rationale

Research by USDA Natural Resources Conservation Service (NRCS) and Agriculture Research Service (ARS) has shown that drainage water management systems can reduce annual nitrate loads by as much as 30 to 40%. Drainage water management systems can improve water quality by preventing the discharge of manure or nutrient laden water carried through subsurface drainage into waters of the state. Other water quality benefits may be derived from a reduction in wind eroded organic soil depositing in streams and other water bodies and by providing a mechanism to pump and treat or divert polluted sub-surface drain water.

Resources	• USDA – NRCS and ARS staff • Crawford, Marion, and Wyandot County EQIP and implementation staff • Scioto River Watershed CREP and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Provide up to 90% cost share assistance for the installation of permanent drainage water management structures where determined suitable to the CREP contract acreage site and needed to achieve water quality objectives. Provide access to a BMP risk management instrument for producers to offset yield loss and/or costs for subsurface drainage system repair

	that has resulted from the employment and/or installation of the water table management infrastructure. • Provide EQIP funding (50-75% cost-share) when available for the installation of permanent drainage water management structures where determined suitable to the site and needed to achieve water quality objectives
Information/Education Component	• Utilize a comprehensive promotional effort that includes radio programs, farm magazine articles, revised CREP brochures and literature, and public meetings, Delaware SWCD newsletter and website. Review local EQIP ranking sheet to determine the amount of points available to drainage water management practices. Active information/education partners include volunteers, and staff from Crawford, Wyandot, Marion, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Reports provided by USDA-ARS, NRCS, SWCD staff, City of Columbus, Division of Water, Water Quality Assurance Laboratory, and producers that indicate a trend towards lower nitrate levels in the ambient water downstream of drain outlets during non-growing season (e.g., November through March)
Time frame	• Initiate promotional efforts January 2006. Begin installation of practices as early as summer 2006.

▶ ACTION ITEM 5 - Supports goal 4
Increase the diversity and quality of habitat within the channel and riparian zone along the Little Scioto River mainstem and its tributaries.

Rationale
The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a "healthier" ecosystem. Stream habitat such as meanders and in-stream structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • WRRSP contract with Scioto Conservancy Distinct or other group. • Watershed Coordinator

Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met. • Partner with the Scioto Conservancy District to identify locations that are appropriate for restoring stream habitat and to secure funding for the efforts. Explore idea that habitat restoration (i.e., through increased floodplain connection) may result in an increase in the carrying capacity of the channel which can serve to reduce flooding in immediate areas and even improve stormwater retention in the upper watershed. An increase in retention in the upper watershed may alleviate flooding issues for downstream landowners. Wildlife habitat plan created and implemented by conservancy district or another group in areas where the Scioto River is in partial attainment.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and staff from Crawford, Marion, Union, and Delaware SWCDs and NRCS.
Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI). • Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ ACTION ITEM 6 - Supports goal 3

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies and aquatic life habitat.

Rationale

Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Health Department and General Health District Environmental Health staffs; • Wastewater treatment plant operators; • Division of Environmental and Financial Assistance (DEFA) linked deposit loans if available; • Water Pollution Control Fund (WPCLF) linked deposit loan program; • OEPA 319 funding.
Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate such information as year of HSTS installation, type of HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs; • Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or

	connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education Component	• The project plans to have an organized educational component in order to educate communities about steps that they can take to improve water quality within the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's HSTS program. • The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the life of the system.
Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures, identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented; • Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders; • A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented;

	• Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

Subwatershed 7: Lower Little Scioto River

HUC: 05060001040-030 & -040

Drainage area	**41.5 mi.^{2}**	**26,562 ac.**		
Straightened channels	**7.7%**			
Relief	**120 ft.**			
Land cover (2002)	**Agriculture & open urban**	**78.3%**	**Wooded**	**10.9%**
	Urban	**6.9%**	**Shrub/scrub**	**1.9%**

Soils: Ground moraine soils (Blount-Pewamo) & some lake plains silty clay and clay soils
Note: This subwatershed occurs entirely within the boundaries of Marion County.

Water Quality Concerns Based on Stakeholder Input

• Excessive soil particle sediment loads and excessive in-streambed sedimentation • Excessive nutrient loading to streams (nitrogen and phosphorus) • Poor aquatic life habitat in streams	• Poor riparian habitats • Excessive chemical loading in streams (pesticides) • Pollutants in streams (toxins and carcinogens) • Ground water contamination (nutrients and pesticides)	• High levels of pathogens in streams and wells • Stormwater runoff • Trash and refuse in streams

Problem statements (causes and sources)

1. Accelerated erosion from unprotected soils and from streambank erosion contributes to excessive in-stream sediment loading and sedimentation. Less than 1 percent or about 106 acres have slopes greater than 6 percent.

2. Channel maintenance activities facilitate the downstream transport of silt. Channel modifications and maintenance activities along the Little Scioto, Rockswale Ditch and Honey Creek has created poor physical habitat for aquatic life uses. The poor quality or lack of in-stream and riparian habitat has impaired biological communities in these streams resulting in non-attainment of their aquatic life use designations.

3. Surface runoff from unprotected soils and poor filtration of nutrients contribute to excessive nutrient loads and exacerbate phosphorus loadings to the Little Scioto River mainstem.

4. Discharges from the wastewater treatment plant (WWTP) for the City of Marion have added excessive amounts of nutrient enrichment to the Little Scioto River and impacted the water quality resource.

5. Stakeholders have expressed concerns that untreated effluent from failing household sewage treatment systems (HSTS) is leading to high levels of pathogens and excessive nutrients in ditches and streams. To date credible data does not exist to support these concerns.

6. Various carcinogens and other toxic substances from industrial sites within the subwatershed have resulted in the closure of stream segments to public use and raised concerns over the extent of affected areas.

7. Decomposition of trash and refuse causes discoloration of water and contribute unknown contaminants.

Impairment Reduction Goals

1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30% annually.

3. Reduce level of pathogens from failing HSTSs, WWTPs and package plants, and livestock operations to ensure water quality standards in accordance with the Clean Water Act throughout the subwatershed.

4. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status

5. Restore areas of streams polluted with toxic and carcinogenic contaminants to ensure water quality standards in accordance with the Clean Water Act throughout the watershed project area.

6. Reduce the amount of trash and refuse in streams and along stream corridors to levels manageable by one annual river sweep per year.

Other goals

1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the subwatershed

2. To better understand current water quality conditions of the water resources and identify areas that are performing well and those that need improvement.

Specific Actions

1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) throughout the subwatershed.

2. Continued monitoring and assessment of water quality along the Little Scioto River mainstem and its tributaries within this subwatershed to determine impairment trends.

3. Promote the use of conservation programs and conservation tillage practices that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals loading to surface waters.

4. Promote and implement the use of drainage water management systems for nitrate reduction where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and Scioto River Watershed CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

5. Increase the diversity and quality of both in-channel and riparian habitats along the Little Scioto River mainstem and its tributaries.

6. Quantify the level of pathogens from failing HSTSs, WWTPs and package plants, and livestock operations throughout the subwatershed.

7. Organize, coordinate and participate in stream sweeps, litter indexing, and other litter reduction efforts.

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s);information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

▶ ACTION ITEM 1 - Supports goals 1, 2, and 4

Create at least 1700 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) and the Wetland Reserve Program (WRP) in the form of filter strips, wildlife habitat, and shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale

Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wildlife habitat.

Resources	• Marion County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Wildlife Habitat Incentive Program and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, and WHIP Programs
Information/Education Component	• Public event speaking engagements, display booths at county fairs and Farm Science Review, informational fliers and/or other written materials, and written and verbal correspondence with potential CREP enrollees, Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Marion, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CREP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ ACTION ITEM 2 - Supports goal 6 and "Other Goals" 1 & 2
Monitor and quantify water quality and bio-indicators along the Scioto River mainstem and its tributaries in this subwatershed.

Rationale
Monitoring water quality and biological indicators will provide information that can be used to assess the overall function, performance and quality of the water resources. It will also provide a basis of comparison to other areas within the Upper Scioto River Watershed Project area as well as other watersheds throughout the Midwest. Such data will add to a current pool of information and can be used for trend analyses.

Resources	• Support provided by the Ohio EPA for equipment, personnel, laboratory analyses, and expertise • City of Columbus, Division of Water, Water Quality Lab • USGS 03219500 Scioto River near Prospect OH • USGS 03220000 Mill Creek near Bellpoint OH • Farm Bureau, Agriculture Ecology Committees –

	AWARE Program • Watershed Coordinator
Method	• In addition to stationary sites, water quality sampling will take place regularly at locations that are appropriate for providing baseline information as well as monitoring the effectiveness of action items (these specific locations are yet to be determined). The frequency of sampling will be determined based on the usefulness of the data as well as the availability of resources. Biological monitoring will be conducted at a select number of sites each year, which will be determined as information needs arise.
Information/Education Component	• USGS Ohio real-time water data website, Delaware SWCD newsletter and website.
Performance indicators	• An assessment of river and stream quality that is adequate to update Ohio EPA aquatic life use designations by 2007 (in compliance with the credible data rules).
Time frame	• Field sampling and monitoring summer 2006 – 2007. Stationary sites on-going.

▶ **ACTION ITEM 3 - Supports goals 1, 2, and 4**
Promote and implement soil erosion management programs that reduce the potential for nonpoint source sediment loading to surface waters.

Rationale
Conservation tillage or no-tillage, planting warm season grasses on highly erodible land, planting cover crops, conservation crop rotations, pasture and hayland plantings, and pasture and grazing management all help to reduce the potential for soil loss from erosion in farm fields and improve soil quality.

Resources	• Marion County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • DEFA-WPCLF implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Marion County SWCD and Ohio EPA-DEFA partner to provide low interest loans to landowners for the implementation of projects that result in a reduction of agricultural nonpoint source pollution problems (sediment).

	• Continue to use cost share incentives currently provided through CRP, CREP, and EQIP for agricultural BMPs.
Information/Education Component	• Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Marion, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Reduction in the total suspended solid load in mainstem (as measured through grab sample data). • QHEI substrate scores improve.
Time frame	• Ongoing, suspend date dependent on funding

▶ ACTION ITEM 4 - Supports goal 2

Promote and implement the use of drainage water management systems where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and where SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

Rationale

Research by USDA Natural Resources Conservation Service (NRCS) and Agriculture Research Service (ARS) has shown that drainage water management systems can reduce annual nitrate loads by as much as 30 to 40%. Drainage water management systems can improve water quality by preventing the discharge of manure or nutrient laden water carried through subsurface drainage into waters of the state. Other water quality benefits may be derived from a reduction in wind eroded organic soil depositing in streams and other water bodies and by providing a mechanism to pump and treat or divert polluted sub-surface drain water.

Resources	• USDA – NRCS and ARS staff • Marion County EQIP and implementation staff • Scioto River Watershed CREP and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Provide up to 90% cost share assistance for the installation of permanent drainage water management structures where determined suitable to the CREP contract acreage site and needed to achieve water quality objectives. Provide access to a BMP risk management instrument for producers to offset yield loss and/or costs for subsurface drainage system repair that has resulted from the employment and/or installation of the water table management infrastructure.

	• Provide EQIP funding (50-75% cost-share) when available for the installation of permanent drainage water management structures where determined suitable to the site and needed to achieve water quality objectives
Information/Education Component	• Utilize a comprehensive promotional effort that includes radio programs, farm magazine articles, revised CREP brochures and literature, and public meetings, Delaware SWCD newsletter and website. Review local EQIP ranking sheet to determine the amount of points available to drainage water management practices. Active information/education partners include volunteers, and staff from Marion, and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Reports provided by USDA-ARS, NRCS, SWCD staff, City of Columbus, Division of Water, Water Quality Assurance Laboratory, and producers that indicate a trend towards lower nitrate levels in the ambient water downstream of drain outlets during non-growing season (e.g., November through March)
Time frame	• Initiate promotional efforts January 2006. Begin installation of practices as early as summer 2006.

▶ **ACTION ITEM 5 - Supports goal 4**

Increase the diversity and quality of habitat within the channel and riparian zone along the Little Scioto River mainstem and its tributaries.

Rationale

The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a "healthier" ecosystem. Stream habitat such as meanders and in-stream structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • WRRSP contract with the Scioto Conservancy Distinct or other group. • Watershed Coordinator
Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met. • Partner with the Scioto Conservancy District to

	identify locations that are appropriate for restoring stream habitat and to secure funding for the efforts. Explore idea that habitat restoration (i.e., through increased floodplain connection) may result in an increase in the carrying capacity of the channel which can serve to reduce flooding in immediate areas and even improve stormwater retention in the upper watershed. An increase in retention in the upper watershed may alleviate flooding issues for downstream landowners. Wildlife habitat plan created and implemented by conservancy district or another group in areas where the Scioto River is in partial attainment.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and staff from Marion and Delaware SWCDs and NRCS.
Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI). • Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ **ACTION ITEM 6 - Supports goal 3**

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies.

Rationale

Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Health Department and General Health District Environmental Health staffs; • Wastewater treatment plant operators; • Division of Environmental and Financial Assistance

	(DEFA) linked deposit loans if available; • Water Pollution Control Fund (WPCLF) linked deposit loan program; • OEPA 319 funding.
Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate such information as year of HSTS installation, type of HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs; • Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education Component	• The project plans to have an organized educational component in order to educate communities about steps that they can take to improve water quality within

	the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's HSTS program. • The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the life of the system.
Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures, identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented; • Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders; • A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented; • Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

▶ ACTION ITEM 7 - Supports goal 6

Promote and implement an annual stream sweep of the Little Scioto River mainstem and conduct a litter index throughout the subwatershed.

Rationale

Trash and refuse in streams can decompose to cause discoloration of water and contribute unknown contaminants. Litter in streams and along corridors and roadsides lower the aesthetic appeal and value of the area generate unnecessary workloads for cleanup. Litter indexing is an effective method of generating public involvement and participation in watershed activities. Indexing can be used to determine the effectiveness of litter prevention campaigns and assist in targeting areas where additional efforts are needed to maintain the watershed in good condition.

Resources	• Marion County SWCD and Marion County General Health District staffs. • Watershed Coordinator
Method	• Watershed coordinator would organize, coordinate, and participate with Marion County SWCD and Marion County General Health District staffs to conduct an annual river sweep and litter indexing activity.
Information/Education Component	• Delaware SWCD newsletter and website. Event flier. Active information/education partners include volunteers, and staff from Marion County SWCD and Marion County General Health District
Performance indicators	• Reduction in the amount of trash and refuse in streams and along corridors to levels manageable by one event per year.
Time frame	• September 2007. Annually thereafter until no longer necessary.

Subwatershed 8: Downstream Little Scioto River

HUC: 05060001040-010 -020 -030 -040 & -050

Drainage area	**79.5 mi.^{2}**	**50,899 ac.**		
Straightened channels	**15.4%**			
Relief	**100 ft.**			
Land cover (2002)	**Agriculture & open urban**	**91.2%**	**Wooded**	**7.1%**

Soils: Ground moraine soils (Blount-Pewamo) & some lake plains silty clay and clay soils
Note: This subwatershed includes parts of Marion, Union, and Delaware Counties.

Water Quality Concerns Based on Stakeholder Input

• Excessive soil particle sediment loads and excessive in-streambed sedimentation • Excessive nutrient loading in streams (nitrogen and phosphorus) • Poor aquatic life habitat in streams	• Poor riparian habitats • Excessive chemical loading in streams (pesticides) • Pollutants in streams (toxins and carcinogens) • Drinking water contamination	• High levels of pathogens in streams and wells • Trash and refuse in streams and along corridors

Problem statements (causes and sources)
1. Accelerated erosion from unprotected soils and from streambank erosion contributes to excessive in-stream sediment loading and sedimentation. Less than 2 percent or about 809 acres have slopes greater than 6 percent.

2. Channel maintenance activities facilitate the downstream transport of silt. Channel modifications and maintenance activities along the Scioto mainstem, Ottawa Creek, Patton Run, Battle Run, Kebler Run, Davids Run and Beaver Run has created poor physical habitat for aquatic life uses. The poor quality or lack of in-stream and riparian habitat has impaired biological communities in these streams resulting in non-attainment of their aquatic life use designations.

3. Surface runoff from unprotected soils and poor filtration of nutrients contribute to excessive nutrient loads and exacerbate phosphorus loadings to the Scioto River mainstem.

5. Stakeholders have expressed concerns that untreated effluent from failing household sewage treatment systems (HSTS) is leading to high levels of pathogens and excessive nutrients in ditches and streams. To date credible data does not exist to support these concerns.

6. Various carcinogens and other toxic substances and nutrient enrichment from industrial sites and WWTPs within subwatershed 7 (Lower Little Scioto River) have contributed to poor macroinvertebrate and fish community scores.
7. Decomposition of trash and refuse causes discoloration of water and contribute unknown contaminants.

Impairment Reduction Goals
1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30% annually.

3. Reduce level of pathogens from failing HSTSs, WWTPs and package plants, and livestock operations to ensure water quality standards in accordance with the Clean Water Act throughout the subwatershed.

4. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status

5. Restore areas of streams polluted with toxic and carcinogenic contaminants to ensure water quality standards in accordance with the Clean Water Act throughout the watershed project area.

6. Reduce the amount of trash and refuse in streams and along stream corridors to levels manageable by one annual river sweep per year.

Other goals
1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the subwatershed

2. To better understand current water quality conditions of the water resources and identify areas that are performing well and those that need improvement.

Specific Actions
1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) throughout the subwatershed.

2. Continued monitoring and assessment of water quality along the Scioto River mainstem and its tributaries within this subwatershed to determine impairment trends.

3. Promote the use of resource management plans, conservation programs, and conservation tillage practices that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals loading to surface waters.

4. Promote and implement the use of drainage water management systems for nitrate reduction where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and Scioto River Watershed CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

5. Increase the diversity and quality of both in-channel and riparian habitats along the Scioto River mainstem and its tributaries.

6. Quantify the level of pathogens from failing HSTSs, WWTPs and package plants, and livestock operations throughout the subwatershed.

7. Organize, coordinate and participate in stream sweeps, litter indexing, and other litter reduction efforts.

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s);information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

▶ ACTION ITEM 1 - Supports goals 1, 2, and 4

Create at least 550 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) and the Wetland Reserve Program (WRP) in the form of filter strips, wildlife habitat, and shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale

Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wildlife habitat.

Resources	• Marion, Union, and Delaware Counties EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Wildlife Habitat Incentive Program and implementation staff

	• Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, and WHIP Programs
Information/Education Component	• Public event speaking engagements, display booths at county fairs and Farm Science Review, informational fliers and/or other written materials, and written and verbal correspondence with potential CREP enrollees, Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Marion, Union, and Delaware SWCDs, NRCS, ODNR, HoO RC&D
Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CREP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ ACTION ITEM 2 - Supports goal 6 and "Other Goals" 1 & 2
Monitor and quantify water quality and bio-indicators along the Scioto River mainstem and its tributaries in this subwatershed.

Rationale
Monitoring water quality and biological indicators will provide information that can be used to assess the overall function, performance and quality of the water resources. It will also provide a basis of comparison to other areas within the Upper Scioto River Watershed Project area as well as other watersheds throughout the Midwest. Such data will add to a current pool of information and can be used for trend analyses.

Resources	• Support provided by the Ohio EPA for equipment, personnel, laboratory analyses, and expertise • City of Columbus, Division of Water, Water Quality Lab • USGS 03219500 Scioto River near Prospect OH • USGS 03220000 Mill Creek near Bellpoint OH • Farm Bureau, Agriculture Ecology Committees – AWARE Program • Watershed Coordinator
Method	• In addition to stationary sites, water quality sampling will take place regularly at locations that are appropriate for providing baseline information as well as monitoring the effectiveness of action items (these specific locations are yet to be determined). The

	frequency of sampling will be determined based on the usefulness of the data as well as the availability of resources. Biological monitoring will be conducted at a select number of sites each year, which will be determined as information needs arise.
Information/Education Component	• USGS Ohio real-time water data website, Delaware SWCD newsletter and website.
Performance indicators	• An assessment of river and stream quality that is adequate to update Ohio EPA aquatic life use designations by 2007 (in compliance with the credible data rules).
Time frame	• Field sampling and monitoring summer 2006 – 2007. Stationary sites on-going.

▶ **ACTION ITEM 3 - Supports goal 1, 2, and 4**
Promote and implement soil erosion management programs that reduce the potential for nonpoint source sediment loading to surface waters.

Rationale
Conservation tillage or no-tillage, planting warm season grasses on highly erodible land, planting cover crops, conservation crop rotations, pasture and hayland plantings, and pasture and grazing management all help to reduce the potential for soil loss from erosion in farm fields and improve soil quality.

Resources	• Marion, Union, and Delaware Counties EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • DEFA-WPCLF implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Marion and Union County SWCDs and Ohio EPA-DEFA partner to provide low interest loans to landowners for the implementation of projects that result in a reduction of agricultural nonpoint source pollution problems (sediment). • Continue to use cost share incentives currently provided through CRP, CREP, and EQIP for agricultural BMPs.
Information/Education Component	• Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Marion, Union, and Delaware SWCDs,

	NRCS, ODNR, HoO RC&D
Performance indicators	• Reduction in the total suspended solid load in mainstem (as measured through grab sample data). • QHEI substrate scores improve.
Time frame	• Ongoing, suspend date dependent on funding

▶ **ACTION ITEM 4 - Supports goal 2**

Promote and implement the use of drainage water management systems where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and where SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

Rationale

Research by USDA Natural Resources Conservation Service (NRCS) and Agriculture Research Service (ARS) has shown that drainage water management systems can reduce annual nitrate loads by as much as 45 %. Drainage water management systems can improve water quality by preventing the discharge of manure or nutrient laden water carried through subsurface drainage into waters of the state. Other water quality benefits may be derived from a reduction in wind eroded organic soil depositing in streams and other water bodies and by providing a mechanism to pump and treat or divert polluted sub-surface drain water.

Resources	• USDA – NRCS and ARS staff • Marion, Union, and Delaware County EQIP and implementation staff • Scioto River Watershed CREP and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Provide up to 90% cost share assistance for the installation of permanent drainage water management structures where determined suitable to the CREP contract acreage site and needed to achieve water quality objectives. Provide access to a BMP risk management instrument for producers to offset yield loss and/or costs for subsurface drainage system repair that has resulted from the employment and/or installation of the water table management infrastructure. • Provide EQIP funding (50-75% cost-share) when available for the installation of permanent drainage water management structures where determined suitable to the site and needed to achieve water quality objectives

Information/Education Component	• Utilize a comprehensive promotional effort that includes radio programs, farm magazine articles, revised CREP brochures and literature, and public meetings, Delaware SWCD newsletter and website. Review local EQIP ranking sheet to determine the amount of points available to drainage water management practices. Active information/education partners include volunteers, and staff from Marion, Union, and Delaware SWCDs, NRCS, ODNR, HoO RC&D
Performance indicators	• Reports provided by USDA-ARS, NRCS, SWCD staff, City of Columbus, Division of Water, Water Quality Assurance Laboratory, and producers that indicate a trend towards lower nitrate levels in the ambient water downstream of drain outlets during non-growing season (e.g., November through March)
Time frame	• Initiate promotional efforts January 2006. Begin installation of practices as early as summer 2006.

▶ **ACTION ITEM 5 - Supports goal 4**

Increase the diversity and quality of habitat within the channel and riparian zone along the Scioto River mainstem and its tributaries.

Rationale

The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a "healthier" ecosystem. Stream habitat such as meanders and in-stream structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • Watershed Coordinator
Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met. • Partner with the Scioto Conservancy District to identify locations that are appropriate for restoring stream habitat and to secure funding for the efforts. Explore idea that habitat restoration (i.e., through increased floodplain connection) may result in an increase in the carrying capacity of the channel which can serve to reduce flooding in immediate areas and

	even improve stormwater retention in the upper watershed. An increase in retention in the upper watershed may alleviate flooding issues for downstream landowners. Wildlife habitat plan created and implemented by conservancy district or another group in areas where the Scioto River is in partial attainment.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and staff from Marion, Union, and Delaware SWCDs, NRCS, HoO RC&D, OEPA
Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI). • Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ ACTION ITEM 6 - Supports goal 3

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies.

Rationale

Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Health Department and General Health District Environmental Health staffs; • Wastewater treatment plant operators; • Division of Environmental and Financial Assistance (DEFA) linked deposit loans if available; • Water Pollution Control Fund (WPCLF) linked deposit loan program; • OEPA 319 funding.

Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate such information as year of HSTS installation, type of HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs; • Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education Component	• The project plans to have an organized educational component in order to educate communities about steps that they can take to improve water quality within the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal

	newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's HSTS program. • The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the life of the system.
Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures, identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented; • Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders; • A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented; • Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

▶ **ACTION ITEM 7 - Supports goals 1, 2 and 3**

Promote, implement, and maintain Resource Management Plans that include Conservation Nutrient Management Plans (CNMPs) according to Ohio Nonpoint Source Pollution Management Plans and NRCS technical standards as outlined in the Field Office Technical Guide (FOTG) for each livestock operation in the subwatershed.

Rationale There are livestock identified in the inventory for this subwatershed. Large amounts of animal wastes, if not properly managed, can contaminate surface and ground waters used as drinking sources. Pathogens, nitrates, and other pollutants, such as, metals, antibiotics, pesticides, and hormones pose human health risks. In addition, oxygen-demanding substances can lead to fish kills and degrade water quality. Solids from animal wastes can increase turbidity and adversely affect the taste and odor of waters. Scientific evidence shows that CNMPs can significantly reduce the impact of waste from livestock, poultry, and horses on water supplies and in-stream habitat diversity for aquatic life.

Resources	• CRP, CREP, and EQIP implementation staff • USDA, NRCS and ARS staff • ODNR Nonpoint Source Pollution staff • ODA staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Utilizing data and other information from the watershed inventory the district conservationist works with AFO owners/operators to develop and implement CNMPs consistent with the plan outlined in the Ohio Nonpoint Source Pollution Management Plan and FOTG. EQIP provides technical assistance and cost-share payments to producers to adopt projects that offer the greatest level of environmental benefits. A plan of operations, developed with the producer, receives funding for nutrient management plans and projects as approved by the local agriculture committee.
Information/Education Component	• Ohio Nonpoint Source website, Ohio EPA, Cooperative Extension, and NRCS fact sheet, EQIP, CRP, and CREP brochures, Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Marion, Union, and Delaware SWCDs, NRCS, ODNR, HoO RC&D
Performance indicators	• All AFOs in the project area have current CNMPs consistent with the FOTG and Ohio Nonpoint Source Pollution Management Plan – Guides to Management Practices and Measures and are not in violation of clean water standards.
Time frame	• January 2006-2008

▶ ACTION ITEM 8 - Supports goal 6

Promote and implement an annual stream sweep of the Little Scioto River mainstem and conduct a litter index throughout the subwatershed.

Rationale

Trash and refuse in streams can decompose to cause discoloration of water and contribute unknown contaminants. Litter in streams and along corridors and roadsides lower the aesthetic appeal and value of the area generate unnecessary workloads for cleanup. Litter indexing is an effective method of generating public involvement and participation in watershed activities. Indexing can be used to determine the effectiveness of litter prevention campaigns and assist in targeting areas where additional efforts are needed to maintain the watershed in good condition.

Resources	• Marion and Delaware County SWCDs, Marion County Park District, and Marion County General Health District staffs • Watershed Coordinator
Method	• Watershed coordinator would organize, coordinate, and participate with Marion and Delaware County SWCDs, Marion County Park District, and Marion County General Health District staffs to conduct an annual river sweep and litter indexing activity.
Information/Education Component	• Delaware SWCD newsletter and website. Event flier. Active information/education partners include volunteers, and staff from Marion and Delaware County SWCDs, Marion County Park District, and Marion County General Health District
Performance indicators	• Reduction in the amount of trash and refuse in streams and along corridors to levels manageable by one event per year.
Time frame	• September 2007. Annually thereafter until no longer necessary.

Subwatershed 9: Fulton Creek

HUC: 05060001040-060 & -070

Drainage area	**60.1 mi.^{2}**	**38,699 ac.**		
Straightened channels	**11.9%**			
Relief	**190 ft.**			
Land cover (2002)	**Agriculture & open urban**	**92.1%**	**Wooded**	**6.5%**

Soils: Ground moraine till soils silt loam and silty clay loam (Blount-Wetzel-Pewamo)
Note: This subwatershed includes parts of Union and Delaware Counties.

Water Quality Concerns Based on Stakeholder Input

• Excessive soil particle sediment loads and excessive in-streambed sedimentation • Excessive nutrient loading to streams (nitrogen and phosphorus)	• Poor aquatic life habitat in streams • Poor riparian habitats • Excessive chemical loading in streams (pesticides) • Pollutants in streams (toxins and carcinogens)	• Drinking water contamination • High levels of pathogens in streams and wells

Problem statements (causes and sources)

1. Accelerated erosion from unprotected soils and from streambank erosion contributes to excessive in-stream sediment loading and sedimentation. Less than 2 percent or about 744 acres have slopes greater than 6 percent. These soil areas pose the greatest potential for accelerated erosion where unprotected.

2. Channel maintenance activities facilitate the downstream transport of silt. Channel modifications and maintenance activities along Fulton Creek and tributaries has created poor physical habitat for aquatic life uses in some areas. The poor quality or lack of in-stream and riparian habitat has impaired biological communities resulting in non-attainment of their aquatic life use designations in some areas of the subwatershed.

3. Surface runoff from unprotected soils and poor filtration of nutrients contribute to excessive nutrient loads and exacerbate phosphorus loadings to the Scioto River mainstem.

5. Stakeholders have expressed concerns that untreated effluent from failing household sewage treatment systems (HSTS) is leading to high levels of pathogens and excessive nutrients in ditches and streams. To date enough credible data does not exist to support these concerns.

6. Decomposition of trash and refuse causes discoloration of water and contribute unknown contaminants.

7. Chronic NPDES permit violations at the Richwood wastewater treatment plant (WWTP) contributes a variety of pollutants into Fulton Creek.

Impairment Reduction Goals
1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30 percent annually.

3. Reduce level of pathogens from failing HSTSs, WWTPs and package plants, and livestock operations to ensure attainment of water quality standards in accordance with the Clean Water Act throughout the subwatershed.

4. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status

5. Investigate the Scioto River mainstem to determine if sediments have become contaminated from past industrial activities upstream. Restore any areas of channel polluted with toxic and carcinogenic contaminants to ensure water quality standards in accordance with the Clean Water Act.

Other goals
1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the subwatershed

2. To better understand current water quality conditions of the water resources and identify areas that are performing well and those that need improvement.

Specific Actions
1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) throughout the subwatershed.

2. Continue monitoring and assessment of water quality along the Scioto River mainstem, Fulton Creek, and tributaries to determine impairment extent and trends.

3. Promote the use of resource management plans (RMPs), conservation programs, and conservation tillage practices that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals, and pathogen loading to surface waters.

4. Promote and implement the use of drainage water management systems for nitrate reduction where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and Scioto River Watershed CREP supplemental

practice eligibility requirements are met for agricultural drainage water management systems.

5. Increase the diversity and quality of both in-channel and riparian habitats along Fulton Creek and tributaries.

6. Quantify the level of pathogens from failing HSTSs, WWTPs and package plants, and livestock operations throughout the subwatershed

7. Sponsor a cooperative private drinking water well program throughout the subwatershed.

8. Partner with Richwood Village officials and OEPA to develop a plan to reduce pollutant discharge levels from failing WWTP and develop a plan to assess the effect of upgrades to stormwater and sanitary sewer infrastructure.

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s);information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

▶ ACTION ITEM 1 - Supports goals 1, 2, and 4

Create at least 400 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) and the Wetland Reserve Program (WRP) in the form of filter strips, wildlife habitat, and shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale

Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wildlife habitat.

Resources	• Union and Delaware Counties EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Wildlife Habitat Incentive Program and

	implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, and WHIP Programs
Information/Education Component	• Public event speaking engagements, display booths at county fairs and Farm Science Review, informational fliers, brochures, and other written materials, and written and verbal correspondence with potential CREP enrollees, Delaware SWCD newsletter and website. Active information/education partners include farmer volunteers, staff from Union and Delaware SWCDs, NRCS, ODNR, FSA, and HoO RC&D.
Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CREP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ ACTION ITEM 2 - Supports goal 6 and "Other Goals" 1 & 2
Monitor and quantify water quality and bio-indicators along the Scioto River mainstem, Fulton Creek and tributaries.

Rationale
Monitoring water quality and biological indicators will provide information that can be used to assess the overall function, performance and quality of the water resources. It will also provide a basis of comparison to other areas within the Upper Scioto River Watershed Project area as well as other watersheds throughout the Midwest. Such data will add to a current pool of information and can be used for trend analyses.

Resources	• Support provided by the Ohio EPA for equipment, personnel, laboratory analyses, and expertise • City of Columbus, Division of Water, Water Quality Lab • USGS 03220000 Mill Creek near Bellpoint OH • Farm Bureau, Agriculture Ecology Committees – AWARE Program • Watershed Coordinator
Method	• In addition to stationary sites, water quality sampling will take place regularly at locations that are appropriate for providing baseline information as well as monitoring the effectiveness of action items (these

	specific locations are yet to be determined). The frequency of sampling will be determined based on the usefulness of the data as well as the availability of resources. Biological monitoring will be conducted at a select number of sites each year, which will be determined as information needs arise.
Information/Education Component	• USGS Ohio real-time water data website, Delaware SWCD newsletter and website. Personal contacts with landowners.
Performance indicators	• An assessment of river and stream quality that is adequate to update Ohio EPA aquatic life use designations by 2007 (in compliance with the credible data rules).
Time frame	• Field sampling and monitoring calendar year 2007. Stationary sites on-going.

▶ **ACTION ITEM 3 - Supports goals 1, 2, and 4**

Promote and implement soil erosion management programs that reduce the potential for nonpoint source sediment loading to surface waters.

Rationale

Conservation tillage or no-tillage, planting warm season grasses on highly erodible land, planting cover crops, conservation crop rotations, pasture and hayland plantings, and pasture and grazing management all help to reduce the potential for soil loss from erosion in farm fields and improve soil quality.

Resources	• Union and Delaware Counties EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • DEFA-WPCLF implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Union County SWCD and Ohio EPA-DEFA partner to provide low interest loans to landowners for the implementation of projects that result in a reduction of agricultural nonpoint source pollution problems (sediment). • Continue to use cost share incentives currently provided through CRP, CREP, and EQIP for agricultural BMPs.
Information/Education	• Delaware SWCD newsletter and website. Active

Component	information/education partners include volunteers, and staff from Union and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Reduction in the total suspended solid load in mainstem (as measured through grab sample data). • QHEI substrate scores improve.
Time frame	• Ongoing

▶ **ACTION ITEM 4 - Supports goal 2**

Promote and implement the use of drainage water management systems where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and where SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

Rationale

Research by USDA Natural Resources Conservation Service (NRCS) and Agriculture Research Service (ARS) has shown that drainage water management systems can reduce annual nitrate loads by as much as 30 to 40%. Drainage management systems can improve water quality by preventing the discharge of manure or nutrient laden water carried through subsurface drainage into waters of the state. Other water quality benefits may be derived from a reduction in wind eroded organic soil depositing in streams and other water bodies and by providing a mechanism to pump and treat or divert polluted sub-surface drain water.

Resources	• USDA – NRCS and ARS staff • Union and Delaware County EQIP and implementation staff • Scioto River Watershed CREP and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Provide up to 90% cost share assistance for the installation of permanent drainage water management structures where determined suitable to the CREP contract acreage site and needed to achieve water quality objectives. Provide access to a BMP risk management instrument for producers to offset yield loss and/or costs for subsurface drainage system repair that has resulted from the employment and/or installation of the water table management infrastructure. • Provide EQIP funding (50-75% cost-share) when available for the installation of permanent drainage water management structures where determined

	suitable to the site and needed to achieve water quality objectives
Information/Education Component	• Utilize a comprehensive promotional effort that includes radio programs, farm magazine articles, revised CREP brochures and literature, and public meetings, Delaware SWCD newsletter and website. Review local EQIP ranking sheet to determine the amount of points available to drainage water management practices. Active information/education partners include volunteers, and staff from Union and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Reports provided by USDA-ARS, NRCS, SWCD staff, City of Columbus, Division of Water, Water Quality Assurance Laboratory, and producers that indicate a trend towards lower nitrate levels in the ambient water downstream of drain outlets during non-growing season (e.g., November through March)
Time frame	• Initiate promotional efforts January 2006. Begin installation of practices as early as summer 2006.

▶ ACTION ITEM 5 - Supports goal 4

Increase the diversity and quality of habitat within the channel and riparian zone along the Scioto River mainstem and its tributaries.

Rationale

The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a "healthier" ecosystem. Stream habitat such as meanders and in-stream structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • Watershed Coordinator
Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and staff from Union and Delaware SWCDs, NRCS, HoO RC&D, OEPA

Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI). • Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ **ACTION ITEM 6 - Supports goal 3**

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies.

Rationale

Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Health Department and General Health District Environmental Health staffs; • Wastewater treatment plant operators; • Division of Environmental and Financial Assistance (DEFA) linked deposit loans if available; • Water Pollution Control Fund (WPCLF) linked deposit loan program; • OEPA 319 funding.
Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate such information as year of HSTS installation, type of

	HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs; • Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education Component	• The project plans to have an organized educational component in order to educate communities about steps that they can take to improve water quality within the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's HSTS program. • The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the life of the system.

Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures, identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented; • Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders; • A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented; • Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

▶ **ACTION ITEM 7 - Supports goals 1, 2 and 3**

Promote, implement, and maintain Resource Management Plans that include Conservation Nutrient Management Plans (CNMPs) according to Ohio Nonpoint Source Pollution Management Plans and NRCS technical standards as outlined in the Field Office Technical Guide (FOTG) for each livestock operation in the subwatershed.

Rationale There are livestock identified in the inventory for this subwatershed. Large amounts of animal wastes, if not properly managed, can contaminate surface and ground waters used as drinking sources. Pathogens, nitrates, and other pollutants, such as, metals, antibiotics, pesticides, and hormones pose human health risks. In addition, oxygen-demanding substances can lead to fish kills and degrade water quality. Solids from animal wastes can increase turbidity and adversely affect the taste and odor of waters. Scientific evidence shows that CNMPs can significantly reduce the impact of waste from livestock, poultry, and horses on water supplies and in-stream habitat diversity for aquatic life.

Resources	• CRP, CREP, and EQIP implementation staff • USDA, NRCS and ARS staff

	• ODNR Nonpoint Source Pollution staff • ODA staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Utilizing data and other information from the watershed inventory the district conservationist works with AFO owners/operators to develop and implement CNMPs consistent with the plan outlined in the Ohio Nonpoint Source Pollution Management Plan and FOTG. EQIP provides technical assistance and cost-share payments to producers to adopt projects that offer the greatest level of environmental benefits. A plan of operations, developed with the producer, receives funding for nutrient management plans and projects as approved by the local agriculture committee.
Information/Education Component	• Ohio Nonpoint Source website, Ohio EPA, Cooperative Extension, and NRCS fact sheet, EQIP, CRP, and CREP brochures, Delaware SWCD newsletter and website. Active information/education partners include volunteers, and staff from Union and Delaware SWCDs, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• All AFOs in the project area have current CNMPs consistent with the FOTG and Ohio Nonpoint Source Pollution Management Plan – Guides to Management Practices and Measures and are not in violation of clean water standards.
Time frame	• January 2006-2008

▶ ACTION ITEM 8 - Supports "Other Goals" goal 2

Develop a drinking water well monitoring program throughout the subwatershed that will include limited sampling and testing for total coliform, and if warranted or requested, test for E. coli, nitrates, certain pesticides and other contaminates.

Rationale

In many areas of the watershed, very little information is available on water quality in private wells. Organized data on rural drinking water quality can support the development of appropriate groundwater protection and education programs and help target such programs to those locations with greatest needs.

Resources	• Delaware and Union County General Health District staff • City of Columbus, Division of Power and Water • Heidelberg College National Center for Water Quality

	Research • Ohio EPA • Ohio Department of Health • Watershed Coordinator
Method	• Conduct sampling and testing of all new drinking water wells as part of the local permit to install (PTI) process. • Sample existing wells having increased likelihood of contamination • Create a digital layer indicating the location, types of wells, and types of contaminants that exceed acceptable standards. • Utilize GPS data from well drillers logs and health districts
Information/Education Component	• Delaware SWCD newsletter and web page for watershed project, program brochure, Delaware and Union County General Health District newsletters
Performance indicators	• Sufficient distribution of testing sites and data acquisition to make determinations as to whether there are any significant public health risks associated with drinking water sources ground water resources in the
Time frame	• Initiate promotional efforts January 2007. Begin program implementation as early as spring 2007.

▶ **ACTION ITEM 9 Supports goals 1, 2, 3, and 4**

Partner with Richwood Village officials and OEPA to develop a plan to reduce pollutant discharge levels and develop a plan to assess the effect of upgrades to stormwater and sanitary sewer infrastructure.

Rationale

Malfunctioning WWTPs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems, or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5).

Resources	• Richwood Village officials • Community stakeholders • Ohio EPA. • Watershed Coordinator
Methods	• Arrange meeting with OEPA and Richwood Village officials to assess progress. Build Village Council and community awareness and support for system upgrades. Pursue funding sources as an outcome of stakeholder meetings.

	• Arrange for stream monitoring and assessment in vicinity of treatment plant discharge.
Information/Education Component	• Stormwater brochure distributed to community. Stormwater management training provided to municipal employees. • Educate Mayor and Council on issues related to permit violations and surrounding water quality impairments.
Performance indicators	• Reduction in volume of inflow and infiltration in the sanitary sewer system serving the Richwood wastewater treatment plant. • Short term repairs to WWTP infrastructure. • Funding stream sufficient to maintain infrastructure.
Time frame	• To be determined as an outcome of meetings with Richwood Village officials, community stakeholders and watershed project.

Subwatershed 10: Bokes/Mill Confluence

HUC: 05060001060-020

Drainage area	**36.7 mi.^{2}**	**15,700 ac.**		
Straightened channels	**11.9%**			
Relief	**190 ft.**			
Land cover (2002)	**Agriculture & open urban**	**77.0%**	**Wooded**	**2.0%**
	Barren (quarry)	**2.0%**	**Shrub/scrub**	**2.0%**

Soils: Primarily glacial till soils on ground moraines. Silt loam and silty clay loam Glynwood-Blount-Pewamo soils.
Note: This subwatershed occurs entirely within the boundaries of Delaware County.

Water Quality Concerns Based on Stakeholder Input

• Excessive soil particle sediment loads and excessive in-streambed sedimentation • Excessive nutrient loading to streams (nitrogen and phosphorus)	• Poor aquatic life habitat in streams • Poor riparian habitats • Excessive chemical loading in streams (pesticides)	• Drinking water contamination • High levels of pathogens in streams and wells

Problem statements (causes and sources)
1. Over 10 percent of the soils or about 1,573 acres of soil have slopes greater than 6 percent. Accelerated erosion from unprotected soils and from streambank erosion contributes to excessive in-stream sediment loading and sedimentation.

2. Surface runoff from unprotected soils and poor filtration of nutrients contribute to excessive nutrient loads and exacerbate phosphorus loadings to the Scioto River mainstem.

3. Stakeholders have expressed concerns that untreated effluent from failing household sewage treatment systems (HSTS) is leading to high levels of pathogens and excessive nutrients in ditches and streams. To date credible data does not exist to support these concerns.

4. Decomposition of trash and refuse causes discoloration of water and contribute unknown contaminants.

Impairment Reduction Goals
1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30% annually.

3. Reduce level of pathogens from failing HSTSs, WWTPs and package plants, and livestock operations to ensure water quality standards in accordance with the Clean Water Act throughout the subwatershed.

4. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status.

5. Reduce the amount of trash and refuse in streams and along stream corridors to levels manageable by one annual river sweep per year.

Other goals

1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the subwatershed

2. To better understand current water quality conditions of the water resources and identify areas that are performing well and those that need improvement.

Specific Actions

1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) throughout the subwatershed.

2. Continued monitoring and assessment of water quality along the Scioto River mainstem and its tributaries within this subwatershed to determine impairment trends. Begin assessments of Prairie Run, Eagon Run, and Moors Run.

3. Promote the use of conservation programs and conservation tillage practices that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals loading to surface waters.

4. Promote and implement the use of drainage water management systems for nitrate reduction where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and Scioto River Watershed CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

5. Increase the diversity and quality of both in-channel and riparian habitats along the Scioto River mainstem and its tributaries.

6. Quantify the level of pathogens from failing HSTSs, WWTPs and package plants, and livestock operations throughout the subwatershed.

7. Organize, coordinate and participate in stream sweeps, litter indexing, and other litter reduction efforts.

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s);information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

▶ ACTION ITEM 1 - Supports goals 1, 2, and 4
Create at least 100 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) and the Wetland Reserve Program (WRP) in the form of filter strips, wildlife habitat, and shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale
Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wildlife habitat.

Resources	• Delaware County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Wildlife Habitat Incentive Program and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, and WHIP Programs
Information/Education Component	• Public event speaking engagements, display booths at county fairs and Farm Science Review, informational fliers and/or other written materials, and written and verbal correspondence with potential CREP enrollees, Delaware SWCD newsletter and website. Active information/education partners include volunteers, staff from Delaware SWCD, NRCS, ODNR, FSA, HoO RC&D

Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CREP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ **ACTION ITEM 2 - Supports goal 6 and "Other Goals" 1 & 2**
Monitor and quantify water quality and bio-indicators along the Scioto River mainstem and its tributaries in this subwatershed.

Rationale
Monitoring water quality and biological indicators will provide information that can be used to assess the overall function, performance and quality of the water resources. It will also provide a basis of comparison to other areas within the Upper Scioto River Watershed Project area as well as other watersheds throughout the Midwest. Such data will add to a current pool of information and can be used for trend analyses.

Resources	• Support provided by the Ohio EPA for equipment, personnel, laboratory analyses, and expertise • City of Columbus, Division of Water, Water Quality Lab • USGS 03220000 Mill Creek near Bellpoint OH • Farm Bureau, Agriculture Ecology Committees – AWARE Program • Watershed Coordinator
Method	• In addition to stationary sites, water quality sampling will take place regularly at locations that are appropriate for providing baseline information as well as monitoring the effectiveness of action items (these specific locations are yet to be determined). The frequency of sampling will be determined based on the usefulness of the data as well as the availability of resources. Biological monitoring will be conducted at a select number of sites each year, which will be determined as information needs arise.
Information/Education Component	• USGS Ohio real-time water data website, Delaware SWCD newsletter and website.
Performance indicators	• An assessment of river and stream quality that is adequate to update Ohio EPA aquatic life use designations by 2007 (in compliance with the credible data rules).
Time frame	• Field sampling and monitoring summer 2006 – 2007. Stationary sites on-going.

▶ ACTION ITEM 3 - Supports goal 1, 2, and 4
Promote and implement soil erosion management programs that reduce the potential for nonpoint source sediment loading to surface waters.

Rationale
Conservation tillage or no-tillage, planting warm season grasses on highly erodible land, planting cover crops, conservation crop rotations, pasture and hayland plantings, and pasture and grazing management all help to reduce the potential for soil loss from erosion in farm fields and improve soil quality.

Resources	• Delaware County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Continue to use cost share incentives currently provided through CRP, CREP, and EQIP for agricultural BMPs.
Information/Education Component	• Watershed meetings, mailings to producers, brochures, personal contacts, Delaware SWCD newsletter and website. Active information/education partners include volunteers, staff from Delaware SWCD, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Reduction in the total suspended solid load in mainstem (as measured through grab sample data). • QHEI substrate scores improve.
Time frame	• On-going. Suspend date dependent on funding.

▶ ACTION ITEM 4 - Supports goal 2
Promote and implement the use of drainage water management systems where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and where SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

Rationale
Research by USDA Natural Resources Conservation Service (NRCS) and Agriculture Research Service (ARS) has shown that drainage water management systems can reduce annual nitrate loads by as much as 30 to 40%. Drainage water management systems can improve water quality by preventing the discharge of manure or nutrient laden water carried through subsurface drainage into waters of the state. Other water quality benefits may be derived from a reduction in wind eroded organic soil depositing in streams and

other water bodies and by providing a mechanism to pump and treat or divert polluted sub-surface drain water.

Resources	• USDA – NRCS and ARS staff • Union and Delaware County EQIP and implementation staff • Scioto River Watershed CREP and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Provide up to 90% cost share assistance for the installation of permanent drainage water management structures where determined suitable to the CREP contract acreage site and needed to achieve water quality objectives. Provide access to a BMP risk management instrument for producers to offset yield loss and/or costs for subsurface drainage system repair that has resulted from the employment and/or installation of the water table management infrastructure. • Provide EQIP funding (50-75% cost-share) when available for the installation of permanent drainage water management structures where determined suitable to the site and needed to achieve water quality objectives
Information/Education Component	• Utilize a comprehensive promotional effort that includes radio programs, farm magazine articles, revised CREP brochures and literature, and public meetings, Delaware SWCD newsletter and website. Review local EQIP ranking sheet to determine the amount of points available to drainage water management practices. Active information/education partners include volunteers, staff from Delaware SWCD, NRCS, ODNR, FSA, HoO RC&D, ARS
Performance indicators	• Reports provided by USDA-ARS, NRCS, SWCD staff, City of Columbus, Division of Water, Water Quality Assurance Laboratory, and producers that indicate a trend towards lower nitrate levels in the ambient water downstream of drain outlets during non-growing season (e.g., November through March)
Time frame	• Initiate promotional efforts January 2006. Begin installation of practices as early as summer 2006.

▶ ACTION ITEM 5 - Supports goal 4

Increase the diversity and quality of habitat within the channel and riparian zone along the Scioto River mainstem and its tributaries.

Rationale

The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a "healthier" ecosystem. Stream habitat such as meanders and in-stream structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • Watershed Coordinator
Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and staff from Delaware SWCD, NRCS, HoO RC&D, OEPA.
Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI). • Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ ACTION ITEM 6 - Supports goal 3

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies.

Rationale

Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and

condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Health Department and General Health District Environmental Health staffs; • Wastewater treatment plant operators; • Division of Environmental and Financial Assistance (DEFA) linked deposit loans if available; • Water Pollution Control Fund (WPCLF) linked deposit loan program; • OEPA 319 funding.
Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate such information as year of HSTS installation, type of HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs;

	• Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education Component	• The project plans to have an organized educational component in order to educate communities about steps that they can take to improve water quality within the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's HSTS program. • The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the life of the system.
Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures, identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented; • Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders;

	• A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented; • Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

▶ **ACTION ITEM 7 - Supports goal 3**

Promote, implement, and maintain Resourcement Plans that include Conservation Nutrient Management Plans (CNMPs) according to Ohio Nonpoint Source Pollution Management Plans and NRCS technical standards as outlined in the Field Office Technical Guide (FOTG) for each livestock operation in the subwatershed.

Rationale Large amounts of animal wastes, if not properly managed, can contaminate surface and ground waters used as drinking sources. Pathogens, nitrates, and other pollutants, such as, metals, antibiotics, pesticides, and hormones pose human health risks. In addition, oxygen-demanding substances can lead to fish kills and degrade water quality. Solids from animal wastes can increase turbidity and adversely affect the taste and odor of waters. Scientific evidence shows that CNMPs can significantly reduce the impact of waste from livestock, poultry, and horses on water supplies and in-stream habitat diversity for aquatic life.

Resources	• CRP, CREP, and EQIP implementation staff • USDA, NRCS and ARS staff • ODNR Nonpoint Source Pollution staff • ODA staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Utilizing data and other information from the watershed inventory the district conservationist works with AFO owners/operators to develop and implement CNMPs consistent with the plan outlined in the Ohio Nonpoint Source Pollution Management Plan and FOTG. EQIP provides technical assistance and cost-share payments to producers to adopt projects that offer the greatest level of environmental benefits. A plan of operations, developed with the producer, receives funding for nutrient management plans and projects as approved by the local agriculture committee.
Information/Education Component	• Ohio Nonpoint Source website, Ohio EPA, Cooperative Extension, and NRCS fact sheet, EQIP, CRP, and CREP brochures, Delaware SWCD newsletter and website.
Performance	• All AFOs in the project area have current CNMPs

indicators	consistent with the FOTG and Ohio Nonpoint Source Pollution Management Plan – Guides to Management Practices and Measures and are not in violation of clean water standards.
Time frame	• January 2006-2008

Subwatershed 11: O'Shaughnessy area

HUC: 05060001080-010 & -020

Drainage area	**30.0 mi.^{2}**	**19,330 ac.**		
Straightened channels	**1.6%**			
Relief	**170 ft.**			
Land cover (2002)	**Agriculture & open urban**	**74%**	**Wooded**	**18%**
	Open water	**1.0%**	**Shrub/scrub**	**1.0%**
	Urban	**1.0%**		

Soils: Primarily glacial till soils on ground moraines and end moraines. Glynwood-Blount-Pewamo-Milton soils.
Note: This subwatershed includes parts of Delaware and Union Counties.

Water Quality Concerns Based on Stakeholder Input

• Excessive soil particle sediment loads to surface waters and excessive in-streambed and reservoir sedimentation • Excessive nutrient loading to streams (nitrogen and phosphorus)	• Poor aquatic life habitat in streams • Poor riparian habitats • Drinking water contamination • High levels of pathogens in streams and wells	• Municipal wastewater discharges to O'Shaughnessy Reservoir • Stormwater runoff

Problem statements (causes and sources)

1. Over 10 percent of the soils or about 2,066 acres of soil have slopes greater than 6 percent. Accelerated erosion from unprotected soils and from streambank erosion contributes to excessive in-stream sediment loading and sedimentation.

2. Surface runoff from unprotected soils and poor filtration of nutrients contribute to excessive nutrient loads and exacerbate phosphorus loadings to the Scioto River mainstem.

3. Stakeholders have expressed concerns that untreated effluent from failing household sewage treatment systems (HSTS) is leading to high levels of pathogens and excessive nutrients in ditches and streams. To date credible data does not exist to support these concerns.

4. Decomposition of trash and refuse causes discoloration of water and contribute unknown contaminants.

5. Stormwater runoff from the Village of Shawnee Hills may lead to excessive runoff containing soil sediment and a variety of pollutants which enter the adjacent Scioto River (O'Shaughnessy Reservoir).

Impairment Reduction Goals
1. Reduce sediment loading and phosphorus loading from all sources by 20 percent annually.

2. Reduce nitrate-N loading from all sources by 30% annually.

3. Reduce level of pathogens from failing HSTSs, WWTPs and package plants, and livestock operations to ensure water quality standards in accordance with the Clean Water Act throughout the subwatershed.

4. Improve aquatic life habitat and riparian habitat in all stream segments to meet Clean Water Act attainment status.

5. Reduce stormwater pollution sufficient to meet Federal Clean Water Act standards.

Other goals
1. Maintain water quality standards in all unimpaired stream segments and water bodies throughout the subwatershed

2. To better understand current water quality conditions of the water resources and identify areas that are performing well and those that need improvement.

Specific Actions
1. Continue to implement and promote the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP) throughout the subwatershed.

2. Continued monitoring and assessment of water quality along the Scioto River mainstem and its tributaries within this subwatershed to determine impairment trends. Begin assessments of Eversole Run and other unnamed, unassessed tributaries.

3. Promote the use of conservation programs and conservation tillage practices that reduce the potential for nonpoint source sediment, nutrients and agricultural chemicals loading to surface waters.

4. Promote and implement the use of drainage water management systems for nitrate reduction where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG and Scioto River Watershed CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

5. Increase the diversity and quality of both in-channel and riparian habitats along the Scioto River mainstem and its tributaries.

6. Quantify the level of pathogens from failing HSTSs, WWTPs and package plants, and livestock operations throughout the subwatershed

7. Implement NPDES Phase II stormwater pollution control measures sufficient to meet Federal Clean Water Act standards for the Village of Shawnee Hills.

The following tables describe the amount of resources required in the way of technical and financial assistance necessary to implement the NPS management measure(s); sources/authorities of implementation funding; method(s) used to implement the practice(s);information and education components for promoting, selecting, designing, and implementing NPS management measures; performance indicators; and completion schedule.

Figure 4-4. A backyard in Shawnee Hills looking south along the O'Shaughnessy Reservoir (dam in the distance)

▶ ACTION ITEM 1 - Supports goal 1, 2, and 4

Create at least 150 acres of cool and warm season grasses and forest buffers through the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) and the Wetland Reserve Program (WRP) in the form of filter strips, wildlife habitat, and shallow water areas for wildlife, riparian forest buffers, and wetlands on agricultural croplands or marginal pasturelands.

Rationale

Scientific research shows that vegetated buffer strips will reduce runoff of soil sediment, nutrients and pesticides, help protect local drinking water supplies, and provide additional habitat for fish and wildlife. Vegetated buffers provide valuable wildlife habitat for both terrestrial and aquatic life. Forested riparian areas can moderate extremes in stream temperatures as well as provide greater in-stream habitat and food resource diversity for aquatic life. Wetlands and shallow water areas store stormwater, reduce sediment and nutrients in runoff, recharge groundwater supplies, and provide valuable wildlife habitat.

Resources	• Delaware and Union County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Wildlife Habitat Incentive Program and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed coordinator
Method	• Implementation of Scioto River Watershed CREP, CRP, WRP, and WHIP Programs
Information/Education Component	• Public event speaking engagements, display booths at county fairs and Farm Science Review, informational fliers and/or other written materials, and written and verbal correspondence with potential CREP enrollees, Delaware SWCD newsletter and website. Active information/education partners include volunteers, staff from Delaware SWCD, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Attainment of goals set forth in the USDA rules for the Scioto River Watershed CREP. Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI)
Time frame	• February 2005-2019

▶ ACTION ITEM 2 - Supports goal 6 and "Other Goals" 1 & 2
Monitor and quantify water quality and bio-indicators along the Scioto River mainstem and its tributaries in this subwatershed.

Rationale
Monitoring water quality and biological indicators will provide information that can be used to assess the overall function, performance and quality of the water resources. It will also provide a basis of comparison to other areas within the Upper Scioto River Watershed Project area as well as other watersheds throughout the Midwest. Such data will add to a current pool of information and can be used for trend analyses.

Resources	• Support provided by the Ohio EPA for equipment, personnel, laboratory analyses, and expertise • City of Columbus, Division of Water, Water Quality Lab • USGS 03220000 Mill Creek near Bellpoint OH • Farm Bureau, Agriculture Ecology Committees –

	AWARE Program • Watershed Coordinator
Method	• In addition to stationary sites, water quality sampling will take place regularly at locations that are appropriate for providing baseline information as well as monitoring the effectiveness of action items (these specific locations are yet to be determined). The frequency of sampling will be determined based on the usefulness of the data as well as the availability of resources. Biological monitoring will be conducted at a select number of sites each year, which will be determined as information needs arise.
Information/Education Component	• USGS Ohio real-time water data website, Delaware SWCD newsletter and website.
Performance indicators	• An assessment of river and stream quality that is adequate to update Ohio EPA aquatic life use designations by 2007 (in compliance with the credible data rules).
Time frame	• Field sampling and monitoring summer 2006 – 2007. Stationary sites on-going.

▶ **ACTION ITEM 3 - Supports goals 1, 2, and 4**
Promote and implement soil erosion management programs that reduce the potential for nonpoint source sediment loading to surface waters.

Rationale
Conservation tillage or no-tillage, planting warm season grasses on highly erodible land, planting cover crops, conservation crop rotations, pasture and hayland plantings, and pasture and grazing management all help to reduce the potential for soil loss from erosion in farm fields and improve soil quality.

Resources	• Delaware and Union County EQIP and implementation staff • Conservation Reserve Program and implementation staff • Scioto River Watershed CREP and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Continue to use cost share incentives currently provided through CRP, CREP, and EQIP for agricultural BMPs.
Information/Education Component	• Watershed meetings, mailings to producers, brochures, personal contacts, Delaware SWCD newsletter and

	website. Active information/education partners include volunteers, staff from Delaware SWCD, NRCS, ODNR, FSA, HoO RC&D
Performance indicators	• Reduction in the total suspended solid load in mainstem (as measured through grab sample data). • QHEI substrate scores improve.
Time frame	• Ongoing, suspend date dependent on funding.

▶ ACTION ITEM 4 - Supports goal 4

Increase the diversity and quality of habitat within the channel and riparian zone along the Scioto River mainstem and its tributaries.

Rationale

The lack of suitable aquatic habitat is one of the most significant factors leading to low biological diversity and/or poor aquatic communities in this area. Increasing the amount of stream habitat and improving its quality will likely result in a more diverse biological community and a "healthier" ecosystem. Stream habitat such as meanders and in-stream structure has been documented as playing an important role in increasing the assimilative capacity (e.g., for nutrients or other pollutants) of a river or stream.

Resources	• Natural Resources Conservation Service (NRCS) Wildlife Habitat Incentives Program (WHIP) funding and implementation staff. • Watershed Coordinator
Methods	• Provide technical assistance and up to 75 % cost-share from WHIP to develop wetlands, riparian, and aquatic habitat areas on private lands where eligibility requirements are met.
Information/Education Component	• Delaware SWCD newsletter and website. NRCS website and associated literature. Active information/education partners include volunteers, and staff from Union and Delaware SWCDs, NRCS, HoO RC&D, OEPA
Performance indicators	• Improved State indices including the Index of Biotic Integrity (IBI), Invertebrate Community Index (ICI), and the Qualitative Habitat Evaluation Index (QHEI). • Affected stream segments reach full attainment of their biological use status.
Time frame	• WHIP is ongoing under Farm Bill 2002.

▶ ACTION ITEM 5 - Supports goal 2

Promote and implement the use of drainage water management systems where practice conditions apply per Ohio Nonpoint Source Pollution Management Plan, NRCS FOTG

and where SRW CREP supplemental practice eligibility requirements are met for agricultural drainage water management systems.

Rationale
Research by USDA Natural Resources Conservation Service (NRCS) and Agriculture Research Service (ARS) has shown that drainage water management systems can reduce annual nitrate loads by as much as 30 to 40%. Drainage water management systems can improve water quality by preventing the discharge of manure or nutrient laden water carried through subsurface drainage into waters of the state. Other water quality benefits may be derived from a reduction in wind eroded organic soil depositing in streams and other water bodies and by providing a mechanism to pump and treat or divert polluted sub-surface drain water.

Resources	• USDA – NRCS and ARS staff • Union and Delaware County EQIP and implementation staff • Scioto River Watershed CREP and implementation staff • Heart of Ohio Resource Conservation and Development (HoO RC&D) • Watershed Coordinator
Method	• Provide up to 90% cost share assistance for the installation of permanent drainage water management structures where determined suitable to the CREP contract acreage site and needed to achieve water quality objectives. Provide access to a BMP risk management instrument for producers to offset yield loss and/or costs for subsurface drainage system repair that has resulted from the employment and/or installation of the water table management infrastructure. • Provide EQIP funding (50-75% cost-share) when available for the installation of permanent drainage water management structures where determined suitable to the site and needed to achieve water quality objectives
Information/Education Component	• Utilize a comprehensive promotional effort that includes radio programs, farm magazine articles, revised CREP brochures and literature, and public meetings, Delaware SWCD newsletter and website. Review local EQIP ranking sheet to determine the amount of points available to drainage water management practices. Active information/education partners include volunteers, staff from Delaware SWCD, NRCS, ODNR, FSA, HoO RC&D, ARS

Performance indicators	• Reports provided by USDA-ARS, NRCS, SWCD staff, City of Columbus, Division of Water, Water Quality Assurance Laboratory, and producers that indicate a trend towards lower nitrate levels in the ambient water downstream of drain outlets during non-growing season (e.g., November through March)
Time frame	• Initiate promotional efforts January 2006. Begin installation of practices as early as summer 2006.

▶ **ACTION ITEM 6 - Supports goal 3**

Prepare reports that quantify the extent of failed/failing household sewage treatment systems (HSTS) throughout the watershed. Take additional action to implement a program for repair or replacement of all failing HSTSs identified in impaired stream segments of the Upper Scioto River Watershed Project area. These objectives will continue to enhance the HSTS program in order to improve surface water quality to meet Ohio EPA's Water Quality Standards for drinking water supplies.

Rationale

Widespread malfunctioning of HSTSs can contribute significant amounts of ammonia and phosphorus to surface waters as well ground water resources. Malfunctioning systems or improperly managed systems can contaminant the water resource with a variety of infectious viruses and other pathogens, household chemicals, and create excessive biochemical oxygen demand (BOD_5). Information regarding the number and condition of these types of systems can be used to determine where efforts should be directed to upgrade, repair or replace failing systems.

Resources	• Health Department and General Health District Environmental Health staffs; • Wastewater treatment plant operators; • Division of Environmental and Financial Assistance (DEFA) linked deposit loans if available; • Water Pollution Control Fund (WPCLF) linked deposit loan program; • OEPA 319 funding.
Method	• Work collaboratively within communities to improve, protect, and preserve water quality with elected officials, local zoning boards, County Regional Planning Commissions, Soil and Water Conservation Districts, Sanitary Engineers, Ohio EPA, ODNR, ODH, ODA, Scioto River Valley Federation, and WWTP operators; • Obtain funding for developing an HSTS database, GPS field mapping, increased HSTS inspection and other plan objectives; • Complete an HSTS database, which will incorporate

	such information as year of HSTS installation, type of HSTS, date of last inspection, date last pumped out, and sampling results. • Develop inventory and document water quality impaired stream segments; • Develop HSTS plan for the project area that incorporates the appropriate best management practice (BMP) systems. • Inspect all HSTSs that are located within the project area. • Develop sampling policies and procedures, and to collect new and existing data on stream water quality within the watersheds including BOD, TSS, fecal coliform and ammonia with the assistance of volunteers; • To design, and conduct stream water sampling study with the Ohio EPA that would document improvements in the water quality over time with causation linked to repair and upgrade of existing failing HSTSs; • Develop effective and ongoing information and education programs; • Provide homeowners with the opportunity for financial assistance to repair or replace their existing HSTS or connect to available sanitary sewer. Plan to apply for OEPA grant money through the Water Pollution Control Loan Fund (WPCLF).
Information/Education Component	• The project plans to have an organized educational component in order to educate communities about steps that they can take to improve water quality within the Upper Scioto River Watershed Project area. Activities include preparing brochures, news articles concerning the watershed project HSTS program, and submitting them to township and municipal newsletters, preparing quarterly news releases for local newspapers in the watershed concerning the project's HSTS program. • The project will partner with local public health staffs to offer quarterly homeowners sewage maintenance workshops. These workshops will discuss how septic system works, and the signs to look for that may indicate whether there is a problem with the HSTS. The workshops will also describe ways to save on the water bill and how to decrease the amount of wastewater entering the HSTS in order to increase the

	life of the system.
Performance indicators	The program evaluation process will be important component of the HSTS plan. Regular program evaluation will be performed to analyze program methods and procedures, identify problems, evaluate the potential for improvement through new technologies or program enhancements, and ensure funding is available to sustain programs. The evaluation program will include: • Development and implementation of an education and awareness program • Development and implementation of a Human Health and Sanitation Committee (subcommittee of the Advisory Committee) • A tracking system for measuring success and for evaluating and adapting program components has been implemented; • Processes for comparing program achievements to goals and objectives has been implemented; • An annual report is prepared outlining the status, trends, and achievements of the program; • Venues for ongoing information exchange has been established among program stakeholders; • A system of quantifying the number of HSTS repaired and upgraded has been developed and implemented; • Documented water quality improvements reflected through coordinated sampling effort.
Time frame	2006-2008

▶ ACTION ITEM 7 - Supports goal 5

Implement NPDES Phase II stormwater management minimum control measures for the Village of Shawnee Hills.

Rationale

In suburban areas, such as Shawnee Hills, much of the land is covered by buildings and pavement, which do not allow stormwater to soak into the ground. Instead, most of the areas rely on storm drains to carry large amounts of stormwater runoff from roofs and paved areas to nearby waterways. Stormwater runoff carries pollutants such as oil, dirt, chemicals, and lawn fertilizers directly to streams and rivers, where they seriously harm water quality. Development and implementation of pollution prevention strategies are helpful in controlling the impacts of stormwater runoff that threatens surface water quality and ground water resources.

Resources	• Village of Shawnee Hills Administrative Office • Delaware County NPDES Phase II implementation staff

	• CPS Consulting Group staff • OEPA NPDES Coordinator • Watershed Coordinator
Method	• Cooperative agreement between the Delaware SWCD and Village of Shawnee Hills for implementation of minimum control measures to address Public Outreach and Education, Public Participation, and Good Housekeeping strategies. • CPS Consulting Group to implement
Information/Education Component	• All information and education components will take place based on terms of agreement with the Village of Shawnee Hills.
Performance indicators	• Reports provided by OEPA and CPS Consulting Group showing measurable improvements in water quality at each stormwater outfall from the Village.
Time frame	• Begin implementation fall 2006. Ongoing thereafter as determined by terms of annual agreements.

Table of Acronyms

AFO: Animal Feeding Operation
AWARE: Agricultural Watershed Awareness Resource Evaluation
BOD_5: Biological Oxygen Demand – 5 Day
CAFO: Confined Animal Feeding Operation
CREP: Conservation Reserve Enhancement Program
CRP: Conservation Reserve Program
DEFA: Division of Environmental and Financial Assistance
EQIP: Environmental Quality Incentives Program
FOTG: Field Office Technical Guide
FSA: Farm Services Agency
GRP: Grassland Reserve Program
HoO RC&D: Heart of Ohio Resource Conservation and Development
HSTS: Household Sewage Treatment System
IBI: Index of Biotic Integrity
ICI: Invertebrate Community Index
MCL: Maximum Contaminant Level
NHD: National Hydrology Data
NPDES: National Pollutant Discharge Elimination System
NPS: Nonpoint Source
NRCS: Natural Resources Conservation Service
OD: Oxygen Demand
ODA: Ohio Department of Agriculture
ODNR: Ohio Department of Natural Resources
OEPA: Ohio Environmental Protection Agency
OFB: Ohio Farm Bureau
QHEI: Qualitative Habitat Evaluation Index
RC&D: Resource Conservation and Development
SWCD: Soil and Water Conservation District
TSS: Total Suspended Solids
USDA: United States Department of Agriculture
USEPA: United States Environmental Protection Agency
USGS: United States Geological Survey
USRWP: Upper Scioto River Watershed Project
WAP: Watershed Action Plan
WHIP: Wildlife Habitat Incentives Program
WPCLF: Water Pollution Control Loan Fund
WRP: Wetland Reserve Program
WRRSP: Water Resource Restoration Sponsor Program
USACE: United States Army Corps of Engineers
WWTP: Waste Water Treatment Plant
WWW: Warmwater Habitat

Chapter 5
Watershed evaluation

Introduction

This chapter outlines how specific goals and objectives are to be evaluated as well as the overall success of the comprehensive action plan. To accomplish the task of perpetual evaluation a set of criteria are defined to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, a set of criteria is defined for determining whether this watershed-based plan (or incorporated TMDL recommendations) needs to be revised. Evaluation of the plan allows for effective tracking of progress and designates who will monitor plan progress, how the monitoring will be accomplished, and the status of adequate resources to monitor progress. Further details outlined in this chapter explain how progress is to be publicized to officials and the public. Finally, a monitoring component is described to evaluate the effectiveness of the implementation efforts over time, measured against established criteria

Tracking Progress

The primary focus is to determine how effective and efficient the watershed planning approach is in managing the water quality resources of the Upper Scioto River Watershed Project area. This process involves a scientific and systematic collection of all the information parameters relevant to the watershed planning approach to meet the Federal Clean Water Act standards by the year 2010.

Oversight for tracking progress is maintained through the administrative elements of the watershed coordinator's two-year work plan, annual functional reviews, a watershed advisory committee, and the Delaware Soil and Water Conservation District. It is supported by the various partnering state and federal agencies charged with restoring and protecting the water quality resource. A detailed inventory of the watershed serves as the foundation upon which water quality impairments have been identified and goals have been established to reach water quality attainment status.

Tracking progress is a dynamic process that includes many broad-base components in the overall watershed approach to water quality improvement and maintenance. These components consist of building public support, water quality, defining problems, goal setting, developing solutions, and implementation of the watershed action plan.

A flexible water quality sampling and monitoring component is being developed within the watershed in order to extend into areas not currently under observation.

Monitoring Plan Progress

The group approach utilizing "stakeholder" evaluation will be the primary tool for measuring progress.

Evaluation techniques will utilize critical questions in a variety of settings and approaches. Workgroups have offered the most effective venue for framing questions and identifying their merit. Other approaches will include questionnaires and web-based feed back.

Measurable objectives will continue to drive the evaluation process by clearly describing the conditions upon which decisions are ultimately to be determined. Measurable impairments and restoration goals will allow for early discernment of progress and the opportunity to make adjustments to the plan in a timely manner.

Criteria, as established by the advisory committee, utilizing the "stakeholder" comment process will be utilized to determine at what point the success or lack of progress on certain objectives call for a revision of the implementation strategy. These criteria evaluate social issues, i.e., economics, political factors, cultural, historical, and various social factors that influence how we interact in our environment.

Water Quality Project Evaluation – A Handbook for Objectives-Based Evaluation of Water Quality Projects and *A Guide to Developing Local Watershed Action Plans in Ohio* are being used as the primary reference sources for evaluating the Upper Scioto River Watershed Project.

More specific information about ongoing monitoring projects (drinking water, habitat, biological, and chemical) are located in the Chapter 1, Current Efforts to Meet Water Quality Standards and in Chapter 4 Action Items by subwatershed.

There are numerous opportunities throughout the Upper Scioto River Watershed Project area for volunteer citizen groups, university or secondary school groups to become involved in watershed monitoring efforts. Training of individuals or groups can be arranged through the project's coordinator. Supplies and materials can also be arranged depending upon the nature of monitoring efforts. The project serves also to encourage, coordinate and document volunteer efforts in the various aspects of monitoring for water quality status.

Publicity

Sharing outcomes of the watershed action plan and the activities associated with its implementation will be through traditional communication methods and various interactive activities. The watershed coordinator's two-year work plan outlines in detail how publicity and public awareness are to take place. Highlighting successful activities will be the primary focus during the early stages of implementation. Detailed plans for the information/education component of each action item in the project area is located in the action item tables for each subwatershed in Chapter 4.

Resource Requirements

The watershed action plan will rely heavily on the availability of grant supported programs, volunteer efforts, mission-oriented agencies and organizations, and donations. Specific resource needs for the implementation of water quality projects, programs, and activities are outlined in Chapter 4 of the watershed action plan.

Chapter 6
Watershed Plan Updating and Revision

Update Elements

Plans for incorporating the watershed action plan into the fabric of the general public and responsible officials include four key elements. These elements are described in more detail in the watershed coordinator's work plan.

1. Making the plan readily available and easily accessible and easy to use.
2. Provide an effective and efficient review/revision process
3. Keeping the action plan in a perpetually updated status
4. Publicizing and providing assistance to users

Making the plan readily available and easily accessible will be accomplished by using several forms of product delivery. Using the Delaware Soil and Water Conservation District's web page and establishing a web-link in a personal document format (pdf) version of the plan will make the document readily available to all internet users. A limited number of CDs will also be made available to users not having internet access. Hard copies can be prepared from either of the electronic formats and made available for public use. A hard copy of the endorsed plan and a working copy will be maintained at the Delaware Soil & Water Conservation District office at 557 Sunbury Road Suite A, Delaware, OH 43015.

The review process will consist of following an annual review process for the first two years after the plan's endorsement. The plan will be reviewed by the Project Advisory Committee, the watershed coordinator, and other interested agency personnel. Subsequent reviews and revisions will be expected once every five years. The review process will be that which is used by the appropriate designated agencies with the authority to conduct reviews and grant endorsement.

A working copy of the watershed action plan will be maintained by the project coordinator. The working copy will be readily available to the designated agency personnel responsible for review and comment and to stakeholders in the project area.

The watershed coordinator will assume the primary responsibility for publicizing the watershed action plan and providing interpretative assistance to users. Advisory Committee members and stakeholders are responsible for using and promoting the use of the watershed action plan as a means to improve and maintain the water quality resource in the project area.

Short term projects (1 to 5 years)	Status	Implementation date	Completion date
Prospect dam decommissioning	Planning	Not determined	Dependent on priority need
Little Scioto River Cleanup	Underway	2002	Dependent on funding
Sawyer-Ludwig Park	Near completion	N/A	Pending
Farm Bill Programs	Underway	2002	Expiration date
Scioto River CREP	Underway	October 2004	2014
Richwood WWTP	Behind schedule	October 2005	
Livestock access to streams inventory	Planning	July 2006	December 2007
Fulton Creek assessments (additional sites)	Planning	July 2006	December 2007
Fulton Creek Plan Implementation (Grant)	Pending	January 2007	December 2009
Initial Fulton Creek subwatershed stakeholder meeting	Planning	July 2006	Ongoing quarterly
Upper Scioto TMDLs	Behind schedule	2009	2011
Revisions of Scioto Plan (including Fulton Creek)	Annually	January 2007	March 1, 2007

Distribution List

Ohio Department of Natural Resources
- Division of Soil and Water Conservation
- Division of Water

Ohio Environmental Protection Agency
- Division of Surface Water
- Division of Surface Water, Northwest District Office

Ohio Department of Agriculture
The Ohio State University Extension
Ohio Department of Transportation
Ohio Department of Economic Development
Ohio Department of Health
Delaware General Health District

Allen County Soil and Water Conservation District
Auglaize County Soil and Water Conservation District
Hardin County Soil and Water Conservation District
Logan County Soil and Water Conservation District
Marion County Soil and Water Conservation District
Wyandot County Soil and Water Conservation District
Crawford County Soil and Water Conservation District
Union County Soil and Water Conservation District
Delaware County Soil and Water Conservation District
Allen County Commissioners
Auglaize County Commissioners
Hardin County Commissioners
Logan County Commissioners
Marion County Commissioners
Wyandot County Commissioners
Crawford County Commissioners
Union County Commissioners
Delaware County Commissioners
Upper Scioto River Watershed Project Advisory Committee
Upper Scioto River Watershed Project stakeholders

Contact Person

K. Ed Miller, Watershed Coordinator
Delaware Soil and Water Conservation District
557 Sunbury Road, Suite A
Delaware, Ohio 43015.
(740) 368-1921 ext. 4
Fax: (740)368-1921
www.delawareswcd.org

Record Keeping Organization

The Delaware Soil and Water Conservation District, 557 Sunbury Road, Suite A, Delaware, Ohio 43015

Appendix 1A

Municipal, Township, and Unincorporated Areas within the Upper Scioto River Watershed Project Area Listed by County

County	Municipal, township, and unincorporated	County	Municipal, township, and unincorporated
Allen	Auglaize Township	Hardin	Village of Alger
		Hardin	Village of McGuffey
Auglaize	Wayne Township	Hardin	Village of Roundhead (may be unincorporated)
Auglaize	Goshen Township	Hardin	unincorporated Holden
		Hardin	unincorporated Jump
Crawford	City of Bucyrus	Hardin	unincorporated Walton
Crawford	Village of Monnett	Hardin	unincorporated Foraker
Crawford	Bucyrus Township	Hardin	unincorporated Jumbo
Crawford	Dallas Township	Hardin	City of Kenton
Crawford	Whetstone Township	Hardin	unincorporated Silver Creek
Delaware	unincorporated Kerr Corner	Hardin	unincorporated Grassy Point
Delaware	unincorporated Robertsburg	Hardin	unincorporated Mentzer
Delaware	unincorporated Meredith	Hardin	unincorporated Brown Crossroads
Delaware	unincorporated Radnor	Hardin	unincorporated Pfeiffer
Delaware	unincorporated Warrensburg	Hardin	unincorporated Hepburn
Delaware	unincorporated Sandy Hill	Hardin	Village of Mt. Victory
Delaware	unincorporated Brindle Corner	Hardin	Village of Ridgeway (part in Hardin County)
Delaware	unincorporated White Sulphur	Hardin	Marion Township
Delaware	unincorporated Klondike	Hardin	Cessna Township
Delaware	unincorporated Rathbone	Hardin	Roundhead Township
Delaware	Village of Shawnee Hills	Hardin	McDonald Township
Delaware	Thompson Township	Hardin	Taylor Creek Township
Delaware	Radnor Township	Hardin	Lynn Township
Delaware	Marlboro Township	Hardin	Pleasant Township
Delaware	Scioto Township	Hardin	Buck Township
Delaware	Troy Township	Hardin	Dudley Township
Delaware	Delaware Township	Hardin	Hale Township
Delaware	Concord Township	Union	unincorporated Byhalia
Delaware	Liberty Township	Union	unincorporated West Jackson

Logan	Village of Ridgeway (part in Logan County)	Union	unincorporated Arbela
Logan	unincorporated Big Springs	Union	unincorporated Essex
Logan	Village of Rushsylvania	Union	Village of Richwood
Logan	unincorporated Harper	Union	unincorporated Somersville
Logan	unincorporated Marl City	Union	unincorporated Claibourne
Logan	unincorporated Mountain Lake Camp	Union	unincorporated Woodland
Logan	Jefferson Township	Union	unincorporated Jerome
Logan	Rushcreek Township	Union	Washington Township
Logan	Bokes Creek Township	Union	Jackson Township
		Union	York Township
Marion	Village of La Rue	Union	Claiborne Township
Marion	Village of New Bloomington	Union	Taylor Township
Marion	unincorporated Espyville	Union	Leesburg Township
Marion	Village of Green Camp	Union	Mill Creek Township
Marion	unincorporated Oak Knoll	Union	Jerome Township
Marion	City of Marion		
Marion	unincorporated Bellaire Gardens	Wyandot	Antrim Township
Marion	unincorporated Owens		
Marion	unincorporated Kirkpatrick		
Marion	unincorporated Tobias		
Marion	unincorporated Newman		
Marion	unincorporated Gooding Corners		
Marion	unincorporated Gast Corner		
Marion	Village of Prospect		
Marion	Montgomery Township		

Appendix 2A

Watershed Public Meetings Concerns

The following are the concerns outlined at each meeting. Wording of the concerns has not been changed from what participants had the opportunity to vote on. Votes received at each meeting are indicated with the number of votes received followed by a letter 'v' to the right of the concern. In Kenton the categories for concerns were created however participants still voted on the individual concerns. Categories were not created at the Richwood and Marion meetings.

Kenton - 9 participants voted and 1 non-meeting participant voted -Total 30 votes
Urban issues:
- Industrial and municipal discharge 2 v
- Unsewered communities
- Wastewater package plants
- Storm water-urban
- Landfill leaching
- Leaking underground tanks
- Water diversions *(taking water from one drainage area to another)*
- Nutrients (excess)

Development issues:
- Septic system 3 v
- Soil Erosion 2 v
- Home site put in floodplain / wetland / tile system
- Drainage

Agricultural issues:
- Drainage (broken county tile main/flooding) 4 v
- Conservation tillage (soil erosion/excess nutrients/chemicals/wind erosion) 4 v
- Livestock in stream/manure management 2 v
- Erosion in CRP (grass selection)

Stream and Wildlife issues:
- Aquatic biology 3 v
- Wildlife habitat 3 v
- Riparian habitat 3 v
- Sediment in streams 1 v
- Water related recreation
- Illegal dumping
- Unstable river banks

Groundwater protection:
- Drinking water 2 v
- Abandoned wells 1v
- Amish wells
- Oil and gas

Richwood - 14 meeting participants --Total 42 votes

- Drainage – Flooding problems 12 v.
- Soil erosion 7 v.
- Filter strip (lack of) 6 v.
- Logjams flooding and erosion 5 v.
- Ditch maintenance 3 v.
- Contaminants getting to waters table (or groundwater) 2 v.
- Concentrated animal feeding operation (manure by products) 2 v.
- Water quality - river and streams 1 v.
- Habitat wildlife (lack of) 1 v.
- Septic systems 1 v.
- Concern of upground reservoirs (construction, management, flow, infrastructure, drainage) 1 v.
- Tile breaks 1 v.
- Storm water pollution (developed)
- Development
- Public education (watershed)
- Ground cover (lack of in ag)
- Wells (abandoned)

Marion - 14 meeting participants voted - Total 42 votes

- Log jams 6 v
- Complete federal cleanup of the Little Scioto River 5 v
- Natural & straightened channel design 5 v
- Drainage 4 v
- Dam management and removal 4 v
- Nutrients (nitrogen and phosphorous) 3 v
- Soil erosion from fields 3 v
- Carcinogens in streams, drinking water wells, & wildlife 3 v
- Flooding/ accelerated flow 2 v
- Lack of quality aquatic life 2 v
- Septic systems 2 v
- Sewage in tributaries (wastewater treatment plants / septics) 1 v
- Trash and refuse 1 v
- Streamside soil erosion 1 v
- Leaking underground storage tank
- Injection wells, deep
- Brown fields & contaminated facilities
- Soil erosion from development
- Landfill leachate
- Manure management/run off
- Combined storm-sewer overflows (CSO)
- Chemicals toxics

Appendix 3A
Soil Series in areas and the Counties of Occurrence in the Watershed

Soils	Counties of occurrence in the watershed
Soils on till plains	
Blount *	Marion, Hardin, Crawford, Delaware, Union
Glynwood *	Delaware, Marion, Hardin, Crawford
Morley	Union
Pewamo	Marion, Hardin, Crawford, Delaware, Union
Wetzel	Union
* These soils can be found in the same associations with the floodplains and terraces soils described below.	
Soils on floodplains and terraces	
Eel	Union, Hardin
Fox	Union, Hardin
Genesee	Union
Henshaw	Logan
Kendallville	Marion
Lobdell	Crawford
Martinsville	Delaware
Martisco	Logan
Milton	Delaware
Nolin	Marion, Hardin
Ockley	Marion
Patton	Logan
Saranac	Marion
Scioto	Delaware
Shoals	Union
Sloan	Marion
Stone	Delaware
Westland	Marion
Soils on lake plains	
Del Rey	Marion
Fulton	Marion
Latty	Marion
McGuffey	Hardin
Milford	Hardin
Patton	Hardin
Paulding	Marion
Roundhead	Hardin
Shinrock	Marion

Appendix 3B
Invasive Plants

Legend Number	Common Name	Latin Name	Status
1	Quack grass	*Agropyron repens*	Well-established Species
2	Tree-of-heaven	*Ailanthus altissima*	Well-established Species
3	Garlic Mustard	*Alliaria petiolata*	Targeted Species
4	Porcelain-berry	*Ampelopisis brevipedunculata*	Watch List Species
5	Japanese barberry	*Berberis thunbergii*	Well-established Species
6	Smooth brome	*Bromus inermis*	Well-established Species
7	Flowering-rush	*Butomus umbellatus*	Well-established Species
8	Nodding thistle	*Carduus nutans*	Watch List Species
9	Asian bittersweet	*Celastrus orbiculatus*	Well-established Species
11	Canada thistle	*Cirsium arvense*	Well-established Species
12	Poison hemlock	*Conium maculatum*	Well-established Species
13	Field bindweed	*Convolvulus arvensis*	Well-established Species
14	Crown-vetch	*Coronilla varia*	Well-established Species
15	Queen Anne's lace	*Daucus carota*	Well-established Species
16	Air-potato	*Dioscorea batatas*	Well-established Species
17	Cut-leaved teasel	*Dipsacus laciniatus*	Well-established Species
18	Common teasel	*Dipsacus sylvestris*	Well-established Species
23	Winged euonymus	*Euonymus alatus*	Well-established Species
24	Wintercreeper	*Euonymus fortunei*	Well-established Species
26	Meadow fescue	*Festuca pratensis*	Well-established Species
27	Day-lily	*Hemerocallis fulva*	Well-established Species
28	Dame's rocket	*Hesperis matronalis*	Well-established Species
29	Yellow flag	*Iris pseudacorus*	Well-established Species
31	Common privet	*Ligustrum vulgare*	Well-established Species
32	Japanese honeysuckle	*Lonicera japonica*	Targeted Species
34	Morrow honeysuckle	*Lonicera morrowii*	Targeted Species
35	Tatarian honeysuckle	*Lonicera tatarica*	Targeted Species
36	Showy pink honeysuckle	*Lonicera X bella*	Watch List Species
37	Moneywort	*Lysimachia nummularia*	Well-established Species
38	Purple loosestrife	*Lythrum salicaria*	Targeted Species
39	White sweet-clover	*Melilotus alba*	Well-established Species
40	Yellow sweet-clover	*Melilotus officinalis*	Well-established Species
43	Eurasian watermilfoil	*Myriophyllum spicatum*	Well-established Species
44	Lesser naiad	*Najas minor*	Well-established Species
45	Water-cress	*Nasturtium officinale*	Well-established Species
46	Star-of_Bethlehem	*Ornithogalum umbellatum*	Watch List Species
47	Reed canary grass	*Phalaris arundinacea*	Targeted Species
48	Reed grass	*Phragmites australis*	Targeted Species
52	Curly pondweed	*Potamogeton crispus*	Well-established Species
56	Glossy buckthorn	*Rhamnus frangula*	Targeted Species
57	Dog rose	*Rosa canina*	Watch List Species

58	Multiflora rose	*Rosa multiflora*	Targeted Species
59	Bouncing Bet	*Saponaria officinalis*	Well-established Species
60	Johnson grass	*Sorghum halepense*	Well-established Species
61	Narrow-leaved cattail	*Typha angustifolia*	Well-established Species
63	European canberry-bush	*Viburnum opulus var. opulus*	Well-established Species
64	Periwinkle	*Vinca minor*	Well-established Species

	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17	18	23	24	26	27	28	29	
DELAWARE	Y	Y	Y		Y	Y			Y	Y	Y	Y	Y	Y			Y		Y			Y	Y	
UNION	Y	Y	Y		Y	Y				Y	Y	Y					Y							
LOGAN	Y	Y			Y	Y				Y	Y	Y		Y										
AUGLAIZE	Y	Y			Y	Y				Y	Y	Y		Y			Y			Y				
MARION	Y	Y	Y		Y	Y	Y			Y		Y		Y		Y			Y	Y		Y		
HARDIN	Y	Y	Y		Y	Y				Y				Y			Y				Y			
ALLEN	Y	Y	Y		Y	Y				Y		Y		Y			Y	Y		Y		Y		
WYANDOT	Y	Y	Y		Y	Y		Y			Y			Y		Y	Y				Y			
CRAWFORD	Y	Y	Y	Y	Y	Y				Y	Y	Y		Y			Y			Y	Y	Y		
	31	32	34	35	36	37	38	39	40	43	44	45	46	47	48	52	56	57	58	59	60	61	63	64
DELAWARE	Y		Y		Y	Y	Y	Y	Y		Y		Y	Y	Y	Y		Y	Y			Y		
UNION						Y		Y	Y		Y		Y	Y				Y	Y	Y	Y			
LOGAN		Y					Y	Y		Y	Y			Y		Y			Y			Y	Y	
AUGLAIZE	Y	Y	Y	Y		Y		Y	Y	Y	Y	Y		Y						Y		Y		Y
MARION			Y	Y	Y	Y	Y	Y						Y	Y			Y	Y		Y			
HARDIN		Y		Y		Y	Y	Y	Y					Y	Y			Y	Y			Y		
ALLEN						Y	Y	Y	Y					Y				Y	Y		Y	Y		
WYANDOT						Y	Y	Y	Y	Y	Y			Y	Y				Y	Y				
CRAWFORD		Y				Y	Y	Y	Y		Y			Y	Y		Y		Y	Y		Y	Y	

Information obtained from the Nature Conservancy

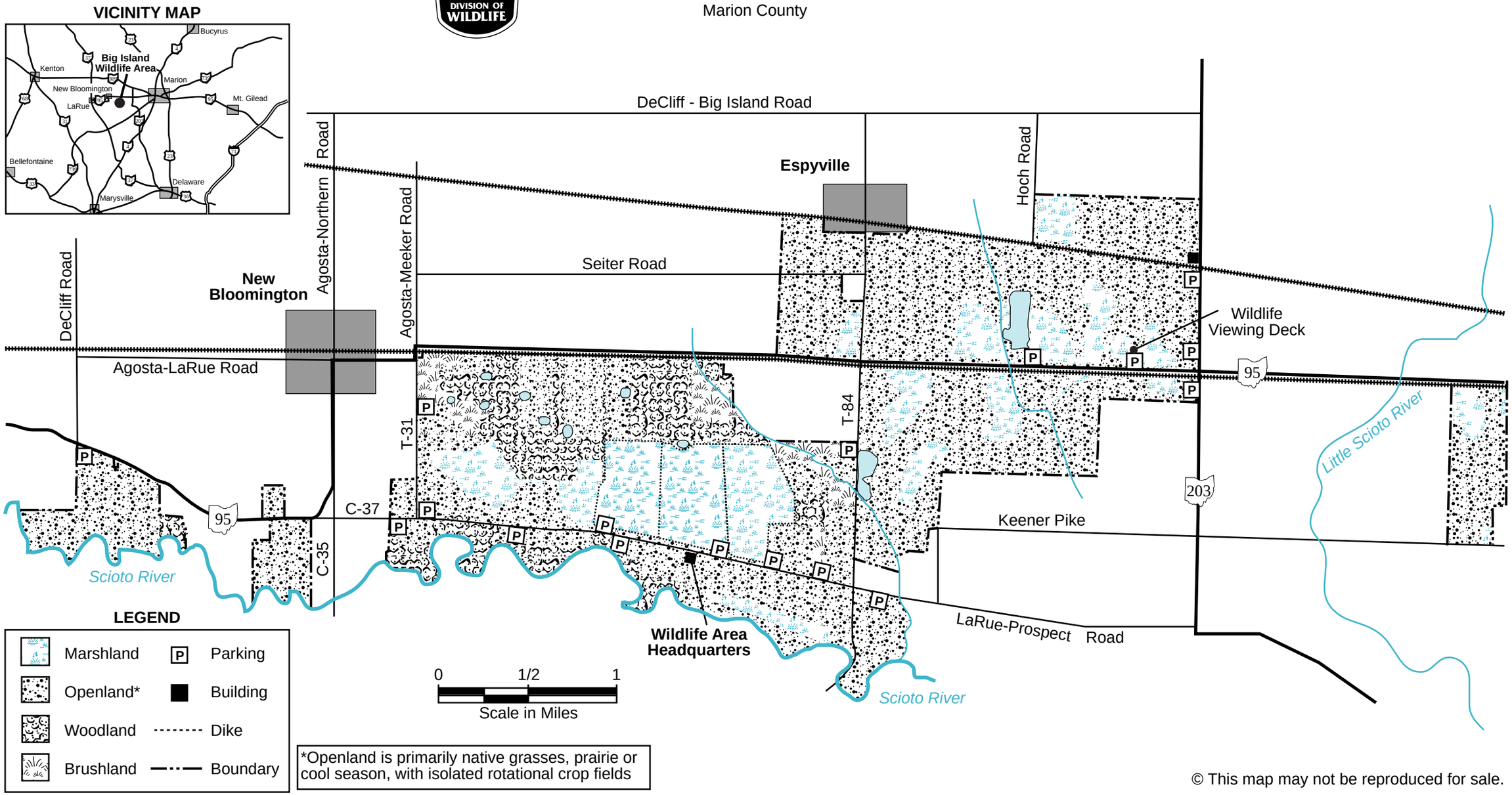
Public Hunting & Fishing
5,032 Acres

Division of Wildlife
Ohio Department of Natural Resources

BIG ISLAND WILDLIFE AREA

Marion County

Publication 292
(R102)



*Openland is primarily native grasses, prairie or cool season, with isolated rotational crop fields

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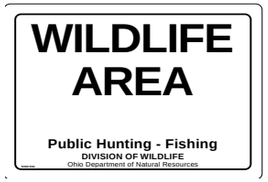

BIG ISLAND WILDLIFE AREA

Marion County

DISTANCE FROM MAJOR POPULATION CENTERS

5 miles from Marion
20 miles from Kenton
32 miles from Bellefontaine
46 miles from Lima
47 miles from Findlay
59 miles from Columbus

LOCATION AND DESCRIPTION

This 5,032-acre wildlife area is located five miles west of Marion on State Route 95. The terrain is very flat. More than 75 percent of the area is openland consisting of grain cropfields, meadow, and prairie grasses in large open fields. Second- and third-growth hardwoods occupy another 10 percent of the area. Pin oak, hickories, and silver maple are common species in the upland woods. Sycamore, box elder, ashes, and silver maple occur along the Scioto River. Ponds, potholes, and over 800 acres of marsh occupy approximately 15 percent of the area.

HISTORY AND PURPOSE

The Big Island Wildlife Area lies within a former wetland prairie, one of the larger prairies that existed in Ohio at the time of settlement. Agricultural development of the area did not begin until the late 1800s, because of the poor drainage. Until recent years, farming on these poorly drained soils was a marginal enterprise, with bumper crops harvested during years of favorable weather and practically no crops produced during poor years. Unfortunately, no significant remnants of the once expansive tall grass prairie remain on the area because of the intensive agricultural use and drainage work that occurred prior to purchase by the Division of Wildlife.

Purchase of the land for this wildlife area began in 1958. Management work in the past has included the protection and improvement of existing woodland, nest box installation, planting of trees and shrubs and prairie and other grasses for nesting cover, contract grain farming for increased food supply, and wetland construction.

A 382-acre marsh, constructed in 1971, is flooded in the fall by water pumped from the Scioto River. This seasonally-flooded marsh provides nesting, feeding, and resting grounds for wetland dependent birds and furbearers and is especially attractive to spring and fall migrating shorebirds and waterfowl. The abundance of wetland wildlife attracted to the marsh along with the overall diversity of the area makes Big Island a popular area for hunters and wildlife watchers. This area is a Watchable Wildlife Area, one of 80 included in the *Ohio Wildlife Viewing Guide*.

Habitat management activities on this wildlife area are ongoing and are constantly improving the area, especially for wetland and grassland dependent wildlife species. In 1996 a 192-acre marsh was restored and nearly 3,000 additional acres were purchased to enlarge the wildlife area. These 3,000 acres have been converted to a combination of prairie grassland habitat and shallow wetlands, which has made Big Island the site of the largest wetland prairie in Ohio.

FISH AND WILDLIFE

Cottontail rabbit, fox squirrel, and ring-necked pheasant are the principal small game species. Waterfowl and woodcock are important migratory game birds. Wood duck, mallard, blue-winged teal, and green-winged teal are the most abundant ducks. Canada geese commonly occur on the area especially during spring and fall migrations. Nongame bird species frequently observed in the wetland and grassland areas include bitterns, Northern harrier, bobolink, upland sandpiper, herons, grebes, numerous shorebirds, and bald eagles.

Deer frequent the area and all of the furbearers common to central Ohio are found here.

The seasonal marsh and all of the ponds on Big Island are shallow and managed primarily for wetland wildlife, therefore, fishing is mostly limited to the Scioto River on the area's south side.

HUNTING, TRAPPING, AND FISHING

The woodlots in the north and west section of the area provide the best squirrel and woodcock hunting, and the adjacent brushland is popular for rabbit hunting. The bottomlands adjacent to the Scioto River also offer good rabbit hunting. Ring-necked pheasants are found mostly in the large, open prairie grass fields. Waterfowl hunting is good throughout the area in the marshes and along the Scioto River. Hunting success for waterfowl, rabbits, and pheasants is expected to increase substantially as the recently restored wetland and grassland habitat becomes established.

The Scioto River offers fair to good fishing opportunities for smallmouth bass, rock bass, channel catfish, bullhead, carp, and suckers. Undercut banks, riffles, and obstructions in the river provide the best spots for concentrations of these species.

PUBLIC USE FACILITIES

State highways and county roads provide good access to the area. Numerous parking lots are located throughout the area. A Watchable Wildlife viewing deck located along State Route 95 provides an excellent view of the open prairie and wetland habitat and the numerous birds that occupy these areas.

SPECIAL USE WATERFOWL HUNTING BLIND

A waterfowl hunting blind is reserved for open use only by persons who are confined to wheelchairs.

ADDITIONAL INFORMATION

Further information may be obtained from the Wildlife District One Office, 1500 Dublin Road, Columbus, Ohio 43215; telephone (614) 644-3925.

TURN IN A POACHER

Ohio's TIP, "Turn In a Poacher," program is helping to curtail poaching throughout the state. TIP is designed to involve the public in reporting wildlife violations. Citizens who observe wildlife violations should call the TIP toll-free hotline, 1-800-POACHER.

Equal Opportunity Employer - M/F/H

Appendix 3D
Example of the Watershed Population Approximation Calculation

Marion County		Population		Multiplier	Watershed population
Big Island township		1223	Part	* .5	611.5
Bowling Green township		569	All	* 1	569
Claridon township					
	Caledonia village	578	Out		0
	Remainder of Claridon township	2009	Part	* .5	1004.5
Grand Prairie township		1609	Part	* .5	804.5
Green Camp township		1163	All	* 1	1163
	Green Camp village	342	All		
	Remainder of Green Camp township	821	All		
Marion township		44908	Part	* .5	22454
	Marion city	37523	Part		
	Remainder of Marion township	9590	Part		
Montgomery township		2498	Part		
	La Rue village	775	All	* 1	775
	New Bloomington village	548	All	* 1	548
	Remainder of Montgomery township	1175	Part	* .5	587.5
Pleasant township		4368	Part	* .5	2184
Prospect township		2207	Part		
	Prospect village	1191	All	* 1	1191
	Remainder of Prospect township	1016	Part	* .5	508
Scott township		521	Part	* .5	260.5
		Marion County Total			**32660.5**

Appendix 3E
Vegetation at the Time of Earliest Survey Descriptions
(vegetation types not in the Upper Scioto River Watershed Project Area have been omitted)

Natural Vegetation in Ohio
At the Time of the Earliest Land Surveys

Major Vegetation Types

Most scientific names of familiar species have been omitted to conserve space. They are included in the bulletin accompanying this map.

Beech Forests

These forests were characterized by a large fraction of beech, sugar maple, red oak, white ash and white oak, with scattered individuals of basswood, shagbark hickory, black cherry and, more rarely, cucumbertree. The most familiar types were beech-sugar maple and "wet beech" on poorly drained flatlands. In the dissected Allegheny Plateau, where mixed mesophytic forests occurred, tuliptree (yellow poplar), red maple and/or sugar maple were associated with beech, generally in the valleys, forming the beech-maple-tuliptree subtype.

Mixed Oak Forests

These forests included a wide variety of primary forest types, of which the most widespread were white oak-black oak-hickory and white oak. The term "black oak" as used by the first surveyors included not only *Quercus velutina* but also red oak and perhaps scarlet oak. The term "hickory" included the shagbark, bitternut, pignut and mockernut hickories. A white oak-black oak-chestnut type occurred in the low-lime glaciated plateau, chiefly on hilltops, and extended down the south-facing slopes. Chestnut disappeared from Ohio woodlands during the 1920's and '30's. Covering ridge tops of the unglaciated Allegheny Plateau were forests of white oak-black oak and chestnut oak-chestnut, with sour gum (*Nyssa sylvatica*), flowering dogwood, sassafras, Virginia pine, pitch pine and/or shortleaf yellow pine locally.

Oak-Sugar Maple Forests

These included xero-mesophytic forests usually lacking beech, chestnut, red maple and tuliptree. Dominants included white oak, red oak, black walnut, black maple as well as the sugar maple, white ash, red elm, basswood, bitternut and shagbark hickories. Of indicator value today in the areas formally occupied by these forests are Ohio buckeye, northern hackberry, honey locust and blue ash. Local components often included black cherry, Kentucky coffee-tree, chinquapin oak, redbud and eastern red-cedar.

Elm-Ash Swamp Forests

These forests were consistent in having among the dominant trees of the canopy white elm, black ash and/or white ash, silver maple and/or red maple. Extremely wet phases contained cottonwood and/or sycamore. Better-drained phases or transitions recognized by Sampson (1930) are bur oak-big shellbark hickory and red oak-basswood. These "swamp oak-hickory" communities were enriched locally with swamp white oak, pin oak, white oak, black walnut and tuliptree. Contiguous areas were covered with "wet beech" forests, wet prairies, sedge swamps and fens.

Prairies

These grass-dominated communities were described in records of the earliest land surveyors as treeless, natural meadows, swales, barrens, and openings as well as the more acceptable French term: prairies. As Sears concluded (1926), most of them were located on wet lands and were dominated by tall grasses such as giant reed (*Phragmites communis*), slough-grass (*Spartina pectinata*), blue-joint (*Calamagrostis canadensis*) and/or big bluestem (*Andropogon Gerardi*). Drier prairies and borders were dominated by big bluestem and little bluestem (*Andropogon scoparius*), switch grass (*Panicum virgatum*) and/or Indian-grass (*Sorghastrum nutans*).

Freshwater Marshes and Fens

These areas differed from wet prairies in that grasses compose only a small fraction of the marsh vegetation. Where water stood through the summer to a depth of one to three feet, tall emergent aquatics grew. These included bulrushes, giant reed-grass, wild rice, cattail, bur-reed, wapato, pickerel-weed and rose-mallow. More frequent but less extensive were the sedge meadow communities which occupied miry clay, circumneutral in reaction, rather than acidified peat and muck. Communities of blue-joint and tussock sedge (*Carex stricta*) furnished early settlers with marsh hay.
Usage here restricts the term "fen" to a different kind of habitat and vegetation supplied with cold water, artesian in origin, containing dissolved bicarbonates of calcium and magnesium, sometimes sulfates too. The vegetation covers marsh peat or muck mixed with marl, often containing calcareous algal concretions and tufa. Shrubby cinquefoil (*Potentilla fruticosa*), swamp birch (*Betula pumila*) and hoary willow (*Salix candida*) appear to be restricted to these fens. Characteristic forbs are *Viola nephrophylla*, *Parnassia glauca*, *Gentiana procera*, *Sanguisorba canadensis*, *Lobelia Kalmii*, *Solidago Riddellii* and *S. obioensis*.

Appendix 3F
Ohio EPA's Description of the Aquatic Life Use Attainment Categories
From: Ohio Environmental Protection Agency. 1997. Biological and Water Quality Study of the Upper Scioto River Basin Delaware, Franklin, Hardin, Marion, and Wyandot Counties, 1996 (OEPA Technical Report Number MAS/1996-12-13).

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

1) *Warmwater Habitat (WWH)* - this use designation defines the "typical" warmwater assemblage of aquatic organisms for Ohio rivers and streams; *this use represents the principal restoration target for the majority of water resource management efforts in Ohio.*

2) *Exceptional Warmwater Habitat (EWH)* - this use designation is reserved for waters which support "unusual and exceptional" assemblages of aquatic organisms which are characterized by a high diversity of species, particularly those which are highly intolerant and/or rare, threatened, endangered, or special status (*i.e.*, declining species); *this designation represents a protection goal for water resource management efforts dealing with Ohio's best water resources.*

3) *Coldwater Habitat (CWH)* - this use is intended for waters which support assemblages of cold water organisms and/or those which are stocked with salmonids with the intent of providing a put-and-take fishery on a year round basis which is further sanctioned by the Ohio DNR , Division of Wildlife; this use should not be confused with the Seasonal Salmonid Habitat (SSH) use which applies to the Lake Erie tributaries which support periodic "runs" of salmonids during the spring, summer, and/or fall.

4) *Modified Warmwater Habitat (MWH)* - this use applies to streams and rivers which have been subjected to extensive, maintained, and essentially permanent hydromodifications such that the biocriteria for the WWH use are not attainable *and where the activities have been sanctioned by state or federal law;* the representative aquatic assemblages are generally composed of species which are tolerant to low dissolved oxygen, silt, nutrient enrichment, and poor quality habitat.

5) *Limited Resource Water (LRW)* - this use applies to small streams (usually <3 mi. drainage ^{2} area) and other water courses which have been irretrievably altered to the

extent that no appreciable assemblage of aquatic life can be supported; such waterways generally include small streams in extensively urbanized areas, those which lie in watersheds with extensive drainage modifications, those which completely lack water on a recurring annual basis (*i.e.,* true ephemeral streams), or other irretrievably altered waterways.

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

Appendix 3G
Permitted Discharges (NPDES)

Outfall stream	STATION/ County	FACILITY	DIVISION PLANT	ADDRESS
Subwatershed # 1				
Unnamed trib to Cottonwood Ditch at RM 5.50	2PB00064 /Hardin	Village of Alger	Lagoon sanitary wastewater treatment	SR 235 Alger, OH 45812
Cottonwood Ditch (RM 1.10)	2PA00006/ Hardin	Village of McGuffey STP	Mechanical sanitary wastewater treatment	On: East Street Address: 301 Courtright, McGuffey, OH 45859
Scioto River (RM 230.75)	2PG00004/ Hardin	Hardin County Commissioners	Reed Road Subdivision	17027 McDonald Township Road 39 Kenton, OH 43226
Subwatershed # 2				
Taylor Creek	2IS00000/ Hardin	Arvinmeritor, Inc.	Meritor Heavy Vehicle	13267 SR 68 South, Kenton, OH 43326
Taylor Creek (RM 2.10)	2IF00002/ Hardin	Occidental Chemical	Durez Corporation	13717 SR 68 S., Kenton, OH 43326
Unnamed trib. to Taylor Creek	2PY00041/ Hardin	Green Hills Coach Park LTD		16244 State Route, Kenton, OH 43326
Scioto River (RM 211.40)	2PD00020/ Hardin	City of Kenton	Mechanical sanitary waste-water treatment	14854 Gilmore Rd. Kenton OH, 43326
Subwatershed #3				
Scioto River (south side river where SR 67 and 31 intersect)	2IN00115/ Hardin	Western Tar Products Corp.	Andover Inc.	350 West Espy St., Kenton, OH 43326
Scioto River (RM 209.90)	2PG00012/ Hardin	Hardin County Commissioners	Fairwayview Subdivision (Package) WWTP	CR 144, Kenton, OH 43326
Scioto River (RM 205.00)	2PG0005/ Hardin	Hardin County Commissioners	Eldridge Station (Package) WWTP	201127 CR 144, Kenton, OH 43326
Unnamed (Swallow Ditch) trib to Panther Creek	2PT00027/ Hardin	Ridgemont High School		162 E. Hale St., Ridgeway, OH 43345
Subwatershed # 2, 3, 4				
Railroad ditch to the Scioto River	2IN00168/ Hardin	BP Oil Co.	Kenton Bulk Plant	*3355 McLemore Dr., Pensacola, FL 32514
Subwatershed #4				
Listed as Panther Creek (most likely actually Wildcat Creek)	2PA00046/ Hardin	Village of Mt. Victory	WWTP	124 S. Washington St., Mt. Victory, OH 43340
Unknown	2PA00051/ Marion	Village of LaRue	WWTP	LaRue, OH 43332
Unknown	2PA00065/	Village of New	WWTP	200 S. Main St., New Bloomington

	Marion	Bloomington		OH 43216
Subwatershed #5				
Rush Creek	1PB00025/ Logan	Village of Rushsylvania	Board of Public Aff. Rushsylvania WW	P.O. Box 204, Rushsylvania, OH 43347
Subwatershed #6				
Unnamed (Harvey Ditch) trib. to Rock Fork	2IJ0027/ Marion	National Lime & Stone Co.	Linkens Road	* 551 Lake Cascades Parkway, Findlay, OH 45839
Trib to Rock Fork	2PG00036/ Marion	Marion County Commissioners	Marion County Sanitary Grandview Est./SD	*100 N. Main St., Marion, OH 43302
Subwatershed #7				
Little Scioto River, Rock Swale Ditch, and Columbia Ditch	2PD00011/ Marion	City of Marion	Sewage Treatment	* 1810 Marion-Agosta Rd. Marion, OH 43302
Rock Swale Ditch	2II00104/ Marion	Sypris Technologies		1550 Marion-Agosta Rd, Marion, OH. 43302
Rock Swale Ditch	2IC00009/ Marion	Whirlpool Corporation	Marion Division	1300 Marion Agosta Rd., Marion, OH 43302
Unnamed trib in city of Marion	2IN00052/ Marion	Sims Brothers	Marion Plant	1011 S. Prospect St. (SR 4), Marion, OH 43302
Honey Creek	2PG00072/ Marion	Marion County Commissioners	S.D. #5-B Harmony	* 100 N. Main St., Marion, OH 43302
Honey Creek	2PR00040/ Marion	Pleasant Acres Trailer Court		1101 Adare Rd., Marion, OH 43302
Honey Creek	2PW00004/ Marion	North Quarry Subdivision		222 W. Center St., Marion, OH 43302
Little Scioto River	2IR00000/ Marion	Parker Hannifin Corp.	Hose Products Division, Green Camp Plant	2974 Marion Green Camp Dr., Marion, OH 43302
Subwatershed #7 or 4 or out of watershed				
Bee Run	2PY00015/ Marion	United Mobile Homes of Ohio	Wood Valley	* 7227 Beth Avenue S.W, Navarre, OH 44662
Scioto River (via storm drain)	2IN00170/ Marion	BP Oil Co.	Marion Bulk Plant	* 3355 McLemore Drive, Pensacola, FL 435214
Unknown	2PA00028/ Marion	Village of Green Camp	WWTP	200 Marin, Green Camp, OH 43216
Subwatershed #8				
Scioto River	2PA0041/ Marion	Village of Prospect	WWTP	SR 203 South, Prospect, OH 43342
Subwatershed #9				
Fulton Creek via storm (Ash Run)	4IW00121/ Union	Village of Richwood	Richwood Water Department	286 S. Franklin St., Richwood, OH 43344
Fulton Creek	4PB00018/ Union	Village of Richwood	Richwood S.T.P. (WWTP)	101 S. Franklin St., Richwood, OH 43344
Subwatershed #10				
Unnamed trib to	4IJ00029/	National Lime and	Delaware Plant	2406 S. Sectionline Rd., Delaware

Scioto River	Delaware	Stone Co.		OH 43015
Scioto River	Delaware	Martin Marietta Materials	Ostrander	1274 Ostrander Rd, Ostrander, OH
Subwatershed #11				
Scioto River (O'Shaughnessy Reservoir)	4IN00026/ Delaware	State of Ohio Department of Youth	Scioto Village-River Sewage Plant B	5993 Home Rd., Delaware, OH 43015
	4PG00046/ Delaware	Delaware County Commissioners	Shawnee Square WWTP	*Delaware County Court House
Scioto River (O'Shaughnessy Reservoir)	Delaware	Scioto Bluffs		
Land application (golf course)	Delaware	Scioto Reserve	Scioto Reserve WWTP	
Subwatershed #8, 9, 10, 11				
Scioto River	4IJ00103/ Delaware	America Aggregates Corp.	Plant #227	* 399 Frank Rd., Columbus, OH 43207
* Indicates permit address is not at location of permit. Source: OEPA 2003b				

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
Auglaize County									
471	1997	2	BESIDE D&B AUTOWRECKING	CRYDERS-VILLE	N/A	FIRE (OPEN BURNING)	FIXED FACILITY - BUSINESS - OTHER	UNKNOWN	AIR
718	**2002**	**3**	**WORREL RD NE OF WAYNESFIELD APPROX 1 MILE**	**WAYNE TWP**	**DITCH**	**DUMPING / DISPOSAL**	**UNKNOWN DRUMS - UNKNOWN**	**UNKNOWN**	**AIR**
1525	2001	5	26101 SR 67 E	WAYNES-FIELD	N/A	VALVE OPENED	FIXED FACILITY - BUSINESS - TANK STORAGE (ABOVE GROUND)	UNKNOWN	AIR
2243	2002	6	05276	SPENCER-VILLE	N/A	DA / CUT OR BREAK	FIXED FACILITY - FARM - CONTAINER	UNKNOWN	AIR
Crawford County									
300	2002	1	I - 44	UNKNOWN	N/A	DA / CUT OR BREAK	TRANSPORTATION - TRUCK - CARGO CONTAINERS	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
327	2001	1	914 MARION RD @ GARVINS MARATHON	BUCYRUS	NONE	HUMAN ERROR	TRANSPORTATION - TRUCK - TANKER	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
609	1997	2	MAPLE GROVE TRAILER PARK	BUCYRUS	STROM SEWER	LEAK	FIXED FACILITY - CITIZEN - TANK STORAGE (ABOVE GROUND)	0 - 499 GAL OR 0 - 3999 LBS	SURFACE WATER/STORM SEWERS
1911	**1998**	**5**	**1477 ST RT 294**	**DALLAS**	**DRAINAGE DITCH**	**LEAK**	**TRANSPORTATION - TRUCK - TANKER**	**500 - 2499 GAL OR 4000 - 19999 LBS**	**LAND OR LAND SURFACE IMPACT**
2431	1999	7	UNK	UNKNOWN	N/A	UNKNOWN	UNKNOWN	UNKNOWN	LAND OR LAND SURFACE IMPACT
2692	2001	7	MOVING TRAIN	BUCYRUS	N/A	DA / CUT OR BREAK	TRANSPORTATION - RAIL - TANKER	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
3076	**2002**	**8**	**201 EAST BEAL AVE**	**BUCYRUS**	**GROUND WATER**	**LEAK**	**FIXED FACILITY - BUSINESS - TANK STORAGE (UST)**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
3218	**1998**	**7**	**1615 MALCOLM RD**	**DALLAS TWP**	**TRIB LITTLE SCIOTO**	**UNKNOWN**	**FIXED FACILITY - UNKNOWN - CULVERT/MANHOLE/OUTFALL**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3663	**1999**	**10**	**1477 SR 294**	**MARION**	**N/A**	**LEAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
3710	1997	9	COUNTY STAR COOPERATIVE RAIL TRACK	N ROBINSON TWP.	NONE	LEAK	TRANSPORTATION - RAIL - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
3754	2000	10	TWP RD 41@ RAIL CROSSING	CHADFIELD	DRAINAGE AREA ALONG TRACKS	DA / CUT OR BREAK	TRANSPORTATION - RAIL - ENGINE OR FUEL SUPPLY	500 - 2499 GAL OR 4000 - 19999 LBS	LAND OR LAND SURFACE IMPACT
3903	**2000**	**10**	**SR 4 @ MALCOM RD**	**BUCYRUS**	**LITTLE SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - FARM - LAGOON/POND**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
Delaware County									
29	2003	1	PENRY RD 200 YARDS SOUTH OF RAIL CROSSING	TROY	N/A	DA / CUT OR BREAK	TRANSPORTATION - RAIL - ENGINE OR FUEL SUPPLY	UNKNOWN	LAND OR LAND SURFACE IMPACT
39	2001	1	760 PITTSBURG DR	DELAWARE	N/A	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
83	1999	1	6437 N SECTION LINE RD	RADNOR TWP	NONE KNOWN	DA / CUT OR BREAK	FIXED FACILITY - BUSINESS - PIPING (ABOVE GROUND/OVERHEAD)	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
173	2003	1	760 PITTSBURG DR	LIBERTY	N/A	EQUIPMENT FAILURE	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	A
228	2002	1	760 PITTSBURG DR	DELAWARE	N/A	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
258	2000	1	830 PITTSBURG DR	DELAWARE	N/A	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
330	2000	1	BUNDY STATION & BEANOLLER RD	LIBERTY TWP	N/A	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - CITIZEN - OTHER	UNKNOWN	LAND OR LAND SURFACE IMPACT
390	2002	2	760 PITTSBURGH DRIVE	DELAWARE	N/A	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	> 2500 GAL OR > 20000 LBS	AIR

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
401	**2001**	**2**	**435 PARK AVE**	**DELAWARE**	**SCIOTO RIVER VIA UNNAMED CREEK**	**DA / CUT OR BREAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
410	1999	2	CHELSIE & LONDON RD	DELAWARE	STORM	DA / CUT OR BREAK	FIXED FACILITY - BUSINESS - TRANSFORMER/CAPACITORS/ECT	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
663	2002	2	760 PITTSBURG DRIVE	DELEWARE	N/A	EQUIPMENT FAILURE	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	A
699	2001	3	970 PITTSBURGH DR OFF OF LONDON RD	DELAWARE	N/A	DA / CUT OR BREAK	TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
712	**1998**	**2**	**HOSKINS RD & SR 203**	**RADNER TWP**	**KEBLER RUN**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
771	**2002**	**3**	**48-INCH STORM SEWER @ SE 1/4 SR 257 & GLICK RD**	**LIBERTY TWP**	**SCIOTO RIVER VIA STORM SEWER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - CULVERT/MANHOLE/OUTFALL**	**0 - 499 GAL OR 0 - 3999 LBS**	**SURFACE WATER/STORM SEWERS**
846	1999	3	PITTSBURG DR @ SECTION LINE RD	DELAWARE	NONE	NO SPILL - NO EXCEEDS/RELEASE	TRANSPORTATION - TRUCK - TANKER	NO SPILL	NOTHING SPILLED OR NATURAL EVENT
848	1997	3	760 PITTSBURG DR	DELAWARE	N/A	EQUIPMENT FAILURE	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	A
849	2003	3	760 PITTSBURG DR	LIBERTY TWP	N/A	PERMIT VIOLATION	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
867	2003	3	830 PITTSBURG DRIVE	DELAWARE	N/A	EQUIPMENT FAILURE	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	A
916	2000	3	830 PITTSBURG DR	DELAWARE	N/A	PERMIT VIOLATION	FIXED FACILITY - BUSINESS - STACK RELEASE-AIR	UNKNOWN	AIR
1073	1999	3	MP S29.5	DELAWARE	N/A	DA / CUT OR BREAK	TRANSPORTATION - RAIL - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
1208	**2001**	**4**	**5540 SUNSET CRT**	**LIBERTY TWP**	**N/A**	**DA / CUT OR BREAK**	**FIXED FACILITY - BUSINESS - TRANSFORMER/CAPACITORS/ECT**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
1219	**1999**	**4**	**SR 257 & SR 42**	**CONCORD TWP**	**N/A**	**DA / CUT OR BREAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
1230	2002	4	SANDUSKY DISTRICT LINE	DELAWARE	N/A	LEAK	TRANSPORTATION - RAIL - BOXCAR/BOX TRAILER/VAN BODY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
1344	**2001**	**4**	**8612 DUNBLAINE CT**	**DUBLIN**	**N/A**	**UNKNOWN**	**UNKNOWN**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
1371	2000	4	1076 PITTSBURG DR	DELAWARE	N/A	DA / CUT OR BREAK	TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY	UNKNOWN	LAND OR LAND SURFACE IMPACT
1471	**2001**	**4**	**2989 SR 203**	**RADNOR**	**N/A**	**DA / CUT OR BREAK**	**FIXED FACILITY - BUSINESS - MACHINERY (THINGS THAT STAY PUT)**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
1533	1999	4	UNK	UNKNOWN	NONE	NO SPILL - NO EXCEEDS/RELEASE	FIXED FACILITY - CITIZEN - OTHER	NO SPILL	AIR
1568	**2001**	**5**	**HOME RD BRIDGE**	**CONCORD**	**O'SHAUGHNESSY RESERVOIR**	**IMPROPER HANDLING**	**TRANSPORTATION - CAR - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**SURFACE WATER/STORM SEWERS**
1577	**1998**	**4**	**OSHAUNNESEY RESEVOIR BENEATH THE DAM**	**DUBLIN**	**OSHAUNNESEY AT TURBINES**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
1754	2001	5	BEHIND SHERIFFS STATION IN PIT	DELAWARE	N/A	DUMPING / DISPOSAL	FIXED FACILITY - GOVERNMENT - OTHER	UNKNOWN	LAND OR LAND SURFACE IMPACT
1787	**1998**	**5**	**7000 SR 257**	**THOMPSON TWP**	**N/A**	**OTHER**	**TRANSPORTATION - AIRPLANE - OTHER**	**UNKNOWN**	**AIR**
1811	**1998**	**5**	**SECTION LINE RD & BEAN OLLER**	**CONCORD TWP**	**N/A**	**LEAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
1875	1997	5	760 PITTSBURG DR	DELAWARE	N/A	EQUIPMENT FAILURE	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	A
1964	1997	5	760 PITTSBURG DR	DELAWARE	N/A	DA / CUT OR BREAK	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
2010	1998	5	760 PITTSBURG DR	DELAWARE	N/A	OTHER	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
2043	**2001**	**6**	**8415 DUBLIN RD**	**POWELL**	**OSHAUGHNESSEY LAKE**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
2046	1999	6	23 SB @ HILLSMILLER	DELAWARE	N/A	SADDLE TANKS	TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
2164	**1997**	**6**	**10000 BLOCK S 257**	**LIBERTY TWP**	**N/A**	**MOTHER NATURE - PHENOMENA**	**FIXED FACILITY - CITIZEN - OTHER**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
2254	1998	6	760 PITTSBURG DR	DELAWARE	N/A	STARTUP / SHUTDOWN EMMISSION	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	0 - 499 GAL OR 0 - 3999 LBS	AIR
2300	**2000**	**6**	**8415 DUBLIN RD**	**POWEL**	**N/A**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR**	**UNKNOWN**	**AIR**
2385	**2002**	**6**	**SR 257 CULVERT NUMBER 0520 SOUTH OF SR 42**	**LIBERTY TWP**	**DITCH**	**DA / CUT OR BREAK**	**TRANSPORTATION - TRUCK - MACHINERY HYDRAULICS/ECT**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2482	1998	6	BETWEEN SR 36 & 37	DELAWARE	N/A	DA / CUT OR BREAK	TRANSPORTATION - RAIL - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
2523	1997	6	760 PITTSBURG DR	DELAWARE	N/A	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
2535	**2000**	**7**	**5570 LOCHMORE COURT WEST**	**DUBLIN**	**N/A**	**DA / CUT OR BREAK**	**FIXED FACILITY - BUSINESS - TRANSFORMER/CAPACITORS/ECT**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2569	1997	6	760 PITTSBURGH DR	DELAWARE	N/A	PROCESS MALFUNCTION	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
2582	1997	6	760 PITTSBURGH DR	DELAWARE	N/A	PERMIT VIOLATION	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
2600	**2000**	**7**	**2440 SR 257**	**SCIOTO TWP**	**NONE**	**LEAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2624	2002	6	10101RIVERSIDE DR	LIBERTY TWP	N/A	ODORS	UNKNOWN	UNKNOWN	AIR
2629	1997	6	760 PITTSBURGH DR	DELAWARE	N/A	PERMIT VIOLATION	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
2644	1997	6	760 PITTSBURGH DR	DELAWARE	N/A	PERMIT VIOLATION	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
2659	1997	7	760 PITTSBURG DR	DELAWARE	N/A	PERMIT VIOLATION	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	0 - 499 GAL OR 0 - 3999 LBS	AIR
2694	1997	7	830 PITTSBURG DR	DELAWARE	N/A	PERMIT VIOLATION	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
2704	1998	7	830 PITTSBURG	DELAWARE	N/A	UNKNOWN	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
2799	2002	7	760 PITTSBURG DR	DELAWARE	N/A	PERMIT VIOLATION	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
2857	2002	7	760 PITTSBURG RD	LIBERTY TWP	N/A	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
2882	**1997**	**7**	**RT 257 & RT 36**	**WARRENSBURG**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
2886	1999	8	760 PITTSBURG DR	DELAWARE	N/A	NO SPILL - NO EXCEEDS/RELEASE	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	0 - 499 GAL OR 0 - 3999 LBS	AIR
2947	1997	7	760 PITTSBURGH DR	DELAWARE	N/A	OTHER	FIXED FACILITY - BUSINESS - INCINERATOR	UNKNOWN	OTHER AREA
3118	1998	7	73 LONDON RD	DELAWARE	N/A	FIRE (FACILITY)	FIXED FACILITY - BUSINESS - CONTAINER	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
3227	2002	8	760 PITTSBURG DR	DELAWARE	N/A	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	> 2500 GAL OR > 20000 LBS	AIR
3236	1997	8	760 PITTSBURG DR.	LIBERTY TWP	N/A	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
3351	**1999**	**9**	**SCIOTO HILLS**	**LIBERTY TWP**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3357	1997	8	760 PITTSBURG DR	N/A	N/A	WEATHER RELATED DAMAGE	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
3405	2002	8	760 PITTSBURGH DR	DELAWARE	N/A	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	> 2500 GAL OR > 20000 LBS	AIR

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
3437	**2002**	**8**	**SR 36 & SR 257**	**N/A**	**N/A**	**DA / CUT OR BREAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
3446	**2002**	**8**	**US 36 @ SR 257**	**SCIOTO TWP**	**N/A**	**LEAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
3548	**2002**	**9**	**3761 US 42 SOUTH**	**CONCORD**	**N/A**	**CORROSION OF THE CONTAINER**	**TRANSPORTATION - TRUCK - DRUMS**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
3550	**2002**	**9**	**2720 SR 257 SOUTH**	**OSTRANDER**	**N/A**	**LEAK**	**FIXED FACILITY - CITIZEN - DRUMS**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
3573	**2002**	**9**	**HOME RD**	**CONCORD**	**SCIOTO RIVER**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3594	**2002**	**9**	**SECTION LINE RD S OF RT 36**	**DELAWARE TWP**	**N/A**	**LEAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
3684	**1999**	**10**	**5280 BAYPOINT DR OFF RT 257**	**LIBERTY TWP**	**N/A**	**LEAK**	**TRANSPORTATION - TRUCK - OTHER**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
3711	1999	10	499 LONDON RD	DELAWARE	STORM SEWER	FIRE (FACILITY)	FIXED FACILITY - BUSINESS - OTHER	UNKNOWN	A
3731	**2000**	**9**	**SR 745 NORTH OF SHAWNEE HILLS**	**LIBERTY TWP**	**TWIN LAKE**	**DUMPING / DISPOSAL**	**UNKNOWN**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3804	1997	9	COMPANY	DELAWARE	N/A	STARTUP / SHUTDOWN EMMISSION	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
3821	1997	9	760 PITTSBURG DR	DELAWARE	N/A	OTHER	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
3856	1997	9	760 PITTSBURG DR	DELAWARE	N/A	OTHER	FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR	UNKNOWN	AIR
3872	**2002**	**10**	**US RT 42 & SR 745**	**CONCORD TOWNSHIP**	**NONE**	**SADDLE TANKS**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
3941	**1999**	**11**	**SR 42 AT SOUTH SECTION LINE RD**	**CONCORD TWP**	**N/A**	**UNKNOWN**	**OIL & GAS - LINE LEAK**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
4311	2002	11	RIVERSIDE DR & BAY POINT	LIBERTY	DRAINAGE DITCH	DA / CUT OR BREAK	TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY	UNKNOWN	LAND OR LAND SURFACE IMPACT
4574	**2002**	**12**	**8415 DUBLIN RD**	**POWELL**	**OSHAUGHNESSEY RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
4725	1997	12	9444 WAYEFLOWER RD	POWELL	N/A	DA / CUT OR BREAK	FIXED FACILITY - BUSINESS - TRANSFORMER/CAPACITORS/ECT	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
Hardin County									
60	**1998**	**1**	**14854 GILLMORE RD**	**BUCK TWP**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
95	**1998**	**1**	**14854 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
116	**1997**	**1**	**20449 CR 245**	**MT VICTORY**	**UNK CREEK**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**500 - 2499 GAL OR 4000 - 19999 LBS**	**LAND OR LAND SURFACE IMPACT**
126	**1997**	**1**	**20449 CO RD 245**	**MT VICTORY**	**STORM SEWER SYSTEM**	**HOSE RUPTURE**	**FIXED FACILITY - BUSINESS - FIELD**	**500 - 2499 GAL OR 4000 - 19999 LBS**	**LAND OR LAND SURFACE IMPACT**
220	**2001**	**1**	**CR 144**	**UNKNOWN**	**SCIOTO RIVER TRIB**	**PERMIT VIOLATION**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
286	**1998**	**1**	**14854 GILMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
495	**2002**	**2**	**20449 CR 245**	**MT VICTORY**	**POND**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
502	**1998**	**2**	**201 S MAIN ST**	**ALGER**	**N/A**	**LEAK**	**FIXED FACILITY - BUSINESS - TANK STORAGE (ABOVE GROUND)**	**0 - 499 GAL OR 0 - 3999 LBS**	**AIR**
531	**1998**	**2**	**20279 CO RD 245**	**MT VICTORY**	**MACDONALD CREEK**	**NO SPILL - NO EXCEEDS/RELEASE**	**FIXED FACILITY - FARM - FIELD**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
593	2002	2	SR 119 & SR 235	ALGER	N/A	DA / CUT OR BREAK	TRANSPORTATION - CAR - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
594	1998	2	14854 GILLMORE RD	KENTON	N/A	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - PUBLIC - WASTE SYSTEM	> 2500 GAL OR > 20000 LBS	SURFACE WATER/STORM SEWERS
618	**1998**	**2**	**14854 GILMORE RD**	**KENTON**	**SCIOTO**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - GOVERNMENT - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
664	**1997**	**2**	**205 N MAIN ST**	**ALGER**	**FIRE WATER RUNOFF**	**FIRE (OPEN BURNING)**	**FIXED FACILITY - ABANDONED SITE - BUILDING**	**UNKNOWN**	**A**
671	**1998**	**2**	**SR 235 S OF ALGER**	**MARION**	**N/A**	**LEAK**	**FIXED FACILITY - FARM - OTHER**	**UNKNOWN**	**AIR**
679	**1998**	**2**	**201 S MAIN ST**	**ALGER**	**N/A**	**LEAK**	**FIXED FACILITY - BUSINESS - MACHINERY (THINGS THAT STAY PUT)**	**0 - 499 GAL OR 0 - 3999 LBS**	**AIR**
713	**1998**	**2**	**RT 31 IN MT VICTORY**	**MT VICTORY**	**NONE**	**INSECURE CARGO**	**TRANSPORTATION - TRUCK - BOXCAR/BOX TRAILER/VAN BODY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
719	**1999**	**2**	**CR 150 E OFF OF SR195**	**MCDONALD TWP**	**SCIOTO RIVER**	**CORROSION OF THE CONTAINER**	**FIXED FACILITY - FARM - TANK STORAGE (ABOVE GROUND)**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
751	1998	2	LARUE	LARUE	N/A	IMPROPER HANDLING	FIXED FACILITY - FARM - LAGOON/POND	> 2500 GAL OR > 20000 LBS	AIR
776	**2000**	**3**	**201 S MAIN ST**	**ALGER**	**N/A**	**DA / CUT OR BREAK**	**FIXED FACILITY - BUSINESS - TANK STORAGE (ABOVE GROUND)**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
802	**2003**	**3**	**230 GILMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
835	1998	3	HARDIN COUNTY QUARRY	HARDIN	N/A	OTHER	UNKNOWN DRUMS - UNKNOWN	UNKNOWN	OTHER AREA
874	**1998**	**3**	**SR 31 S**	**BUCK TWP**	**N/A**	**DA / CUT OR BREAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
912	2003	3	T 197	UNKNOWN	N/A	DUMPING / DISPOSAL	FIXED FACILITY - FARM - OTHER	> 2500 GAL OR > 20000 LBS	LAND OR LAND SURFACE IMPACT

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
960	**2001**	**3**	**CR 245 NORTH OF CR 144**	**DUDLEY**	**SCIOTO RIVER AND TRIB VIA DRAINAGE TILE**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - FARM - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
1001	**1998**	**3**	**14854 GILMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
1030	**1997**	**3**	**14854 GILLMORE RD**	**BUCK TWP**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
1032	**1998**	**3**	**13267 SR 68 S**	**BUCK TWP**	**N/A**	**UNKNOWN**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**OTHER AREA**
1126	1999	3	SR 68 @ HIGH RD DRIVEINN	KENTON	N/A	FIRE (OPEN BURNING)	FIXED FACILITY - CITIZEN - OTHER	UNKNOWN	LAND OR LAND SURFACE IMPACT
1279	**2001**	**4**	**230 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
1321	**1997**	**4**	**JUST OFF OF CTY RD 110**	**MARION TWP**	**UNAMED CREEK**	**DUMPING / DISPOSAL**	**FIXED FACILITY - CITIZEN - OTHER**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
1328	**1998**	**4**	**14854 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
1351	1997	4	SANTIARY CATCH BASIN BEHIND DAVIS 76.	KENTON	SANITARY SEWER	UNKNOWN	UNKNOWN	UNKNOWN	OTHER AREA
1366	**2001**	**4**	**230 GILMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
1444	2000	4	10904 CR 15	MCGUFFY	DRAINAGE DITCH	DA / CUT OR BREAK	TRANSPORTATION - CAR - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
1459	**1999**	**4**	**GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
1468	**1998**	**4**	**14854 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
1521	**1998**	**4**	**106 LEE ST**	**ALGER**	**NONE**	**PRODUCT CONTAMINATION**	**FIXED FACILITY - BUSINESS - TANK STORAGE (UST)**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
1522	**2001**	**5**	**CR 219 S OF CR 190**	**DUDLEY**	**NONE**	**DA / CUT OR BREAK**	**FIXED FACILITY - FARM - OTHER**	**500 - 2499 GAL OR 4000 - 19999 LBS**	**LAND OR LAND SURFACE IMPACT**
1557	1999	4	CR 92	MARION TWP	N/A	FIRE (OPEN BURNING)	FIXED FACILITY - FARM - FIELD	UNKNOWN	A
1716	**2001**	**5**	**13717 SR 68 S**	**KENTON**	**TAYLOR CREEK**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
1738	1999	5	506 N MCONNELL	ALGER	N/A	UNKNOWN	UNKNOWN	UNKNOWN	LAND OR LAND SURFACE IMPACT
1759	**1999**	**5**	**13717 SR 68 S**	**KENTON**	**TAYLOR CREEK**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
1761	**1997**	**5**	**14854 GILMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
1771	**1997**	**5**	**MAIN PLANT**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
1827	2002	5	CR 209	DUDLEY	N/A	DUMPING / DISPOSAL	FIXED FACILITY - CITIZEN - OTHER	UNKNOWN	LAND OR LAND SURFACE IMPACT
1922	**1997**	**5**	**14854 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
1982	2002	5	CR 200	GROUNDSHEAD TWP	DITCH	DA / CUT OR BREAK	TRANSPORTATION - CAR - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
2038	**2000**	**6**	**13267 SR 68 S**	**KENTON**	**NA**	**VALVE OPENED**	**FIXED FACILITY - BUSINESS - TANK STORAGE (ABOVE GROUND)**	**> 2500 GAL OR > 20000 LBS**	**LAND OR LAND SURFACE IMPACT**
2041	**1999**	**6**	**13717 SR 68 S**	**KENTON**	**TAYLOR CREEK**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
2084	2000	6	NORTH OF KENTON	KENTON	N/A	DUMPING / DISPOSAL	FIXED FACILITY - BUSINESS - FIELD	UNKNOWN	LAND OR LAND SURFACE IMPACT
2087	**1997**	**5**	**14854 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
2117	**1997**	**5**	**782 STEINER AVE**	**KENTON**	**GROUNDWATER**	**LEAK**	**UNKNOWN**	**UNKNOWN**	**GROUNDWATER/SUBSURFACE AFFECT**
2173	**2002**	**5**	**US 68 S TO KENTON**	**BUCK TWP**	**N/A**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
2177	**1997**	**6**	**14854 GILLMORE RD**	**KENTON**	**scioto river**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
2223	**1997**	**6**	**2954 SR 67**	**MCDONALD TWP**	**N/A**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**AIR**
2237	**2001**	**6**	**LAYER SITE NUMBER 5**	**N/A**	**MCDONALD CREEK**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
2252	1998	6	12701 TR 205	GOSHEN TWP	N/A	DUMPING / DISPOSAL	FIXED FACILITY - CITIZEN - WASTE SYSTEM	0 - 499 GAL OR 0 - 3999 LBS	GROUNDWATER/SUBSURFACE AFFECT
2265	**1999**	**6**	**CR 110**	**MCGUFFEY**	**N/A**	**WEATHER RELATED DAMAGE**	**NATURAL - MOTHER NATURE**	**NO SPILL**	**LAND OR LAND SURFACE IMPACT**
2332	**2001**	**6**	**13717 SR 68 S**	**KENTON**	**TAYLOR CREEK**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
2334	**1998**	**6**	**14854 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
2347	**1998**	**6**	**CR 245 FACILITY**	**HALE TWP**	**NA**	**LEAK**	**FIXED FACILITY - FARM - TANK STORAGE (UST)**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
2414	**1998**	**6**	**GILMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
2464	**1997**	**6**	**14854 GILLMORE RD**	**BUCK TWP**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
2527	**1997**	**6**	**20449 CR 245**	**HALE TWP**	**N/A**	**DA / CUT OR BREAK**	**FIXED FACILITY - BUSINESS - CULVERT/MANHOLE/OUTFALL**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
2630	1997	6	3717 ST RT 68 S	KENTON	NONE	LEAK	TRANSPORTATION - RAIL - OTHER	500 - 2499 GAL OR 4000 - 19999 LBS	LAND OR LAND SURFACE IMPACT
2682	2002	7	FRANKLIN ST TO SR 309	KENTON	N/A	INSECURE CARGO	TRANSPORTATION - TRUCK - CARGO CONTAINERS	> 2500 GAL OR > 20000 LBS	LAND OR LAND SURFACE IMPACT
2797	**1997**	**7**	**14854 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
2917	**2002**	**7**	**401 COURTWRIGHT ST**	**MCGUFFEY**	**N/A**	**IMPROPER HANDLING**	**FIXED FACILITY - BUSINESS - OTHER**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2955	2001	8	9505 CR 175	KENTON	NONE	DA / CUT OR BREAK	FIXED FACILITY - BUSINESS - TRANSFORMER/CAPACITORS/ECT	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
3033	**1997**	**7**	**SR 245**	**LARUE**	**N/A**	**UNKNOWN**	**FIXED FACILITY - FARM - OTHER**	**UNKNOWN**	**AIR**
3050	**1998**	**7**	**320 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
3087	1997	7	350 BALES RD CO. RD. 140	KENTON	NONE EFFECTED	NO SPILL - NO EXCEEDS/RELEASE	NATURAL - MOTHER NATURE	UNKNOWN	LAND OR LAND SURFACE IMPACT
3177	**1999**	**8**	**OUTFALL 001**	**KENTON**	**TAYLOR CREEK**	**PERMIT VIOLATION**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3274	**1998**	**8**	**730 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
3277	**1997**	**8**	**1102 N FRONT ST**	**ALGER**	**N/A**	**FIRE (OPEN BURNING)**	**FIXED FACILITY - CITIZEN - OTHER**	**UNKNOWN**	**A**
3380	**2001**	**9**	**8176 SR 235**	**ALGER**	**N/A**	**LEAK**	**FIXED FACILITY - PUBLIC - CONTAINER**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
3391	**1997**	**8**	**14854 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
3417	2002	8	1771 CR 209	KENTON	N/A	FIRE (OPEN BURNING)	FIXED FACILITY - CITIZEN - JUNKYARD OR LANDFILL	> 2500 GAL OR > 20000 LBS	A
3429	**1997**	**8**	**14854 GILLMORE RD**	**KENTON**	**SCIOTO R**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
3450	2001	9	SR 31 & SR 190	CANTON	N/A	DA / CUT OR BREAK	TRANSPORTATION - TRUCK - OTHER	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
3514	**1997**	**8**	**13177 CTY RD 130**	**PLEASANT TWP**	**N/A**	**DA / CUT OR BREAK**	**FIXED FACILITY - GOVERNMENT - TANK STORAGE (ABOVE GROUND)**	**0 - 499 GAL OR 0 - 3999 LBS**	**SURFACE WATER/STORM SEWERS**
3533	2002	9	CR90, CR45 & CR80	MARION TWP.	NONE	LEAK	TRANSPORTATION - TRUCK - MACHINERY HYDRAULICS/ECT	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
3543	**1998**	**8**	**CO RD 245**	**MT VICTORY**	**N/A**	**UNKNOWN**	**FIXED FACILITY - BUSINESS - BUILDING**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
3561	**1997**	**8**	**CR 265 5 MILES S OF KENTON**	**KENTON**	**N/A**	**DUMPING / DISPOSAL**	**TRANSPORTATION - TRUCK - TANKER**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
3885	**2000**	**10**	**OUTFALL 001**	**KENTON**	**TAYLOR CREEK**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3891	**1999**	**11**	**230 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
3949	1998	9	SR 68	KENTON	STORM SEWER ON PROPERTY.	LEAK	FIXED FACILITY - GOVERNMENT - TANK STORAGE (UST)	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
4127	1998	10	CITY OF KENTON	KENTON	N/A	NO SPILL - NO EXCEEDS/REL EASE	FIXED FACILITY - PUBLIC - TRANSFORMER/CAPACITORS/EC T	> 2500 GAL OR > 20000 LBS	LAND OR LAND SURFACE IMPACT
4224	**2001**	**11**	**SR 31 NEAR FAIRGROUND RD**	**BUCK TWP**	**NONE**	**FIRE (OPEN BURNING)**	**FIXED FACILITY - PUBLIC - OTHER**	**UNKNOWN**	**A**
4231	**2000**	**11**	**13717 SR 68**	**BECK TWP**	**TAYLOR CREEK**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
4272	**1997**	**10**	**12717 SR 68 S**	**KENTON**	**TAYLOR CREEK**	**UNKNOWN**	**FIXED FACILITY - BUSINESS - LAGOON/POND**	**0 - 499 GAL OR 0 - 3999 LBS**	**SURFACE WATER/STORM SEWERS**
4273	**1997**	**10**	**CORNER OF DECATOR &STEVENS**	**KENTON**	**N/A**	**EQUIPMENT FAILURE**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
4370	**1999**	**12**	**20449 CR 245**	**MT VICTORY**	**MCDONALD CREEK**	**DA / CUT OR BREAK**	**FIXED FACILITY - FARM - OTHER**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
4373	**2002**	**11**	**14854 GILLMORE RD**	**KENTON**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**0 - 499 GAL OR 0 - 3999 LBS**	**SURFACE WATER/STORM SEWERS**
4440	**2001**	**11**	**CR 230 & SR 31**	**MT VICTORY**	**N/A**	**LEAK**	**TRANSPORTATION - TRUCK - OTHER**	**UNKNOWN**	**AIR**
4472	2001	11	SR 117 JUST NORTH ROUNDHEAD	ROUND HEAD	ROADSIDE DRAINAGE DITCH	DA / CUT OR BREAK	TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
4624	1997	11	1037 S MAIN ST AT SCIOTO VILLAGE APTS	KENTON	STORM SEWER	DUMPING / DISPOSAL	TRANSPORTATION - CAR - OTHER	0 - 499 GAL OR 0 - 3999 LBS	SURFACE WATER/STORM SEWERS
4698	**1998**	**11**	**19986 CR 245**	**HALE TWP**	**N/A**	**ODORS**	**FIXED FACILITY - FARM - OTHER**	**UNKNOWN**	**AIR**
4735	**1998**	**11**	**23992 TR 230**	**HALE TWP**	**N/A**	**UNKNOWN**	**FIXED FACILITY - FARM - BUILDING**	**UNKNOWN**	**AIR**
4756	2002	12	20449 CR 245	MOUNT VICTORY	N/A	OVERFLOW	FIXED FACILITY - FARM - OTHER	UNKNOWN	SANITARY SEWER
4764	**1997**	**12**	**14854 GILLMORE RD**	**BUCK TWP**	**SCIOTO RIVER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
4873	**1997**	**12**	**20264 CR 245**	**MT VICTORY**	**MC DONALD CREEK TRIBUTARY**	**HUMAN ERROR**	**FIXED FACILITY - BUSINESS - FIELD**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
4891	**1997**	**12**	**20449 CR 245**	**MT VICTORY**	**N/A**	**UNKNOWN**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
4897	2001	12	CR 235 HOUSE 9	LARUE	STORM POND?	DA / CUT OR BREAK	FIXED FACILITY - FARM - OTHER	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
4897	1997	12	SR SR S OF KENTON	KENTON	N/A	CORROSION OF THE CONTAINER	FIXED FACILITY - INDUSTRY - CONTAINER	UNKNOWN	A
4971	**1997**	**12**	**CR 245 AT CR 202**	**HALE TWP**	**NONE**	**DA / CUT OR BREAK**	**TRANSPORTATION - RAIL - ENGINE OR FUEL SUPPLY**	**500 - 2499 GAL OR 4000 - 19999 LBS**	**LAND OR LAND SURFACE IMPACT**
2725	2002	7	WALNUT ST & DETROIT ST	KENTON	N/A	LEAK	UNKNOWN	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
Logan County									
17	2002	1	2946 US RT 68 N	BRUSH CREEK	UNK TRIB	PERMIT VIOLATION	FIXED FACILITY - BUSINESS - WASTE SYSTEM	UNKNOWN	SURFACE WATER/STORM SEWERS
259	2000	1	US 33 EB .5 MILES W OF SR37	PERRY TWP	UNNAMED TRIB.	HUMAN ERROR	TRANSPORTATION - TRUCK - TANKER	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
870	**2003**	**3**	**991 SR 274**	**RUSH CREEK**	**POND & S FORK GREAT MIAMI RIVER**	**RUNOFF**	**FIXED FACILITY - FARM - FIELD**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
3500	**2002**	**8**	**170 MILL ST**	**RUCHCREEK**	**N/A**	**LEAK**	**FIXED FACILITY - PUBLIC - CONTAINER**	**0 - 499 GAL OR 0 - 3999 LBS**	**AIR**
3977	**2001**	**10**	**210 MIAMI RD**	**RUSHSYLVANIA**	**UNK DITCH**	**DA / CUT OR BREAK**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
Marion County									
39	**2002**	**1**	**258 SILVER ST**	**MARION**	**N/A**	**FIRE (FACILITY)**	**FIXED FACILITY - CITIZEN - OTHER**	**NO SPILL**	**A**
80	**2002**	**1**	**269 SILVER ST**	**MARION**	**N/A**	**ODORS**	**FIXED FACILITY - CITIZEN - STACK RELEASE-AIR**	**UNKNOWN**	**AIR**
103	**2001**	**1**	**421 LEADER ST**	**MARION**	**COMBINED SEWER**	**TANK RUPTURE**	**FIXED FACILITY - BUSINESS - TANK STORAGE (ABOVE GROUND)**	**> 2500 GAL OR > 20000 LBS**	**LAND OR LAND SURFACE IMPACT**
149	2002	1	2066 VICTORY RD REAR OF PROPERTY @ SR 23	MARION	DITCH	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - BUSINESS - OTHER	UNKNOWN	SURFACE WATER/STORM SEWERS
159	**1998**	**1**	**334 PARK BLVD**	**MARION**	**N/A**	**DUMPING / DISPOSAL**	**FIXED FACILITY - CITIZEN - BUILDING**	**0 - 499 GAL OR 0 - 3999 LBS**	**GROUNDWATER/SUBSURFACE AFFECT**
175	**1998**	**1**	**OUTFALL 002**	**GREEN CAMP**	**SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
212	**1999**	**1**	**N STORM SEWER OUTFALL @ SAWYER PARK POND**	**MARION**	**LITTLE SCIOTO RIVER TRIBUTARY VIA STORM SEWER**	**RUNOFF**	**FIXED FACILITY - INDUSTRY - CULVERT/MANHOLE/OUTFALL**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
222	**1998**	**1**	**1210 CHANEY AVE**	**MARION**	**N/A**	**CHEMICAL REACTION**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**AIR**
245	**1999**	**1**	**2536 WINNEMAC PIKE**	**LARUE**	**N/A**	**DUMPING / DISPOSAL**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
310	**2002**	**1**	**1600 CASCADE DR**	**MARION TWP.**	**LITTLE SCIOTO R. TRIBUTARY DITCH VIA STORM SEWER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - INDUSTRY - CULVERT/MANHOLE/OUTFALL**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
311	**1999**	**1**	**2315 MORRALL KIRKPATRICK RD AT TOBIAS RD**	**GRAND PRAIRE TWP**	**ROCK FORK CREEK**	**VANDALISM**	**FIXED FACILITY - BUSINESS - TANK STORAGE (ABOVE GROUND)**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
314	**1999**	**1**	**2315 MORRAL KIRK PATRICK RD AT TOBIAS RD**	**GRAND PRARIE TWP**	**ROCK FORK CREEK**	**VANDALISM**	**FIXED FACILITY - BUSINESS - TANK STORAGE (ABOVE GROUND)**	**0 - 499 GAL OR 0 - 3999 LBS**	**SURFACE WATER/STORM SEWERS**
318	**2001**	**1**	**940 MARION WILLIAMSPORT RD**	**MARION**	**GOUNDWATER**	**DA / CUT OR BREAK**	**FIXED FACILITY - GOVERNMENT - TANK STORAGE (UST)**	**> 2500 GAL OR > 20000 LBS**	**GROUNDWATER/SUBSURFACE AFFECT**
353	**2001**	**2**	**1244 HARDING HWY W**	**MARION**	**N/A**	**OVERFILL**	**FIXED FACILITY - BUSINESS - TANK STORAGE (ABOVE GROUND)**	**500 - 2499 GAL OR 4000 - 19999 LBS**	**LAND OR LAND SURFACE IMPACT**
371	**1997**	**1**	**1171 W CENTER ST**	**MARION**	**STORM SEWER**	**DA / CUT OR BREAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
415	2002	2	6178 GROUNDHOG PIKE ACROSS FROM	LARUE	N/A	DUMPING / DISPOSAL	TRANSPORTATION - CAR - UNLOADING/LOADING EQUIPMENT	> 2500 GAL OR > 20000 LBS	LAND OR LAND SURFACE IMPACT
440	**1999**	**2**	**OUTFALL 001**	**GREEN CAMP**	**LITTLE SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
441	**1999**	**2**	**DECLIFF LARUE RD & SR 37**	**MONTGOMERY TWP**	**N/A**	**DA / CUT OR BREAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
480	**2001**	**2**	**1011 S PROSPECT ST**	**MARION**	**DRAINAGE DITHCH**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
503	**1998**	**2**	**1011 S PROSPECT ST**	**MARION**	**SAWYER LAKE TRIB**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
545	1997	2	UNK	RICHWOOD	N/A	UNKNOWN	UNKNOWN	UNKNOWN	LAND OR LAND SURFACE IMPACT
617	2000	2	1429 MARION WALDO RD	MARION	N/A	DUMPING / DISPOSAL	UNKNOWN DRUMS - UNKNOWN	UNKNOWN	LAND OR LAND SURFACE IMPACT

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
697	2000	3	DAVID ST NEXT TO SAWYER LUDWIG PARK	MARION	CREEK	DUMPING / DISPOSAL	UNKNOWN	UNKNOWN	SURFACE WATER/STORM SEWERS
882	**2001**	**3**	**1011 S PROSPECT ST**	**MARION**	**UNK CREEK**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
917	2003	3	LIKENS ROAD	MARION	N/A	VALVE FAILURE	TRANSPORTATION - RAIL - OTHER	0 - 499 GAL OR 0 - 3999 LBS	AIR
939	**1997**	**3**	**FARMING & N MAIN**	**MARION**	**DRY CATCH BASIN**	**LEAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
957	**2000**	**3**	**CHANEY AVE`**	**MARION**	**N/A**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**AIR**
958	1997	3	AT MARION STEEL CO	MARION	N/A	DUMPING / DISPOSAL	UNKNOWN	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
1039	**2000**	**3**	**281 COPELAND AVE**	**MARION**	**NONE**	**OVERFILL**	**FIXED FACILITY - INDUSTRY - TANK STORAGE (UST)**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
1053	1999	3	RT 23 SB ONE MILE N OF REST AREA	PLEASANT TWP	NONE	SADDLE TANKS	TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
1276	**2000**	**4**	**DRY LANE RD AT RAIL ROAD TRACKS .25 EAST OF LA RUE**	**MONTGOMERY TWP**	**GROUND WATER**	**LEAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**GROUNDWATER/SUBSURFACE AFFECT**
1315	**1998**	**4**	**800 E WATER ST**	**PROSPECT**	**N/A**	**SADDLE TANKS**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
1352	**1998**	**4**	**2974 MARION GREENCAMP RD**	**MARION**	**SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
1399	**1998**	**4**	**HOLLAND RD**	**MARION**	**SANITARY**	**DUMPING / DISPOSAL**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**OTHER AREA**
1525	**1999**	**4**	**2033 VICTORY RD**	**MARION**	**SEWER**	**UNKNOWN**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SANITARY SEWER**
1568	1999	4	6.2 MM SR 23 SB ROADSIDE REST	PLEASANT TWP	DITCH	LEAK	TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
1598	**2000**	**5**	**356 W CENTER ST**	**MARION**	**NONE**	**NO SPILL - NO EXCEEDS/RELEASE**	**FIXED FACILITY - BUSINESS - OTHER**	**NO SPILL**	**LAND OR LAND SURFACE IMPACT**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
1603	1997	4	LA RUEDECLIFF RD & AUGUSTA NORTHERN RD	COLS	N/A	LEAK	TRANSPORTATION - TRUCK - CARGO CONTAINERS	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
1630	**2000**	**5**	**5727 PROSPECT UPPER SANDUSKY SOUTH**	**PROSPECT**	**N/A**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
1634	**1998**	**4**	**CENTER ST @ NORFOLK SOUTHERN OFFICE**	**MARION**	**N/A**	**VANDALISM**	**FIXED FACILITY - BUSINESS - OTHER**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
1659	2001	5	1509 TRON LANE	MARION	N/A	DUMPING / DISPOSAL	FIXED FACILITY - CITIZEN - OTHER	UNKNOWN	GROUNDWATER/SUB SURFACE AFFECT
1723	1998	5	CORNER OF BAHAMA & ROBINSON	MARION	STORM SEWER	UNKNOWN	UNKNOWN DRUMS - UNKNOWN	UNKNOWN	SURFACE WATER/STORM SEWERS
1730	**1997**	**5**	**2974 MARION GREEN CAMP RD**	**GREEN CAMP TWP**	**SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
1744	2000	5	POLICE DEPARTMENT	MARION	N/A	OTHER	FIXED FACILITY - CITIZEN - OTHER	UNKNOWN	NOTHING SPILLED OR NATURAL EVENT
1799	**2000**	**5**	**973 FAIRGROUND ST OFF OF RT 309**	**MARION**	**N/A**	**IMPROPER HANDLING**	**FIXED FACILITY - INDUSTRY - OTHER**	**UNKNOWN**	**AIR**
1840	**2000**	**5**	**HOCK & BIG ISLAND DECLIFFE**	**NEW BLOOMINGT ON TWP**	**N/A**	**DA / CUT OR BREAK**	**UNKNOWN**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2056	**2002**	**5**	**503 WEST CENTER ST BETWEEN SILVER ST & FAIRGROUND ST**	**MARION**	**N/A**	**LEAK**	**TRANSPORTATION - RAIL - TANKER**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2161	**1997**	**6**	**1011 S PROSPECT ST**	**MARION**	**SAWYER LAKE TRIB**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
2239	**2000**	**6**	**1810 MARION AGOSTA RD**	**MARION**	**LITTLE SCIOTO RIVER**	**DA / CUT OR BREAK**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
2301	1997	6	194 MARION CARDINGTON W RD	MARION	N/A	DA / CUT OR BREAK	FIXED FACILITY - CITIZEN - TANK STORAGE (ABOVE GROUND)	UNKNOWN	LAND OR LAND SURFACE IMPACT
2327	**2000**	**6**	**SR 423 N & SR 4 AT "Y" INTERSECTION - N SIDE OF MARION**	**MARION TWP**	**DITCH AND ROCKSWALE DITCH TRIBUTARY STORM SEWER**	**DA / CUT OR BREAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2432	1997	6	8221 LINCOLN AVE	MARION	N/A	IMPROPER HANDLING	FIXED FACILITY - INDUSTRY - OTHER	UNKNOWN	AIR
2437	**1999**	**7**	**OUTFALL 002**	**GREENCAMP**	**SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
2442	**1998**	**6**	**CRISSINGER RD HOUSING PROJECT**	**PLEASANT TWP**	**N/A**	**OVERFILL**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2443	**1998**	**6**	**2151 CRISSINGER RD ABOUT .8 SOUTH**	**PLEASANT TWP**	**N/A**	**SADDLE TANKS**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2515	**2002**	**6**	**446 CLARK RD SOUTH**	**LARUE**	**SCIOTO RIVER**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
2565	2002	6	979 POLELAND RD OFF OF MAIN ST	MARION	SEWER	DUMPING / DISPOSAL	FIXED FACILITY - BUSINESS - OTHER	UNKNOWN	LAND OR LAND SURFACE IMPACT
2600	1998	6	MARION GENERAL HOSPITAL	MARION	N/A	OTHER	FIXED FACILITY - CITIZEN - OTHER	UNKNOWN	OTHER AREA
2613	1998	6	556 S VINE & 231 ST JAMES ST	MARION	N/A	LEAK	FIXED FACILITY - BUSINESS - TRANSFORMER/CAPACITORS/ECT	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
2613	**2001**	**7**	**281 COPELAND AVE**	**MARION TWP**	**NONE**	**FIRE (FACILITY)**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**A**
2614	**2001**	**7**	**281 COPELAND AVE**	**MARION TOWNSHIP**	**NONE**	**FIRE (FACILITY)**	**FIXED FACILITY - BUSINESS - TRANSFORMER/CAPACITORS/ECT**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2707	**2001**	**7**	**467 W FAIRGROUND ST**	**MARION TOWNSHIP**	**NONE**	**FIRE (FACILITY)**	**FIXED FACILITY - INDUSTRY - BUILDING**	**> 2500 GAL OR > 20000 LBS**	**OTHER AREA**
2709	**2002**	**7**	**1011 SOUTH PROSPECT ST**	**MARION**	**SAUER LAKE TRIB**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**

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2711	**2002**	**7**	**503 WEST CENTER ST @ MARION YARD**	**MARION**	**N/A**	**LEAK**	**TRANSPORTATION - RAIL - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2719	**2002**	**7**	**427 CLINTON ST**	**MARION**	**N/A**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**OTHER AREA**
2733	2000	7	SR 4 & KENTON GALLIA RD; FRONT YARD AT NORTHEAST CORNER	MARION	ROCK FORK TRIBUTARY STORM WATER DRAINAGE SWALE	DA / CUT OR BREAK	TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
2773	**2001**	**7**	**321 N PROSPECT ST**	**MARION**	**N/A**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
2856	**2000**	**7**	**2181 GREENCAMP RIVER RD .5 MILES FROM ADDRESS ROAD IS DEAD END**	**GREEN CAMP TWP**	**N/A**	**DUMPING / DISPOSAL**	**FIXED FACILITY - FARM - FIELD**	**> 2500 GAL OR > 20000 LBS**	**LAND OR LAND SURFACE IMPACT**
2858	**1998**	**7**	**SR 4 & US23**	**GRAND PRARIE TWP**	**N/A**	**DA / CUT OR BREAK**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2866	**1997**	**7**	**OUTFALL 001**	**GREEN CAMP**	**LITTLE SCIOTO TRIB**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
2890	**1998**	**7**	**US 23 SB AT ROCK FORK BRIDGE**	**GRAND PRAIRIE**	**ROCK FORK OF LITTLE SCIOTO RIVER**	**SADDLE TANKS**	**TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2921	**1999**	**8**	**2974 MARION GREEN CAMP RD**	**GREEN CAMP**	**LITTLE SCIOTO & SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
2930	**1998**	**7**	**SR 95 W**	**MARION**	**N/A**	**ODORS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**UNKNOWN**	**AIR**
2951	**1998**	**7**	**1300 MARION AGOSTA RD; NORTH CENTRAL PLANT EXTERIOR**	**MARION TWP**	**ROCKSWALE DITCH VIA STORM SEWER**	**OVERFILL**	**FIXED FACILITY - INDUSTRY - TANK STORAGE (ABOVE GROUND)**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
2988	1999	8	1509 MARION WALDO RD	MARION TWP	N/A	IMPROPER HANDLING	FIXED FACILITY - BUSINESS - OTHER	UNKNOWN	LAND OR LAND SURFACE IMPACT

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
3030	**2000**	**8**	**GREEN CAMP RIVER RD OFF OF RT 734**	**GREENCAMP [**	**N/A**	**DUMPING / DISPOSAL**	**FIXED FACILITY - FARM - FIELD**	**> 2500 GAL OR > 20000 LBS**	**LAND OR LAND SURFACE IMPACT**
3036	**2001**	**8**	**765 BELLEFONTAINE AVE**	**MARION**	**NONE**	**DUMPING / DISPOSAL**	**FIXED FACILITY - BUSINESS - OTHER**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
3051	**1998**	**7**	**1515 MARION AUGUSTA RD**	**MARION**	**ROCKSWALE DITCH VIA STORM SEWER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - INDUSTRY - CULVERT/MANHOLE/OUTFALL**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3062	**2000**	**8**	**490 WEST FAIR GROUNDS ST**	**MARION**	**N/A**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR**	**UNKNOWN**	**AIR**
3085	**1997**	**7**	**368 AVONDALE ST**	**MARION**	**N/A**	**MOTHER NATURE - PHENOMENA**	**FIXED FACILITY - BUSINESS - TRANSFORMER/CAPACITORS/ECT**	**0 - 499 GAL OR 0 - 3999 LBS**	**GROUNDWATER/SUBSURFACE AFFECT**
3128	**2001**	**8**	**SR 95 N ON THE LITTLE SCIOTO RIVER**	**UNKNOWN**	**LITTLE SCIOTO RIVER**	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3139	**2000**	**8**	**114 SCIOTO ST**	**MARION**	**N/A**	**OTHER**	**FIXED FACILITY - FARM - OTHER**	**UNKNOWN**	**OTHER AREA**
3192	**1998**	**7**	**L1 FACILITY**	**LARUE**	**N/A**	**UNKNOWN**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
3196	**1999**	**9**	**OUTFALL 002**	**GREEN CAMP**	**SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3202	1999	9	MARION KURTPATRICK RD	UNKNOWN	N/A	IMPROPER HANDLING	FIXED FACILITY - FARM - FIELD	UNKNOWN	LAND OR LAND SURFACE IMPACT
3217	**2000**	**8**	**4232 MARION UPPER SANDUSKY RD**	**MARION**	**SCIOTO RIVER**	**ODORS**	**UNKNOWN**	**UNKNOWN**	**AIR**
3240	**2001**	**8**	**WEST FAIRGROUNDS RD AT CSX RAIL CROSSING**	**MARION**	**NONE**	**FIRE (TRANSPORTATION RELATED)**	**TRANSPORTATION - RAIL - ENGINE OR FUEL SUPPLY**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
3322	**2001**	**9**	**US 23 @ LITTLE SCIOTO RIVER (MM 18.15)**	**GRAND PRAIRE**	**LITTLE SCIOTO RIVER**	**DA / CUT OR BREAK**	**FIXED FACILITY - BUSINESS - TANK STORAGE (ABOVE GROUND)**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
3348	**1999**	**9**	**OUTFALL 002**	**GREEN CAMP**	**SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3384	2001	9	CR 101 @ BRIDGE (UPSTREAM)	MARION TWP	COLUMBIA STREET DITCH	UNKNOWN	UNKNOWN	UNKNOWN	SURFACE WATER/STORM SEWERS
3408	**2002**	**8**	**408 OLIVER ST**	**MARION**	**N/A**	**UNKNOWN**	**FIXED FACILITY - PUBLIC - UTILITY RELATED**	**UNKNOWN**	**OTHER AREA**
3477	1999	9	MARION GENERAL HOSPITAL OFF MCKINLEY DR	MARION	NONE	DUMPING / DISPOSAL	FIXED FACILITY - BUSINESS - CONTAINER	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
3488	**1998**	**8**	**617 W CENTER ST**	**MARION**	**N/A**	**DA / CUT OR BREAK**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
3490	1999	9	UNK STREET	MARION	N/A	DUMPING / DISPOSAL	FIXED FACILITY - CITIZEN - FIELD	UNKNOWN	LAND OR LAND SURFACE IMPACT
3513	**2000**	**9**	**136 E GEORGE ST**	**MARION**	**N/A**	**IMPROPER HANDLING**	**FIXED FACILITY - BUSINESS - OTHER**	**0 - 499 GAL OR 0 - 3999 LBS**	**OTHER AREA**
3583	**1998**	**8**	**BUCKEYE AGRIGENERAL**	**LARUE**	**N/A**	**DUMPING / DISPOSAL**	**FIXED FACILITY - FARM - BUILDING**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
3590	**1999**	**10**	**467 W FAIRGROUNDS @ MARION COUNTY FAIRGROUND**	**MARION**	**N/A**	**OVERFILL**	**FIXED FACILITY - INDUSTRY - OTHER**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
3619	**2000**	**9**	**502 SMITH ST OFF OF CHENEY AVE**	**MARION**	**N/A**	**DUMPING / DISPOSAL**	**UNKNOWN DRUMS - UNKNOWN**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
3640	**1998**	**8**	**320 S MAIN ST**	**PROSPECT**	**N/A**	**OTHER**	**UNKNOWN DRUMS - UNKNOWN**	**NO SPILL**	**NOTHING SPILLED OR NATURAL EVENT**
3640	**1999**	**10**	**2974 MARION GREENCAMP RD**	**GREENCAMP**	**SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3713	2000	9	658 E CENTER ST	MARION	N/A	DUMPING / DISPOSAL	FIXED FACILITY - CITIZEN - FIELD	UNKNOWN	LAND OR LAND SURFACE IMPACT
3751	2000	10	13267 CH 77	LARUE	DITCH	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - INDUSTRY - WASTE SYSTEM	> 2500 GAL OR > 20000 LBS	SURFACE WATER/STORM SEWERS

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3764	1998	9	SILVER ST @ S45.5 45.5 MILES S OF SANDUSKY	MARION	N/A	DA / CUT OR BREAK	TRANSPORTATION - RAIL - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
3788	**1999**	**10**	**OUTFALL 002**	**GREEN CAMP**	**SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3854	**2000**	**10**	**HOCH ROAD**	**BIG ISLAND TWP**	**N/A**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - CITIZEN - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3877	**1998**	**9**	**CHENEY AVE**	**MARION**	**N/A**	**IMPROPER HANDLING**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
3915	**1998**	**9**	**2974 MARION GREECAMP RD**	**GREENCAMP TWP**	**SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
3917	**1998**	**9**	**467 W FAIRGROUND ST**	**MARION**	**N/A**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR**	**UNKNOWN**	**AIR**
3948	1997	9	MARION HOTEL	MARION	N/A	UNKNOWN	UNKNOWN	UNKNOWN	AIR
3963	**2002**	**10**	**1011 S PROSPECT S**	**MARION**	**UNKNOWN**	**PERMIT VIOLATION**	**FIXED FACILITY - BUSINESS - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
4019	2000	10	MARION CORRECTIONAL (BEHIND)	MARION	N/A	DA / CUT OR BREAK	FIXED FACILITY - GOVERNMENT - OTHER	UNKNOWN	LAND OR LAND SURFACE IMPACT
4118	**2002**	**10**	**3696 GREEN CAMP ETHICS RD BEHIND**	**MARION**	**N/A**	**DUMPING / DISPOSAL**	**FIXED FACILITY - FARM - FIELD**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
4202	**1999**	**12**	**400 BARTRUM AVE**	**MARION**	**N/A**	**DUMPING / DISPOSAL**	**FIXED FACILITY - BUSINESS - OTHER**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
4304	**1997**	**10**	**436 N MAIN ST**	**MARION**	**NONE**	**SLOPPY OPERATIONS**	**FIXED FACILITY - BUSINESS - DRUMS**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
4332	**1997**	**10**	**427 BEECH ST**	**GREEN CAMP**	**SEWER**	**DUMPING / DISPOSAL**	**FIXED FACILITY - INDUSTRY - CULVERT/MANHOLE/OUTFALL**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
4368	**1999**	**12**	**541 N MILBURN AVE**	**MARION**	**N/A**	**ODORS**	**UNKNOWN**	**UNKNOWN**	**AIR**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
4407	**1997**	**11**	**2974 MARIONGREENCAMP RD**	**GREENCAMP RD**	**SCIOTO RIVER**	**PERMIT VIOLATION**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
4501	**1998**	**11**	**2974 MARION GREENCAMP RD**	**GREEN CAMP TWP**	**LITTLE SCIOTO**	**PERMIT VIOLATION**	**FIXED FACILITY - INDUSTRY - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
4507	2002	11	1011 SOUTH PROSPECT ST	MARION	CREEK	PERMIT VIOLATION	FIXED FACILITY - INDUSTRY - WASTE SYSTEM	UNKNOWN	SURFACE WATER/STORM SEWERS
4532	1997	11	RT 95 PLAZA SHOPPING CENTER	MARION TWP	GRAVES CREEK	DISCHARGE/BYPASS TREATMENT SYS	FIXED FACILITY - INDUSTRY - WASTE SYSTEM	UNKNOWN	SURFACE WATER/STORM SEWERS
4681	**1998**	**11**	**CHENEY AVE**	**MARION**	**N/A**	**IMPROPER HANDLING**	**FIXED FACILITY - INDUSTRY - STACK RELEASE-AIR**	**UNKNOWN**	**AIR**
4693	**2000**	**12**	**PASSING SIDING**	**LARUE**	**N/A**	**VENTING**	**TRANSPORTATION - TRUCK - TANKER**	**UNKNOWN**	**AIR**
Union County									
216	2002	1	SR 31 AT OSBORNE RD (0.35 MILE N OF SOMERSVILLE)	YORK TWP	N/A	DA / CUT OR BREAK	TRANSPORTATION - TRUCK - ENGINE OR FUEL SUPPLY	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
578	2003	2	416 GROVE ST OFF OF RT 23	NORTH UNION	N/A	OVERFLOW	FIXED FACILITY - PUBLIC - OTHER	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
629	**1998**	**2**	**315 E BLAGROVE ST; E SIDE BTWN HOUSE AND ALLEY**	**RICHWOOD**	**FULTON CREEK TRIBUTARY STORM SEWER**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - CITIZEN - TANK STORAGE (UST)**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
690	2001	3	20640 SR 4	LEESBURG TWP	BLUES CREEK	DA / CUT OR BREAK	TRANSPORTATION - TRUCK - CARGO CONTAINERS	0 - 499 GAL OR 0 - 3999 LBS	SURFACE WATER/STORM SEWERS
818	2002	3	SR 31 S OF CR 307 (3 POLES SOUTH OF)	YORK TWP	ROADSIDE DITCH	DA / CUT OR BREAK	FIXED FACILITY - PUBLIC - TRANSFORMER/CAPACITORS/ECT	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
1410	1998	4	WATKINS RD AT QUARRY	MILL CREEK TWP	N/A	DA / CUT OR BREAK	TRANSPORTATION - TRUCK - OTHER	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
1536	**2002**	**4**	**12947 SR 739**	**RICHWOOD**	**N/A**	**DUMPING / DISPOSAL**	**FIXED FACILITY - CITIZEN - CONTAINER**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**

#	YR	MO	SPILL_LOCA	SPILL_CITY	WATERWAY	CAUSE	SOURCE	SPILL SIZE	MEDIA CODE
1696	**2002**	**5**	**207 W BOMFORD ST**	**RICHWOOD**	**FULTON CREEK TRIB**	**DISCHARGE/ BYPASS TREATMENT SYS**	**FIXED FACILITY - PUBLIC - WASTE SYSTEM**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
1711	**1999**	**5**	**SR 31 & LINGRELL RD**	**WASHINGTON TWP**	**RUSH CREEK TRIB**	**DUMPING / DISPOSAL**	**FIXED FACILITY - UNKNOWN - OTHER**	**> 2500 GAL OR > 20000 LBS**	**SURFACE WATER/STORM SEWERS**
2540	1999	7	ADAMS RD BETWEEN SR 736 & KECH RD N SIDE	PLEASANT VALLEY TWP	N/A	FIRE (FACILITY)	FIXED FACILITY - BUSINESS - OTHER	UNKNOWN	LAND OR LAND SURFACE IMPACT
3340	2000	8	12920 SR 739	ESSEX	N/A	UNKNOWN	UNKNOWN	UNKNOWN	OTHER AREA
3563	1998	8	4704 SR 292 S	EAST LIBERTY	N/A	OVERFILL	FIXED FACILITY - BUSINESS - TANK STORAGE (ABOVE GROUND)	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT
3935	**1998**	**9**	**MIDDLESWORTH RD**	**WASHINGTON TWP**	**N/A**	**DUMPING / DISPOSAL**	**UNKNOWN DRUMS - UNKNOWN**	**UNKNOWN**	**LAND OR LAND SURFACE IMPACT**
3960	**2001**	**10**	**SR 4 NEAR NORTH JUNCTION**	**CALYBURN TWP**	**CREEK**	**DA / CUT OR BREAK**	**TRANSPORTATION - CAR - ENGINE OR FUEL SUPPLY**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
4120	**1997**	**10**	**COBBHARRIMAN RD AT BRIDGE**	**JACKSON TWP**	**RUCH CREEK**	**OTHER**	**FIXED FACILITY - GOVERNMENT - OTHER**	**UNKNOWN**	**SURFACE WATER/STORM SEWERS**
4211	**2000**	**11**	**FISCHER ST AT THE RIDGEWOOD WWTP**	**RICHWOOD**	**UNK CREEK**	**DUMPING / DISPOSAL**	**UNKNOWN**	**0 - 499 GAL OR 0 - 3999 LBS**	**SURFACE WATER/STORM SEWERS**
4312	**2002**	**11**	**31310 SR 31**	**RICHWOOD**	**N/A**	**PUNCTURE**	**TRANSPORTATION - TRUCK - OTHER**	**0 - 499 GAL OR 0 - 3999 LBS**	**LAND OR LAND SURFACE IMPACT**
Wyandot County									
1615	2001	5	FARMER COMMISSION COMPANY	UNKNOWN	SR 23	DA / CUT OR BREAK	TRANSPORTATION - FARM EQUIPMENT - LINE LEAK	0 - 499 GAL OR 0 - 3999 LBS	LAND OR LAND SURFACE IMPACT

Appendix 3I
Land use type description for 2003 data

CE S202.046 17 North-Central Interior Dry-Mesic Oak Forest and Woodland

This system is found throughout the glaciated regions of the Midwest, typically in gently rolling landscapes. It can occur on uplands within the prairie matrix and near floodplains, or on rolling glacial moraines and among kettle-kame topography. Soils are typically well-drained Mollisols or Alfisols that range from loamy to sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. Well over 700,000 hectares likely occurred in southern Michigan alone ca. 1800. It is distinct from other forested systems within the region by a dry-mesic edaphic condition that is transitional between dry oak forests and woodlands and mesic hardwood forests, such as maple-basswood forests. Forest cover can range from dense to moderately open canopy, and there is commonly a dense shrub layer. Fire-resistant oak species, in particular Quercus macrocarpa, Quercus rubra, and/or Quercus alba, dominate the overstory. Carya spp., including Carya ovata, Carya cordiformis, and Carya alba (= Carya tomentosa) are diagnostic in portions of the range of this system. Depending on range of distribution, and overstory canopy density, the understory may include species such as Corylus americana, Amelanchier spp., Maianthemum stellatum, Caulophyllum thalictroides, Laportea canadensis, Trillium grandiflorum, Aralia nudicaulis, and Urtica dioica. Occasionally, prairie grasses such as Andropogon gerardii and Panicum virgatum may be present. Fire constitutes the main natural process for this type and likely maintained a more open canopy structure to support oak regeneration. Historic fire frequency was likely highest in the prairie-forest border areas. Fire suppression may account for the more closed oak forest examples of this system with the more mesic understory. It likely has allowed for other associates such as Acer saccharum, Celtis occidentalis, Liriodendron tulipifera, Ostrya virginiana, and Juglans nigra to become more prevalent, especially in upland areas along floodplains. Extensive conversion for agriculture has fragmented these systems. Continued fire suppression has also resulted in succession to mesic hardwoods, such that in many locations, no oak species are regenerating. Remaining large areas of this system are likely under considerable pressure due to conversion to agriculture, pastureland, and urban development.

CE S202.047 18 North-Central Interior Dry Oak Forest and Woodland

This system is found throughout the glaciated regions of the Midwest, typically in gently rolling to flat landscapes. It can occur on uplands within the prairie matrix or within the context of dry-mesic oak-hickory forests and oak savanna. These are common on rolling glacial moraines and outwash plains. Soils are typically well-drained to excessively drained Mollisols or Alfisols that range from sand or sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. It is distinct from other forested systems within the region by a dry edaphic condition that is transitional between dry prairies, oak barrens or savannas, and dry-mesic oak-hickory forests and woodlands. Forest cover can range from dense to moderately open canopy. Fire-resistant oak species, in particular *Quercus velutina, Quercus macrocarpa, Quercus coccinea*, and *Quercus ellipsoidalis*, dominate the

overstory. *Carya glabra*, *Prunus serotina*, and *Sassafras albidum* are also common in portions of the range of this system. Depending on range of distribution and overstory canopy density, the understory may include species such as *Gaylussacia baccata* (in MI, WI, and MN), *Vaccinium angustifolium*, and *Rhus aromatica* and/or a mixture of woodland and grassland species including *Schizachyrium scoparium*, *Deschampsia flexuosa*, and *Carex pensylvanica*. Extreme drought, along with periodic ground fire and crown fire events, constitute the main natural processes for this type and likely maintained a more open canopy structure that supports oak regeneration. In fact, many current examples of this type have resulted from long-term fire suppression and conversion of oak barrens to these forests and woodlands. Fire suppression may also account for examples of this system with the more dry-mesic understory. It likely has allowed for other associates such as *Quercus rubra*, and *Fraxinus americana* to become more prevalent. Extensive conversion for agriculture in surrounding landscape with more productive soils has fragmented and isolated examples of these systems. This system is found primarily within the "corn belt" of the United States, and remaining large areas of this system are likely under considerable pressure due to conversion to pastureland, and urban development.

CE S202.693 32 North-Central Interior Beech-Maple Forest

This system is found primarily along the southern Great Lakes ranging from central Indiana to southern Ontario. It is typically found on flat to rolling uplands to steep slopes with rich loam soils over glacial till. This system is characterized by a dense tree canopy that forms a thick layer of humus and leaf litter leading to dense and rich herbaceous layer. *Acer saccharum* and *Fagus grandifolia* comprise up to 80% of the canopy. Other associates can include *Quercus rubra*, *Tilia americana*, *Carpinus caroliniana*, and *Ostrya virginiana*. The relative dominance of sugar maple compared to other tree species varies across the range of this system based on regional climate and microclimate. The herbaceous layer is very diverse and typically includes spring ephemerals. Some common species include *Arisaema triphyllum*, *Galium aparine*, *Osmorhiza claytonii*, *Polygonatum biflorum*, and *Trillium grandiflorum*. The primary natural dynamic influencing this system includes wind-driven gap dynamics. Conversion to agriculture has significantly decreased the range of this system and very few large stands remain intact.

CE S202.694 33 North-Central Interior Floodplain

This system is found along rivers across the glaciated Midwest. It occurs from river's edge across the floodplain or to where it meets a wet meadow system. It can have a variety of soil types found within the floodplain from very well-drained sandy substrates to very dense clays. It is this variety of substrates and flooding that creates the mix of vegetation that includes *Acer saccharinum*, *Populus deltoides*, willows, especially *Salix nigra* in the wettest areas, and *Fraxinus pennsylvanica*, *Ulmus americana*, and *Quercus macrocarpa* in more well-drained areas. Within this system are oxbows that may support *Nelumbo lutea* and *Typha latifolia*. Understory species are mixed, but include shrubs, such as *Cornus drummondii* and *Asimina triloba* (in Kansas), sedges and grasses, which sometimes help form savanna vegetation. Flooding is the primary dynamic process, but drought, grazing, and fire have all had historical influence on this system. Federal

reservoirs have had a serious and negative effect on this system, along with agriculture that has converted much of this system to drained agricultural land.

CE S202.700 34 North-Central Interior Wet Flatwoods

This small-patch system is found throughout the northern glaciated Midwest ranging east into Lower New England. It usually occurs on poorly drained uplands or in depressions associated with glacial features such as tillplains, lakeplains or outwash plains. Soils often have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary with ponding common during wetter seasons and drought possible during the summer and autumn months. These fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this system. *Quercus palustris* typically dominates and is often associated with *Quercus bicolor* and *Acer rubrum*. *Liquidambar styraciflua* and *Nyssa sylvatica* are also common associates. Some examples in Michigan, Indiana, Ohio, and southern Ontario are dominated by *Fagus grandifolia* associated with oak (*Quercus* spp.) and maple species (*Acer* spp.). Understory herbaceous and shrub species present in examples of this system can vary. Some common species include *Carex* spp., *Osmunda cinnamomea*, *Cephalanthus occidentalis*, *Alnus* spp., and *Ilex* spp. Flooding, drought and fire can influence this system.

CE S202.701 35 North-Central Interior Shrub Swamp - Wet Meadow and Marsh

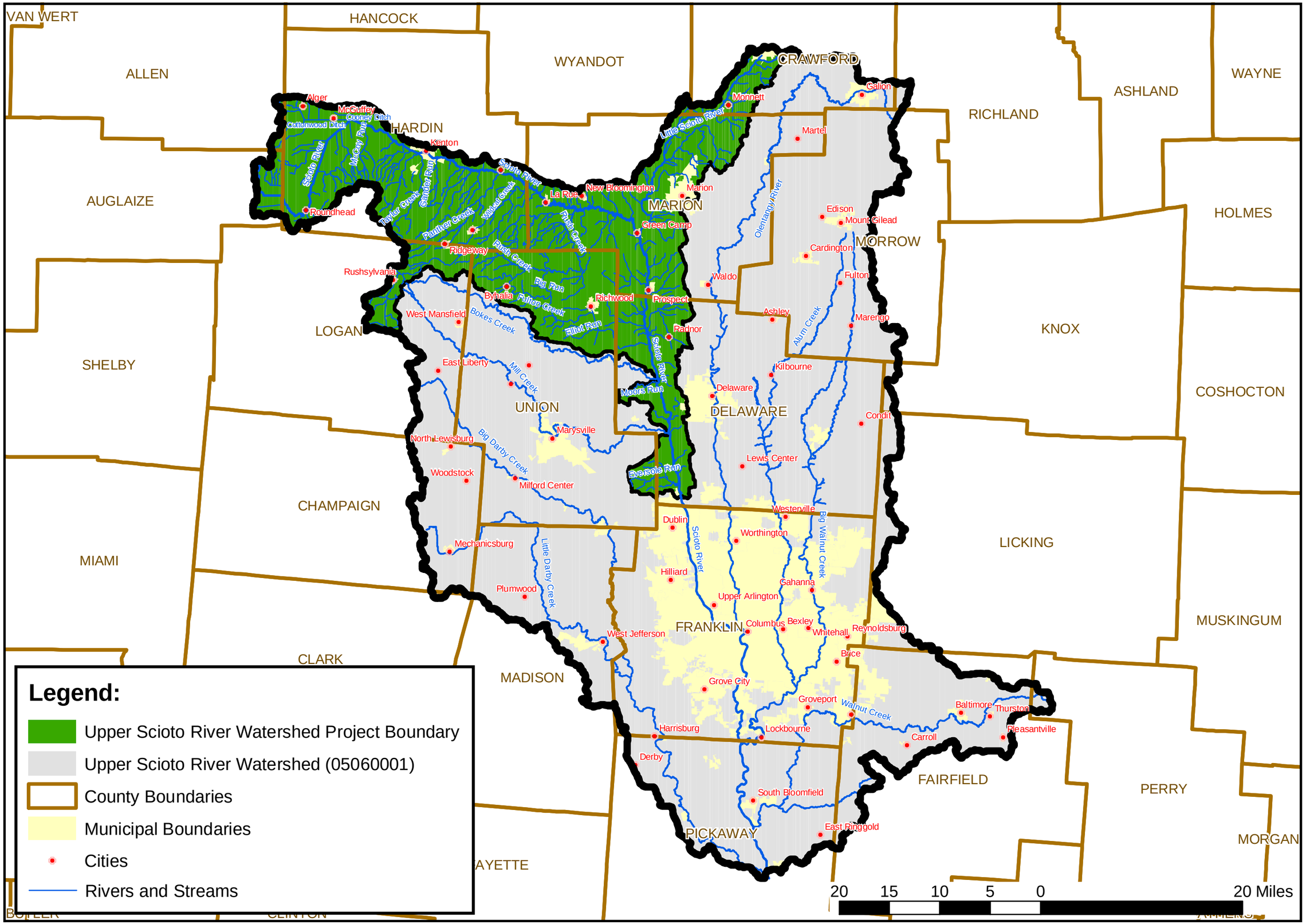
This system is found throughout the northern Midwest ranging into southern Canada. It is typically found on glacial potholes, river valleys, ponds, channels in glacial outwash and on lakeplains. This system contains a deep to shallow area of freshwater marsh dominated by emergent species surrounded by a zone of wet meadow. The emergent marsh zone within this system contains hydric soils flooded by water ranging from several centimeters to over 1 meter for most of the growing season. Emergent marsh species such as *Typha* spp. and *Schoenoplectus* spp. dominate the core of this system. Wet meadows can surround the emergent marsh core along wet mineral soils, or shallow peat with the water table typically just below the surface for most of the growing season. The vegetation in this zone of the system is dominated by sedges (*Carex* spp.) and grasses such as *Calamagrostis canadensis*. Shrub swamps can also be associated with the wet meadows within this system. Typical shrub species include *Cornus* spp., *Salix* spp., and/or *Cephalanthus occidentalis*. Fire originating in adjacent uplands, as well as hydrology, can influence this system. In the absence of fire, drought and/or ditching can increase the proportion of shrubs compared to the wet meadow.

CE S202.702 36 North-Central Interior Shrub-Graminoid Alkaline Fen

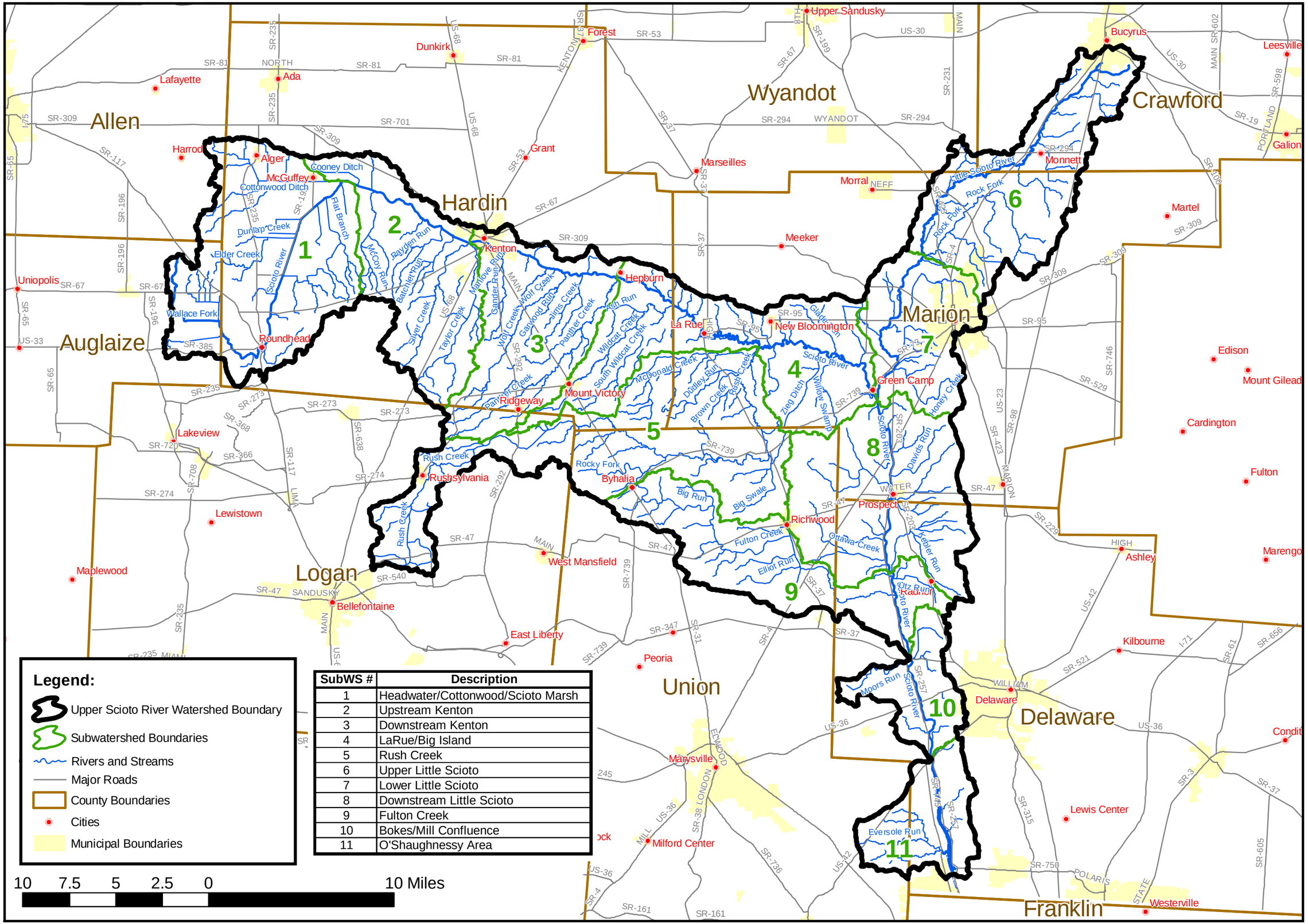
This fen system is found in the glaciated portions of the Midwest and southern Canada. Examples of this system can be located on level to sloping seepage areas, in pitted outwash or in kettle lakes associated with kettle-kame-moraine topography. Groundwater flows through marls and shallow peat soils typically minerotrophic and slightly alkaline. Examples of this system contain a core fen area of graminoids surrounded by shrubs and tall-shrubs with a fairly continuous sphagnum moss. Herbaceous and shrub cover is variable with little to no tree cover. Characteristic species include prairie grasses such as

Andropogon gerardii and *Spartina pectinata* with prairie forbs and sedges, *Carex* spp. Common shrub species include *Dasiphora fruticosa ssp. floribunda, Cornus* spp., and *Salix* spp. Alterations in wetland hydrology and agricultural development can threaten examples of this system.

Upper Scioto River Watershed
Map #1
8-digit HUC Overview

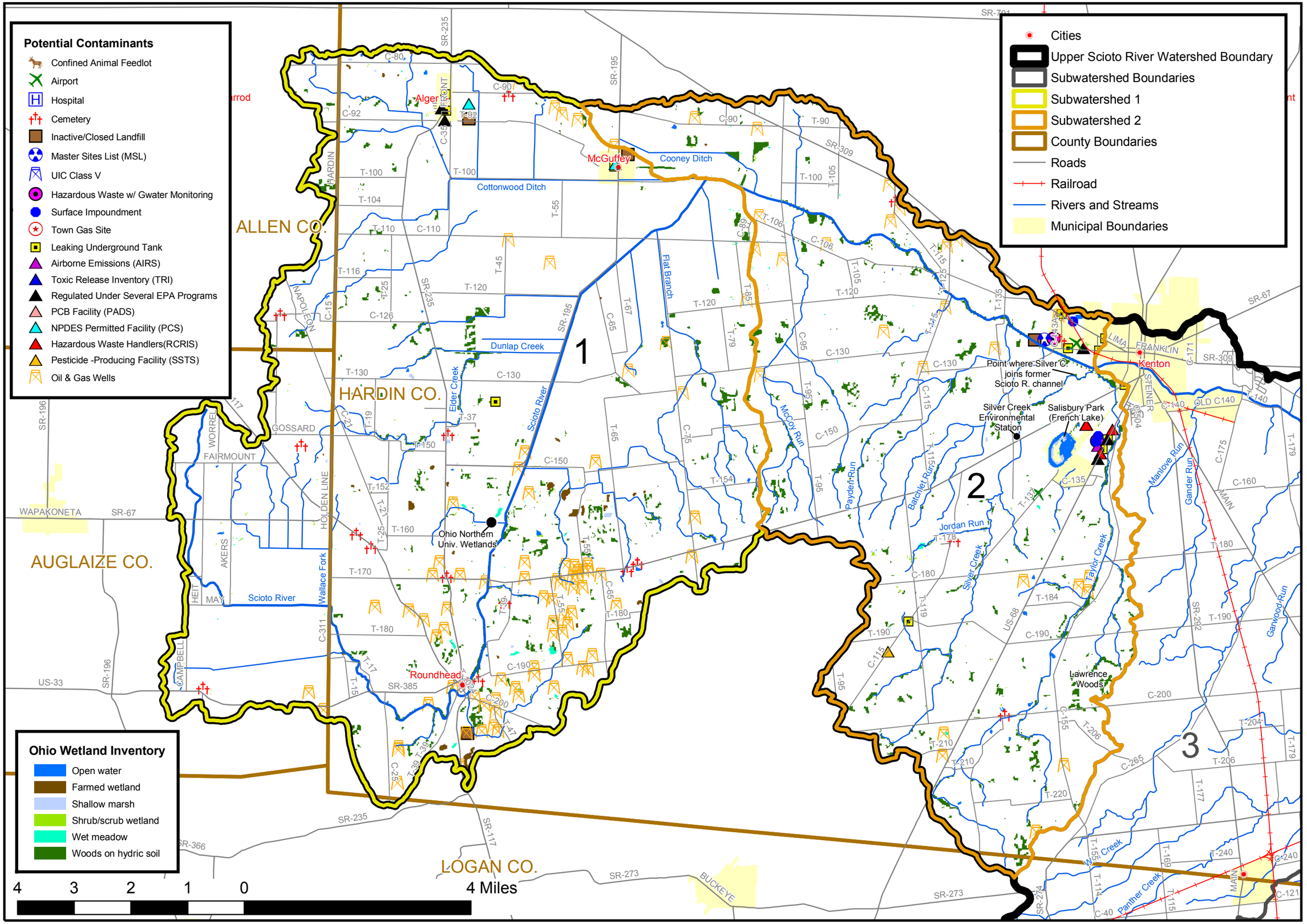


Upper Scioto River Watershed
Map #2
Project Area Overview

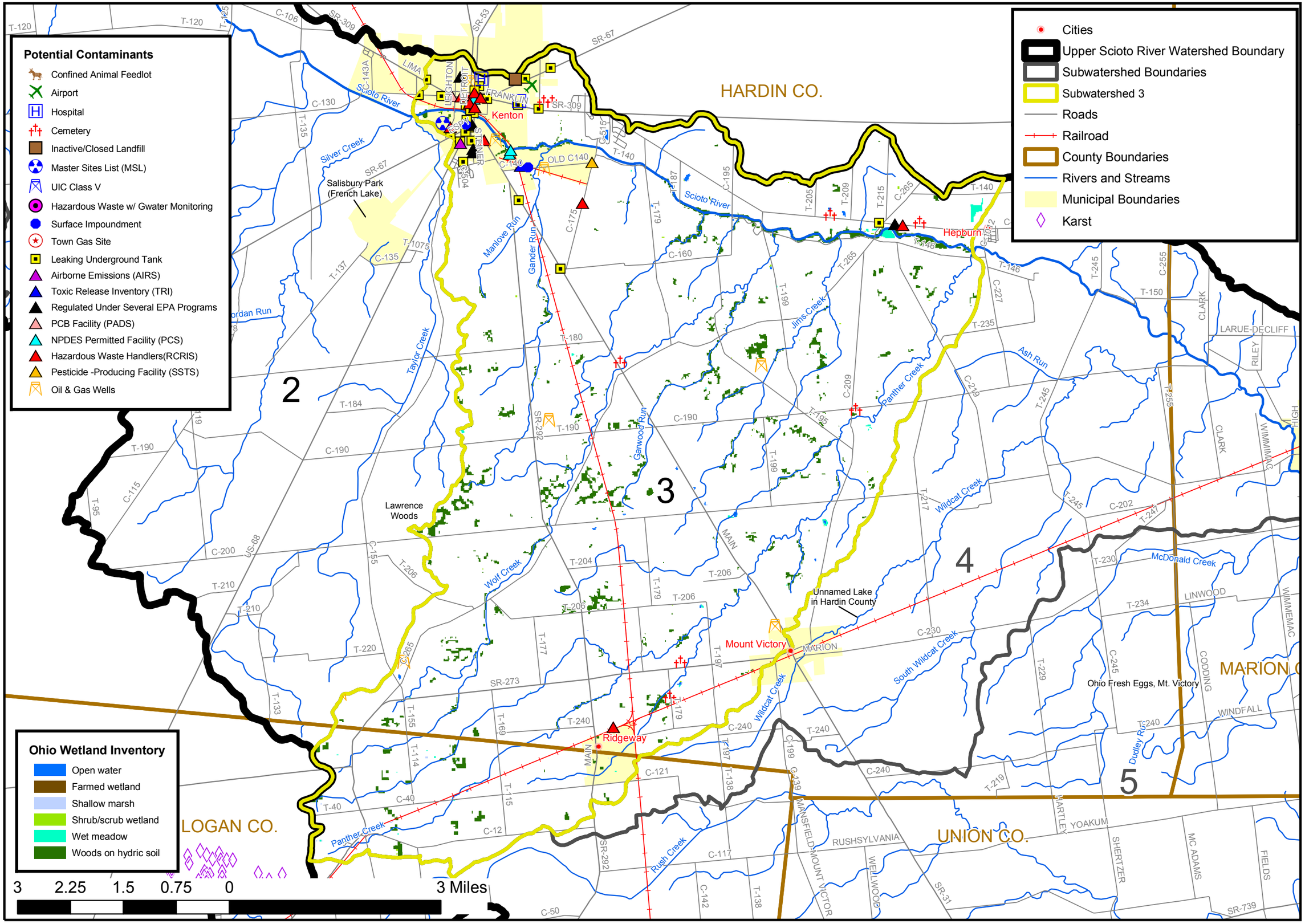


SubWS #	Description
1	Headwater/Cottonwood/Scioto Marsh
2	Upstream Kenton
3	Downstream Kenton
4	LaRue/Big Island
5	Rush Creek
6	Upper Little Scioto
7	Lower Little Scioto
8	Downstream Little Scioto
9	Fulton Creek
10	Bokes/Mill Confluence
11	O'Shaughnessy Area

Upper Scioto River Watershed Map #3 Subwatersheds 1 & 2

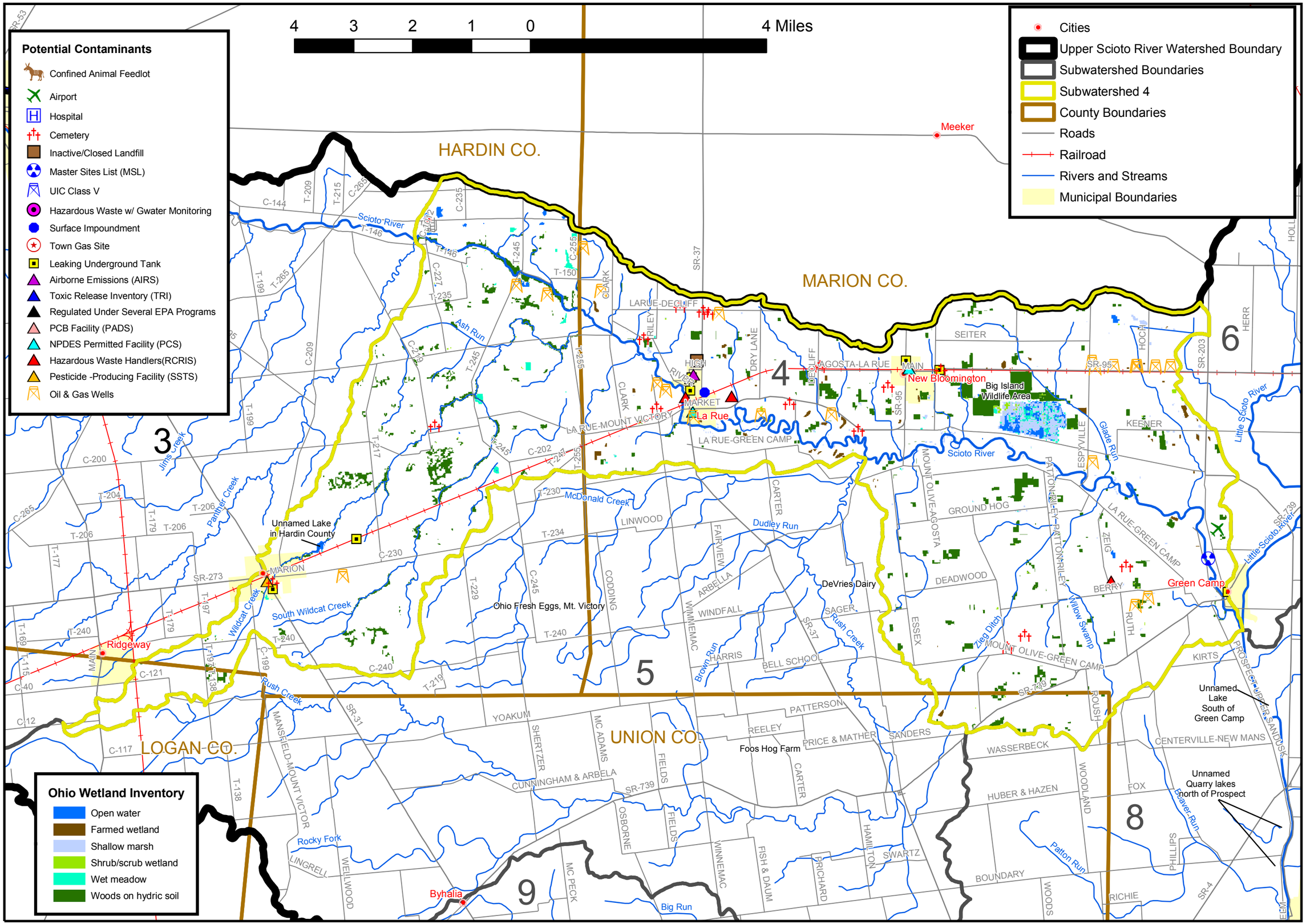


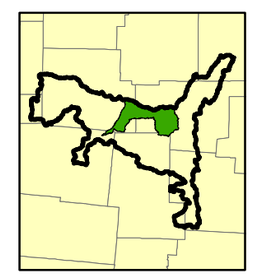
Upper Scioto River Watershed Map #4 Subwatershed 3



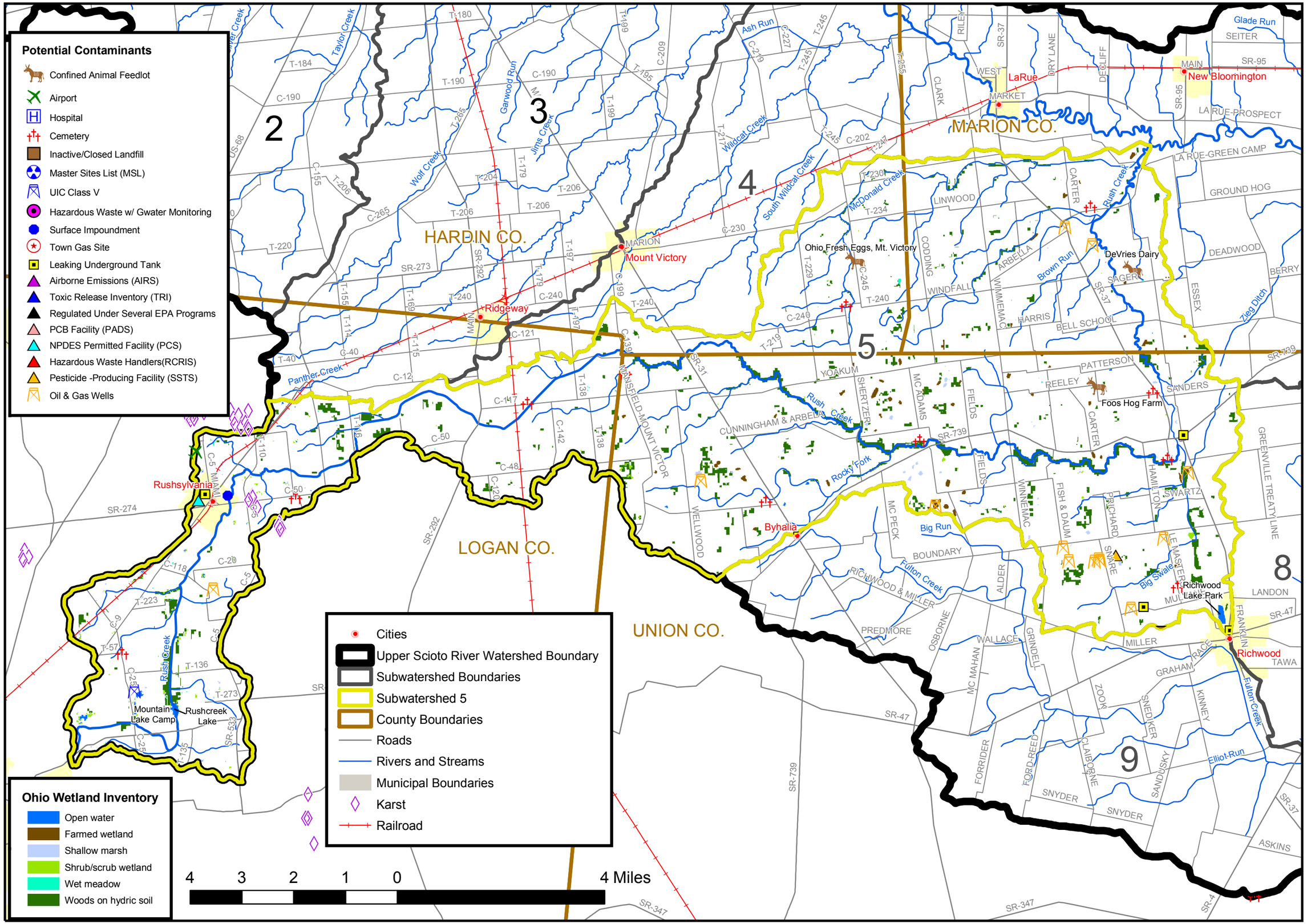
Upper Scioto River Watershed

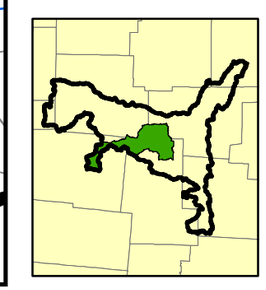
Upper Scioto River Watershed Map #5 Subwatershed 4



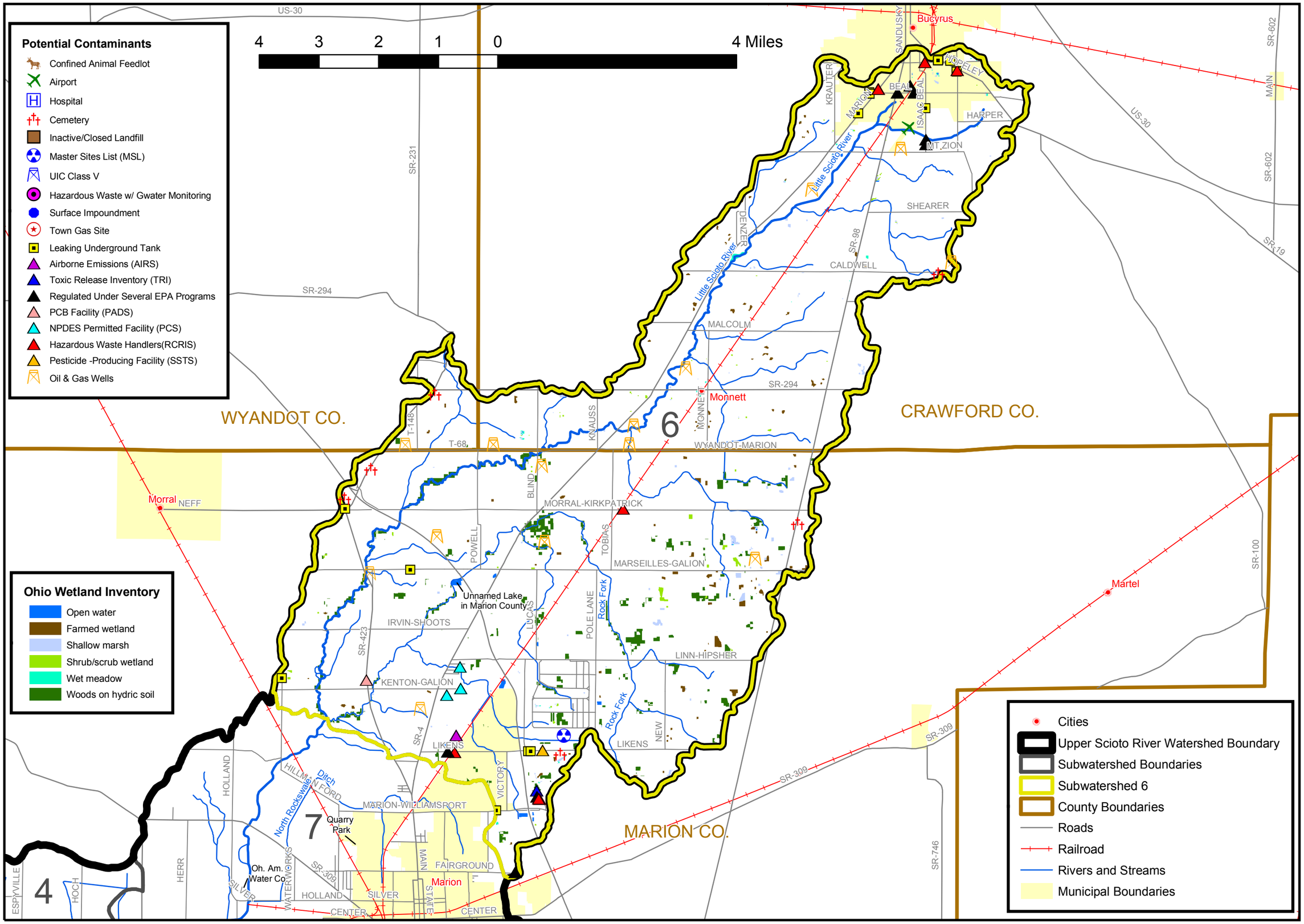


Upper Scioto River Watershed Map #6 Subwatershed 5

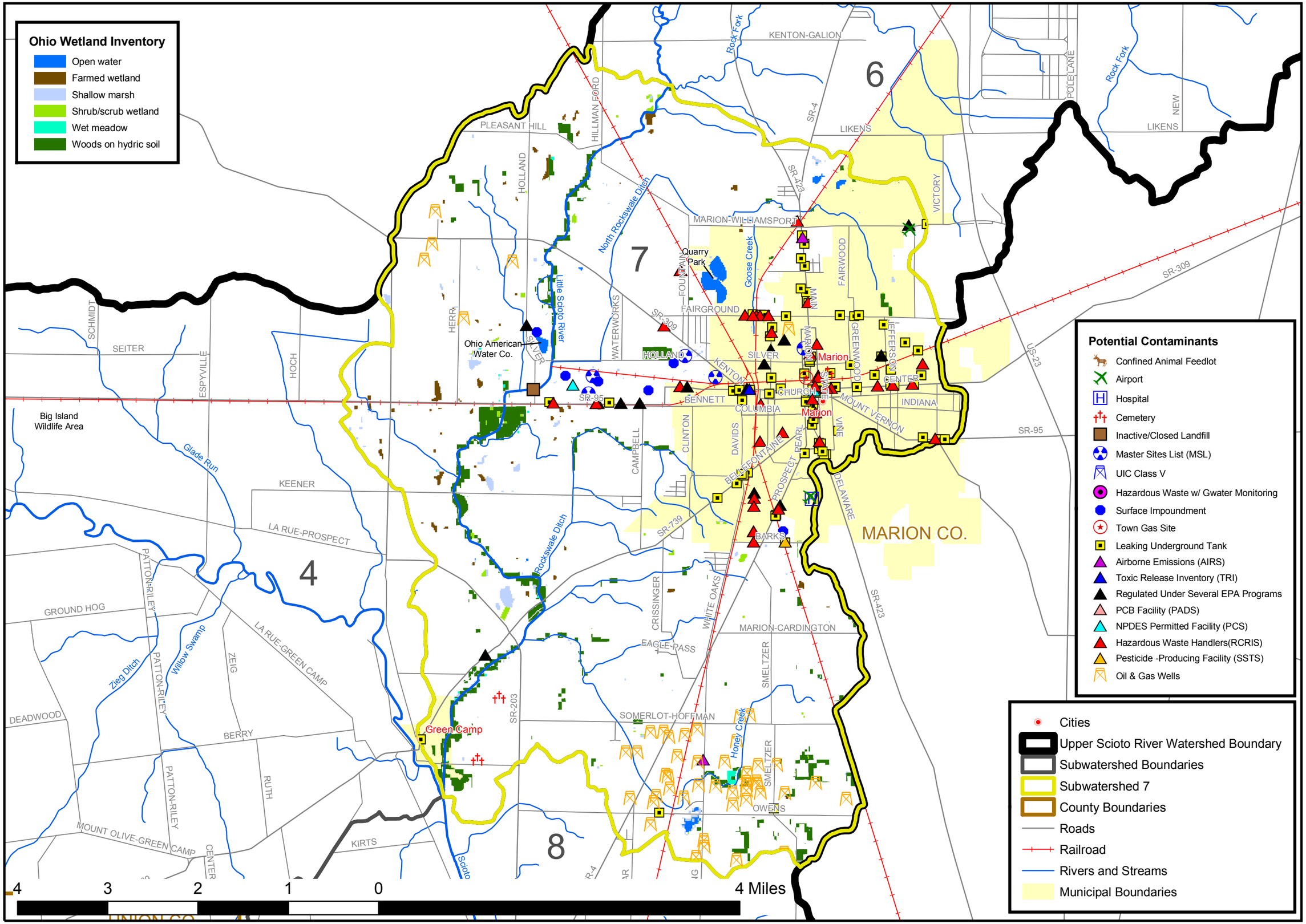




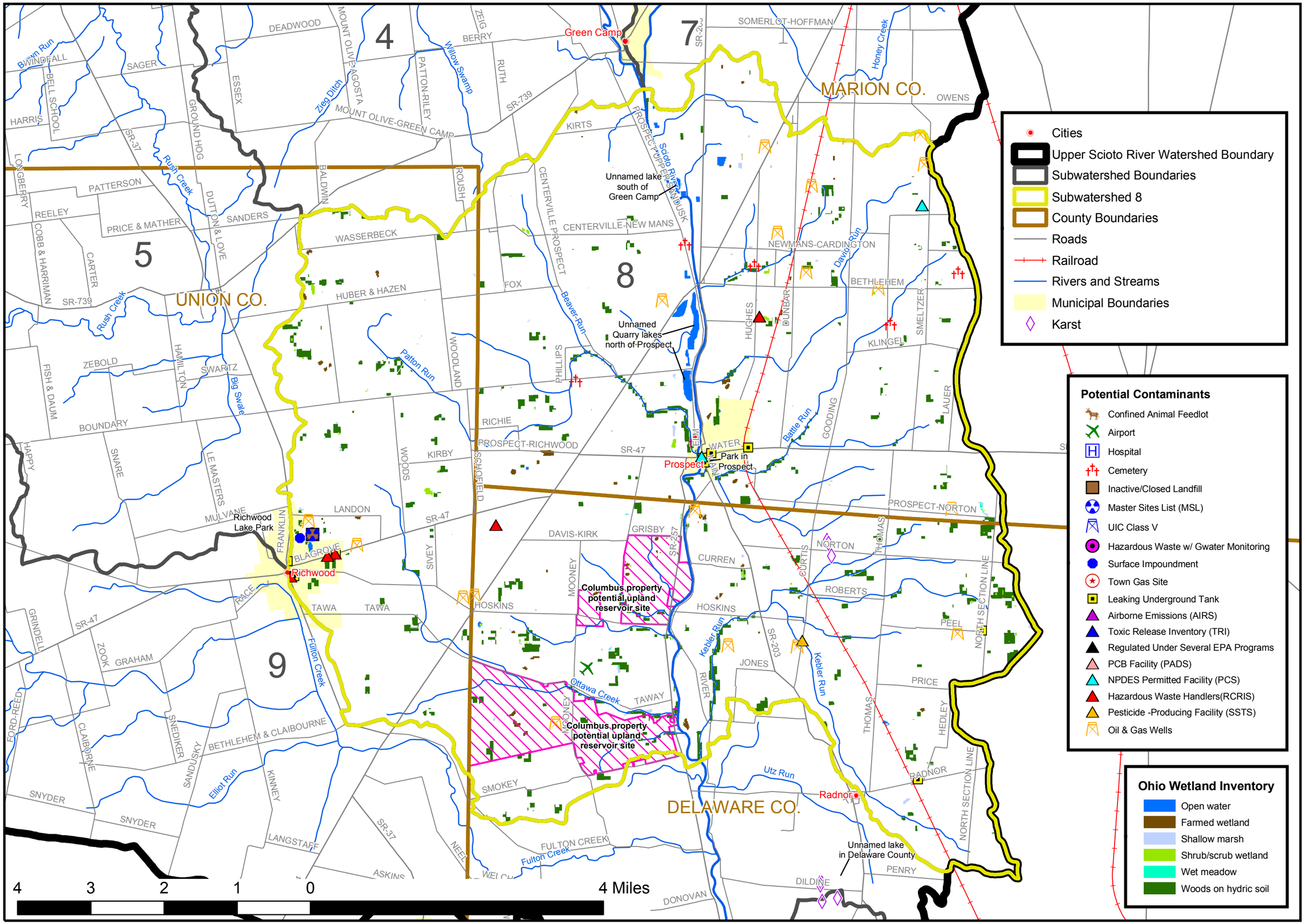
Upper Scioto River Watershed Map #7 Subwatershed 6



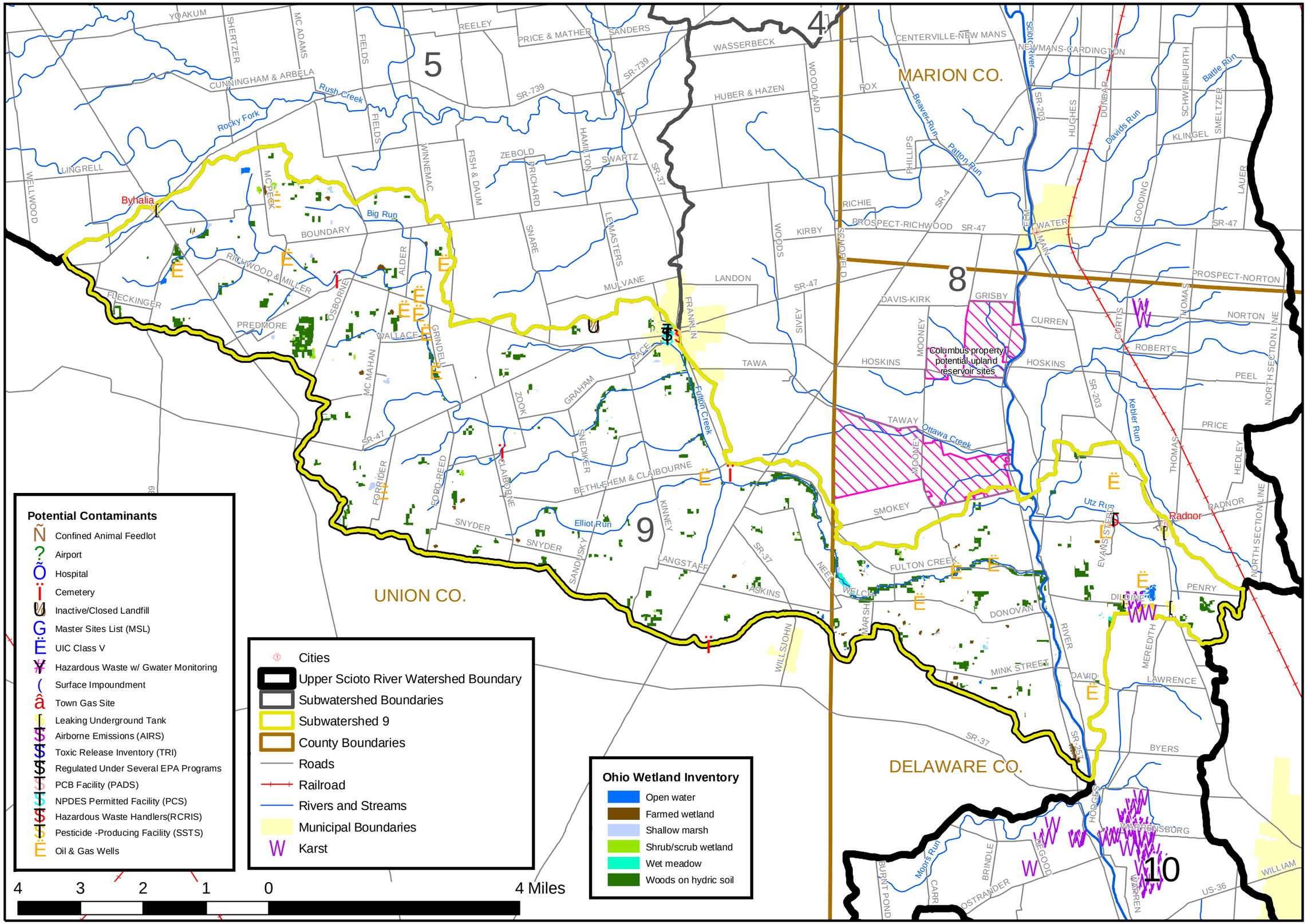
Upper Scioto River Watershed
Map #8
Subwatershed 7



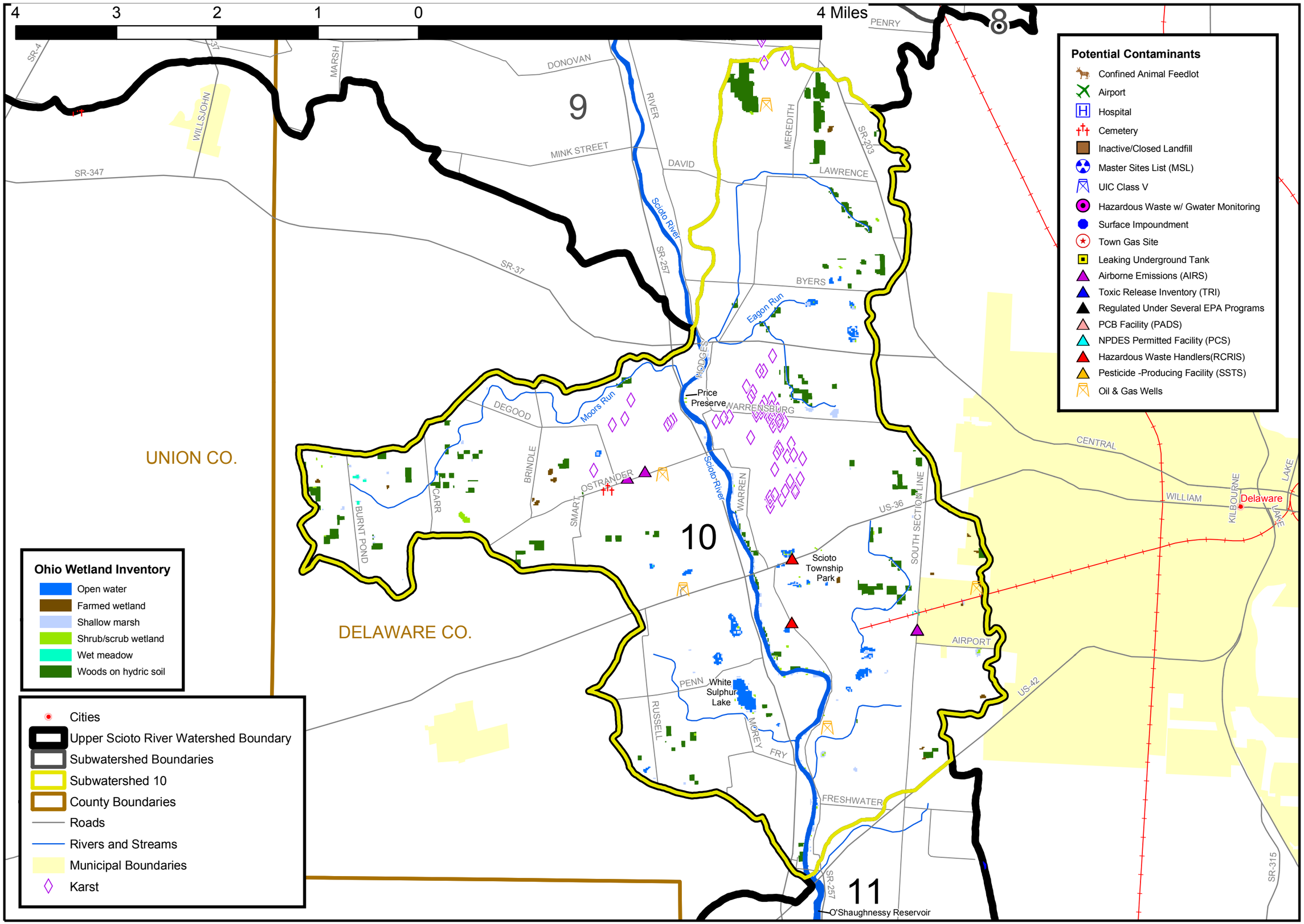
Upper Scioto River Watershed
Map #9
Subwatershed 8



Upper Scioto River Watershed
Map #10
Subwatershed 9



Upper Scioto River Watershed
Map #11
Subwatershed 10



Upper Scioto River Watershed
Map #12
Subwatershed 11

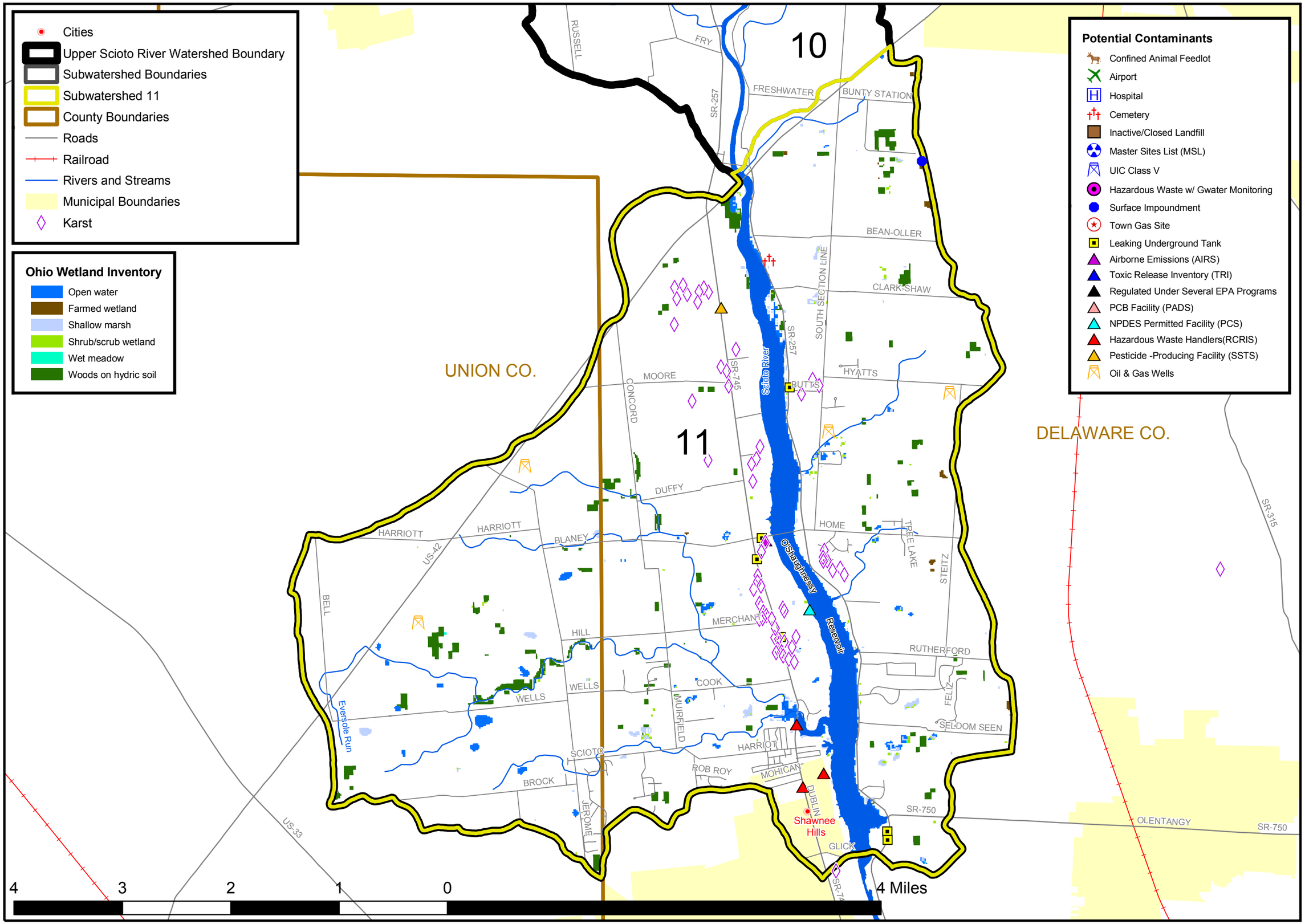
- Cities
- Upper Scioto River Watershed Boundary
- Subwatershed Boundaries
- Subwatershed 11
- County Boundaries
- Roads
- Railroad
- Rivers and Streams
- Municipal Boundaries
- Karst

Ohio Wetland Inventory

- Open water
- Farmed wetland
- Shallow marsh
- Shrub/scrub wetland
- Wet meadow
- Woods on hydric soil

Potential Contaminants

- Confined Animal Feedlot
- Airport
- Hospital
- Cemetery
- Inactive/Closed Landfill
- Master Sites List (MSL)
- UIC Class V
- Hazardous Waste w/ Gwater Monitoring
- Surface Impoundment
- Town Gas Site
- Leaking Underground Tank
- Airborne Emissions (AIRS)
- Toxic Release Inventory (TRI)
- Regulated Under Several EPA Programs
- PCB Facility (PADS)
- NPDES Permitted Facility (PCS)
- Hazardous Waste Handlers(RCRIS)
- Pesticide -Producing Facility (SSTS)
- Oil & Gas Wells



Upper Scioto River Watershed

N
W E
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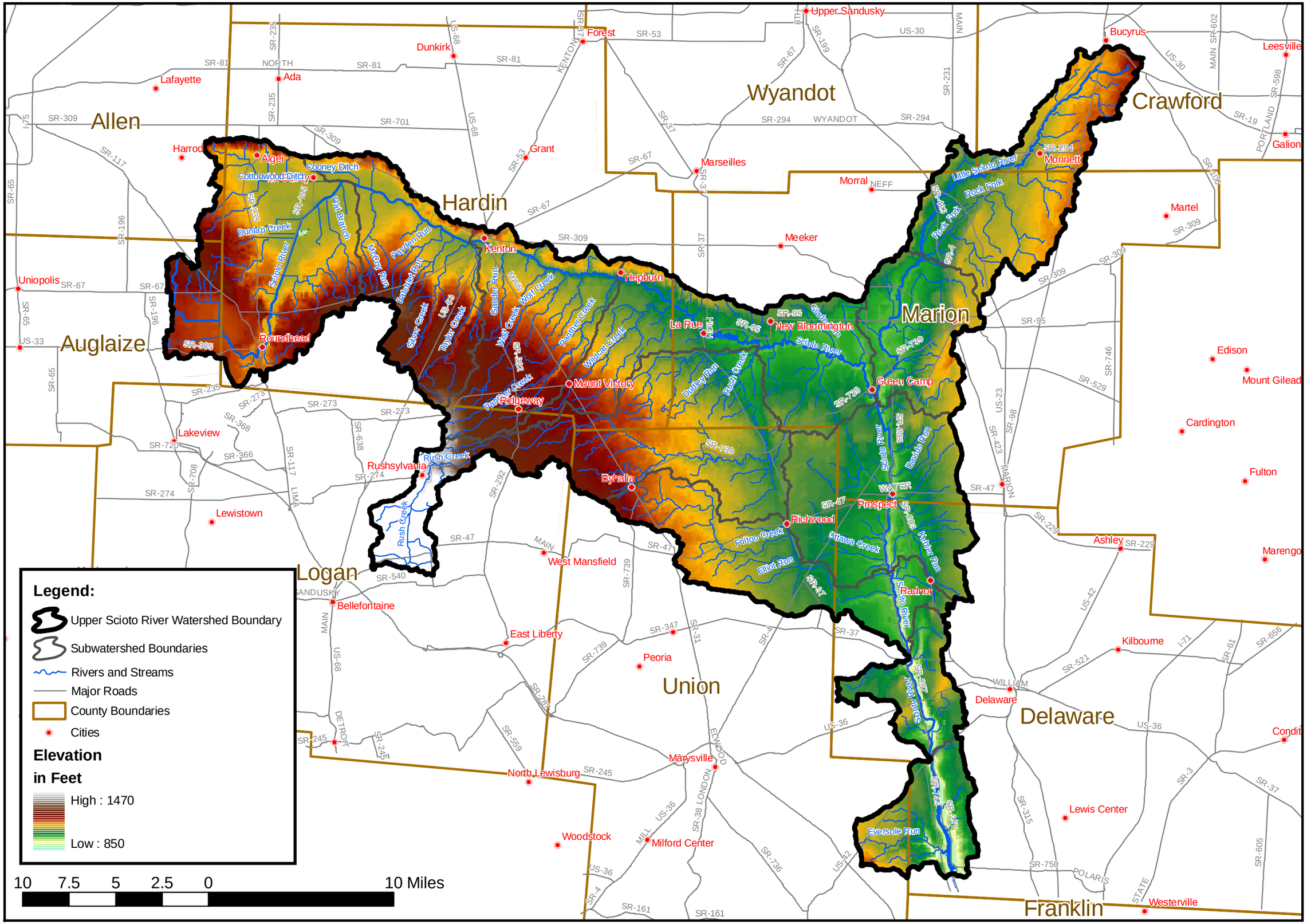
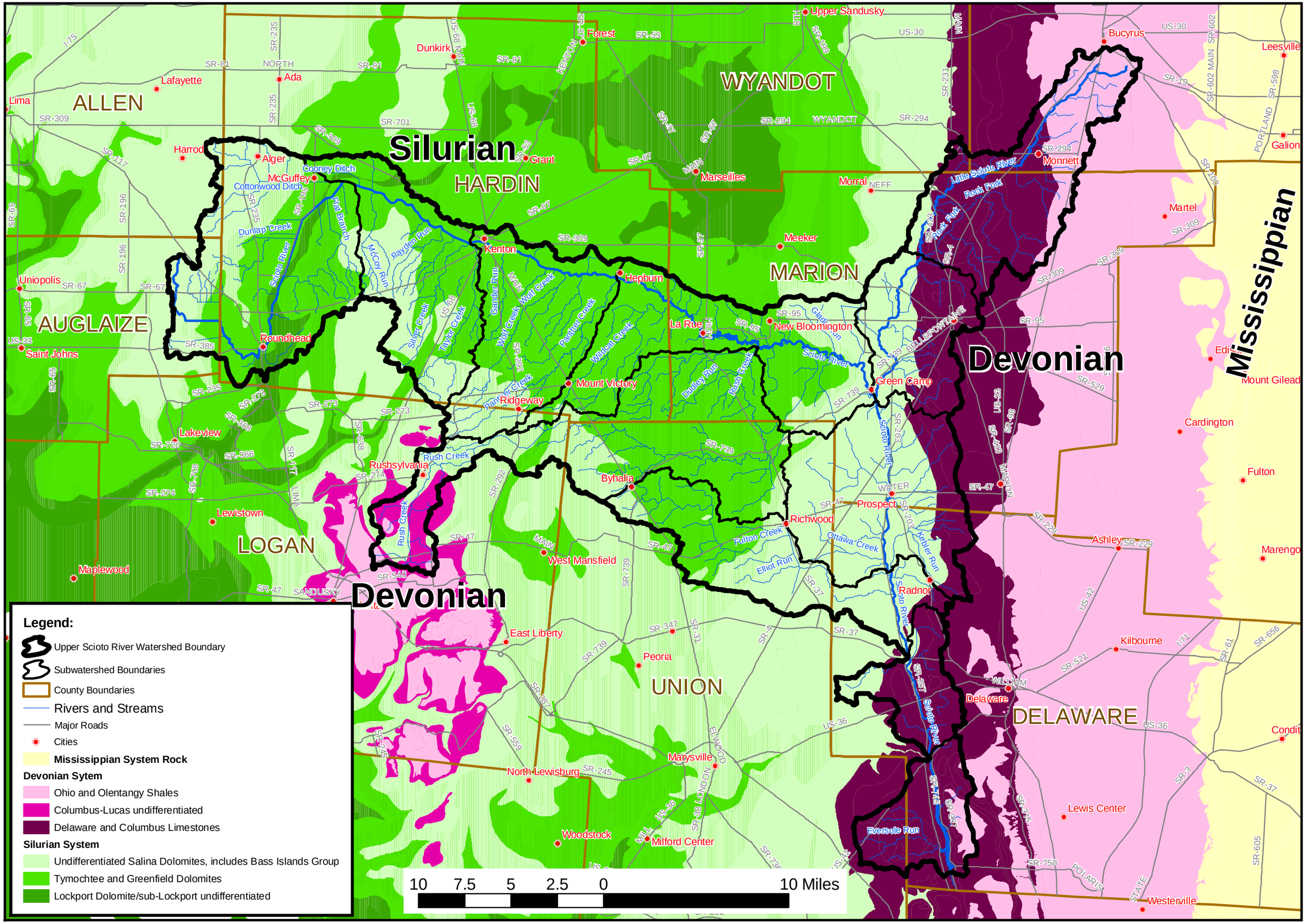
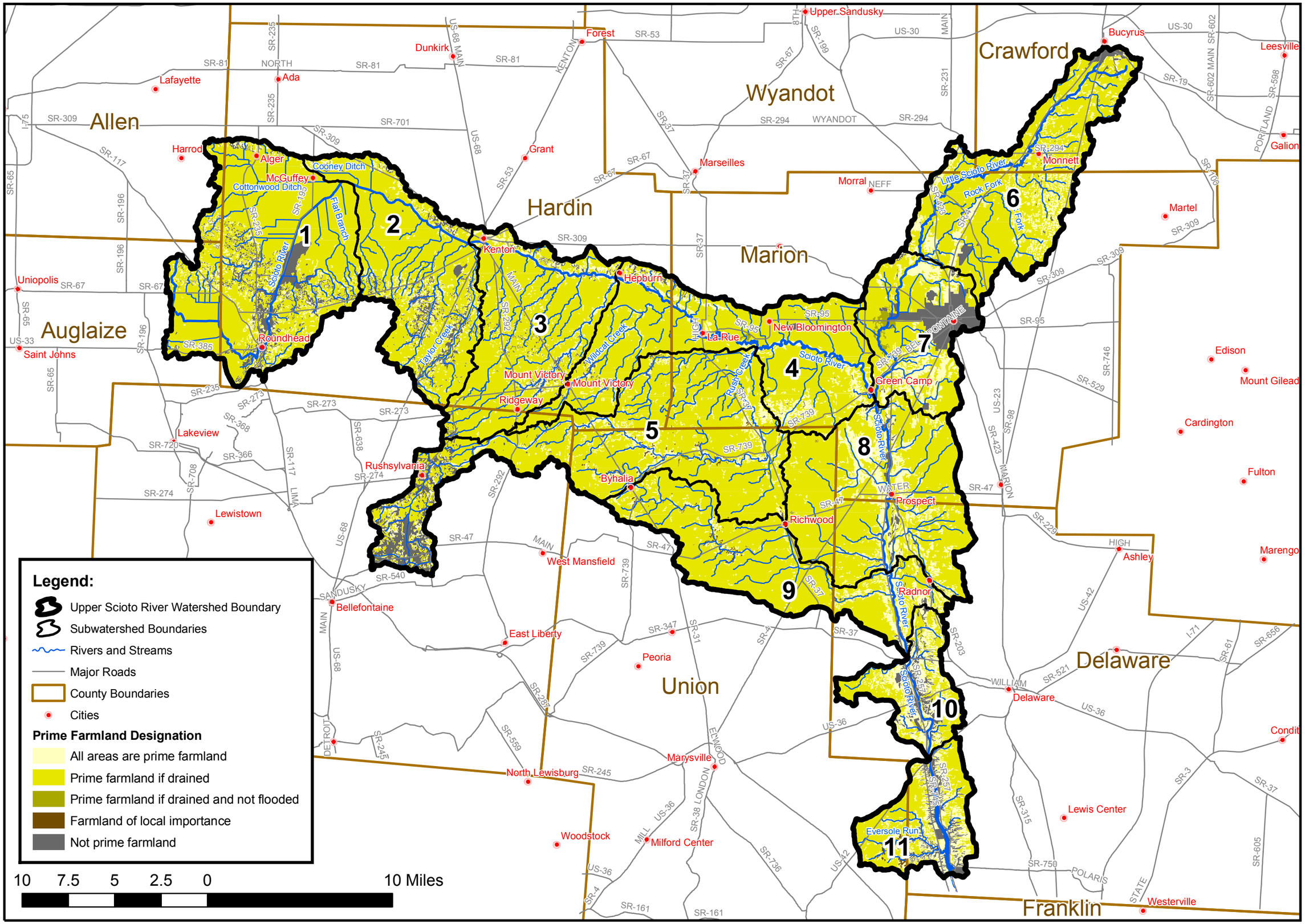
Upper Scioto River Watershed Map #13 Topography



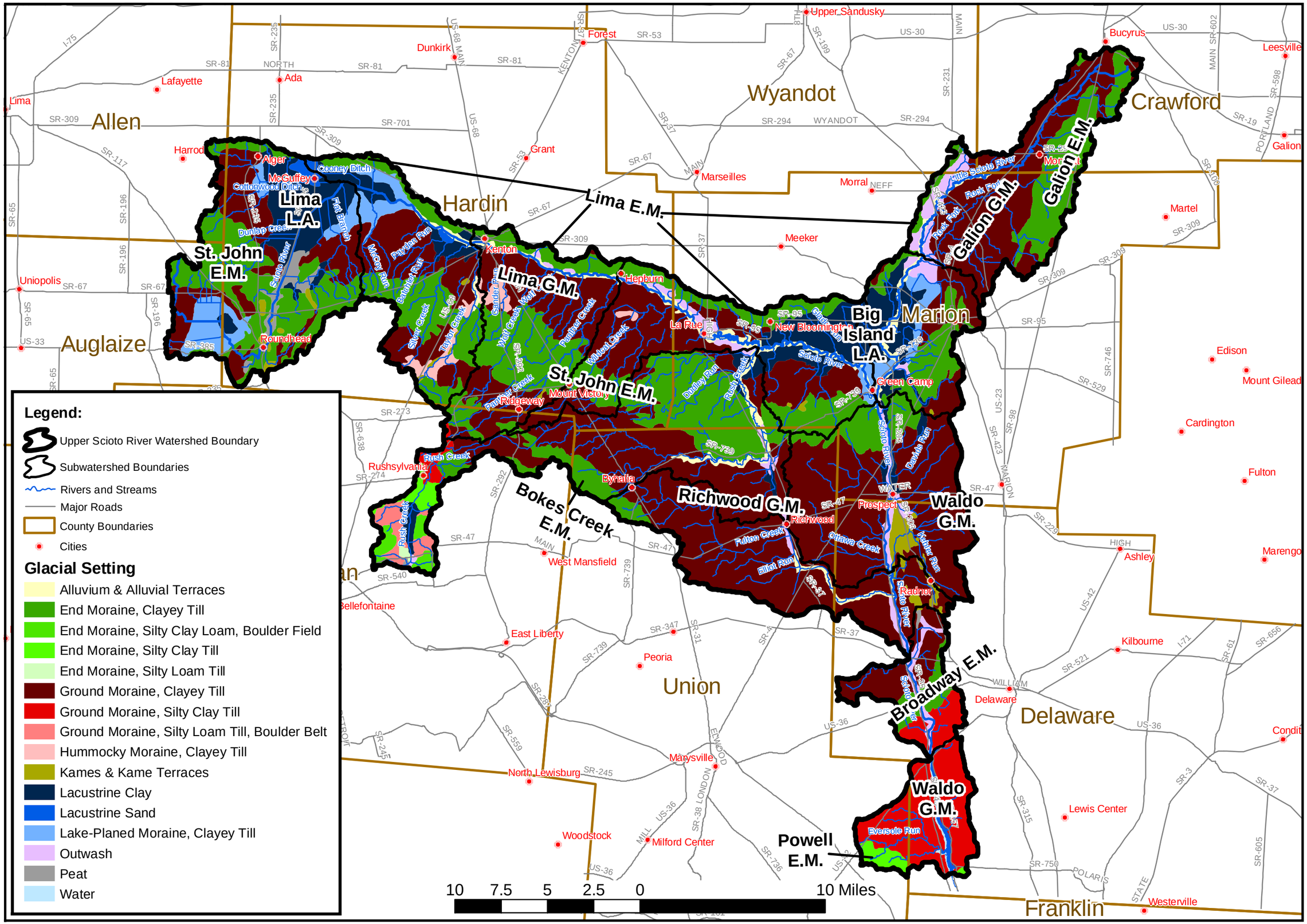
Upper Scioto River Watershed
Map #14
Geology - Bedrock



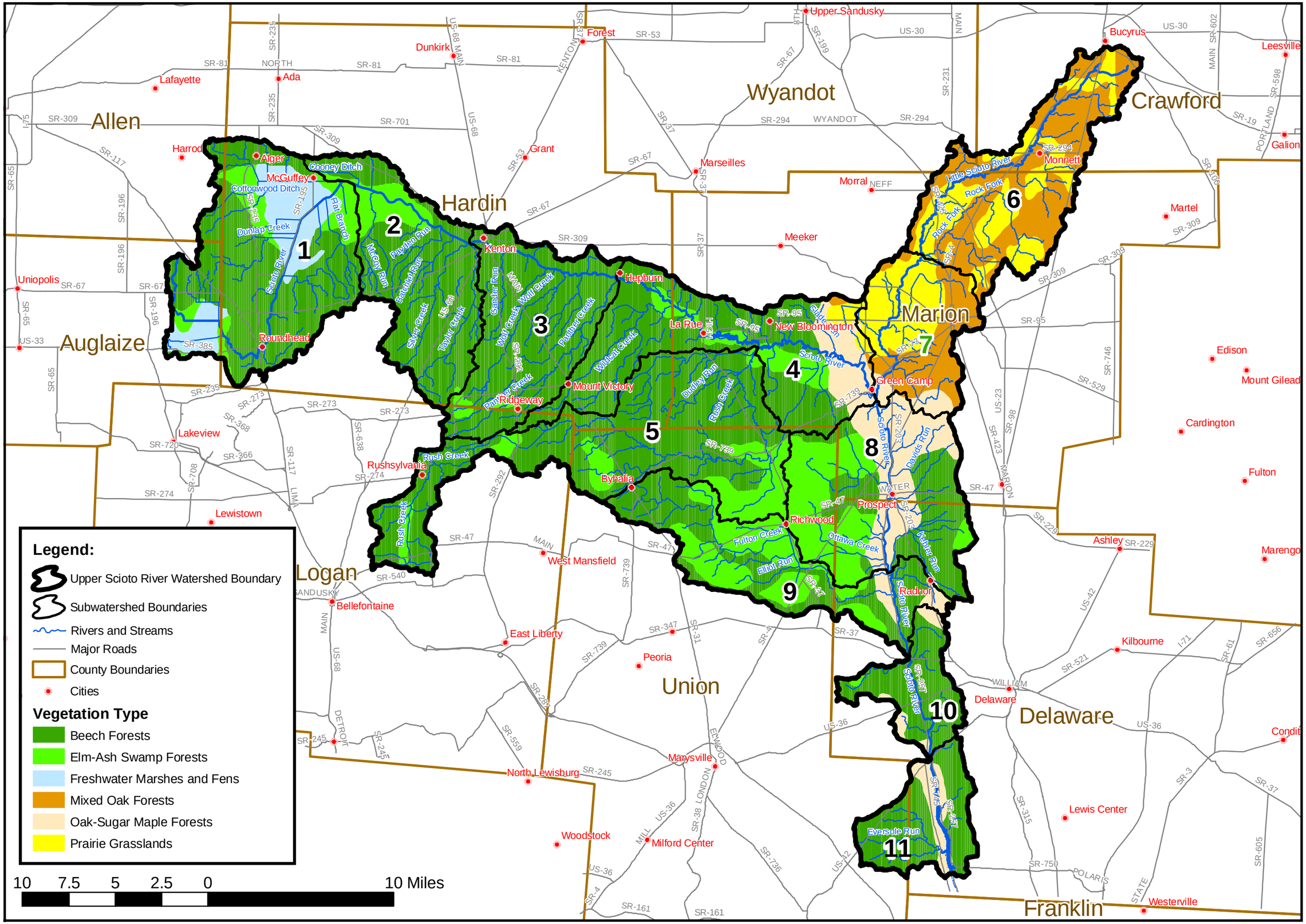
Upper Scioto River Watershed
Map #15
Prime Farmland by Soil Type

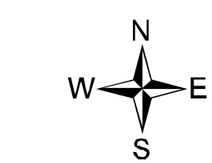


Upper Scioto River Watershed Map #16 Glacial Features

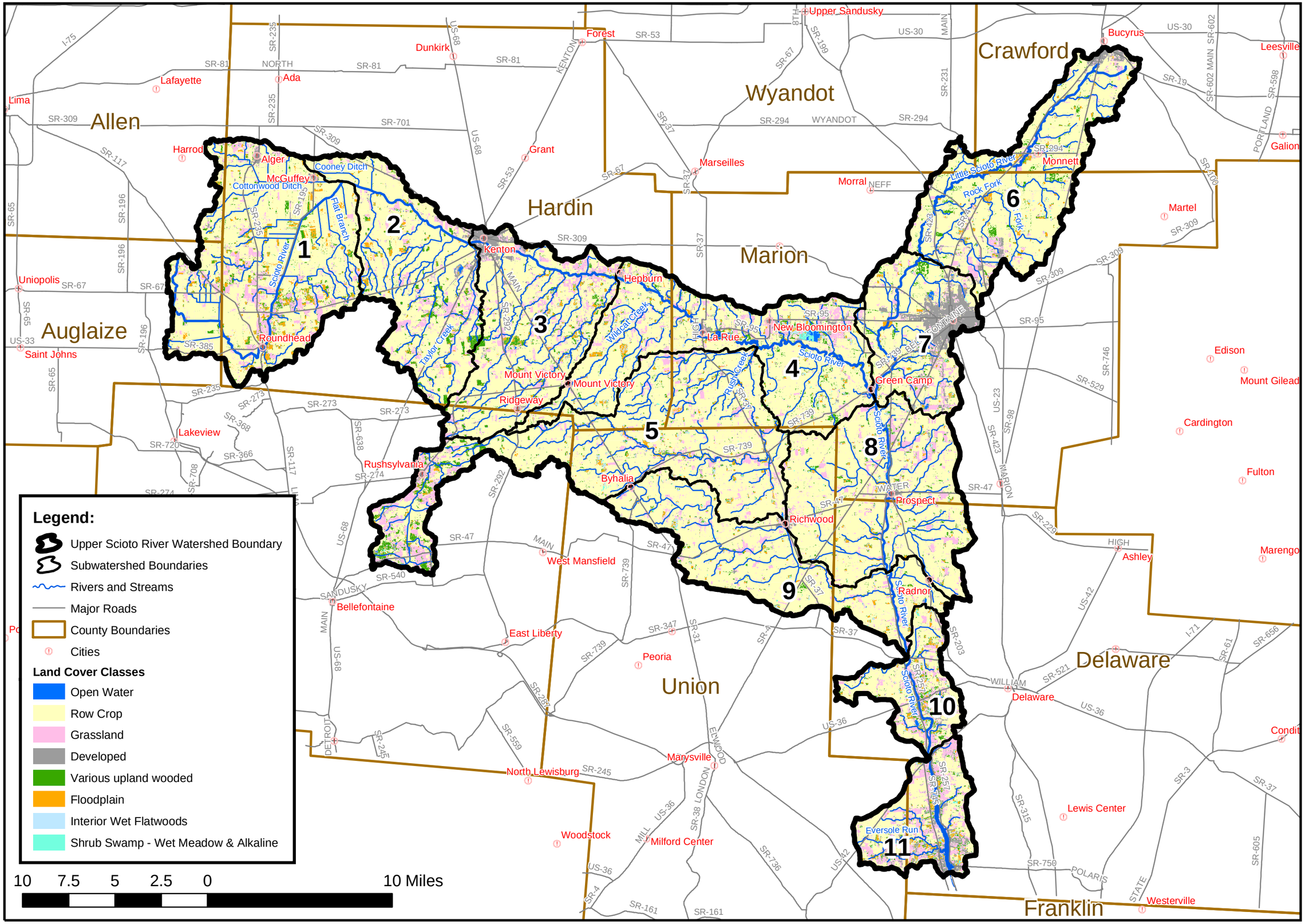


Upper Scioto River Watershed Map #17 Vegetation at the Time of Earliest Surveys



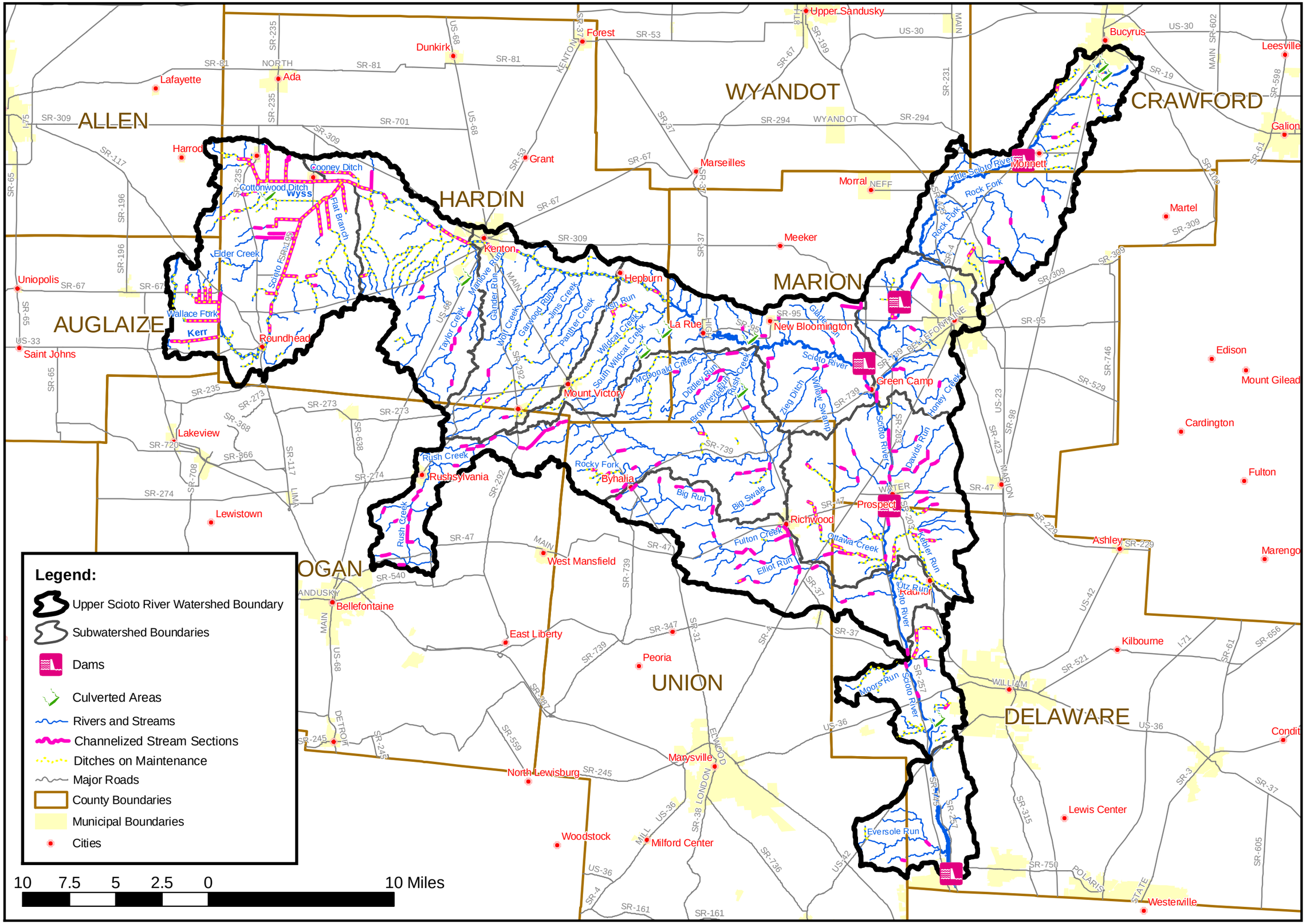


Upper Scioto River Watershed
Map #18
Land Cover 1997 - 2002

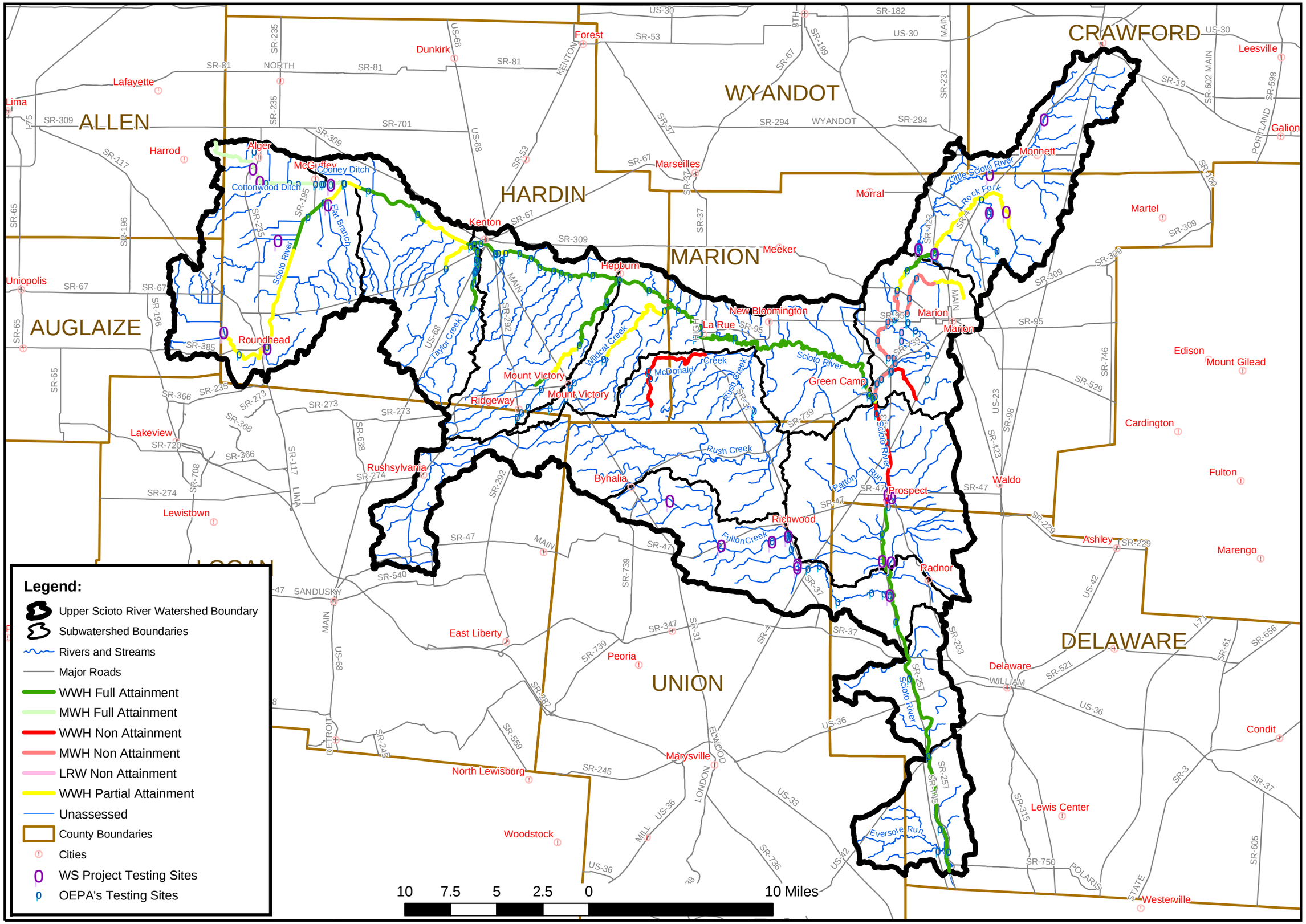


Upper Scioto River Watershed

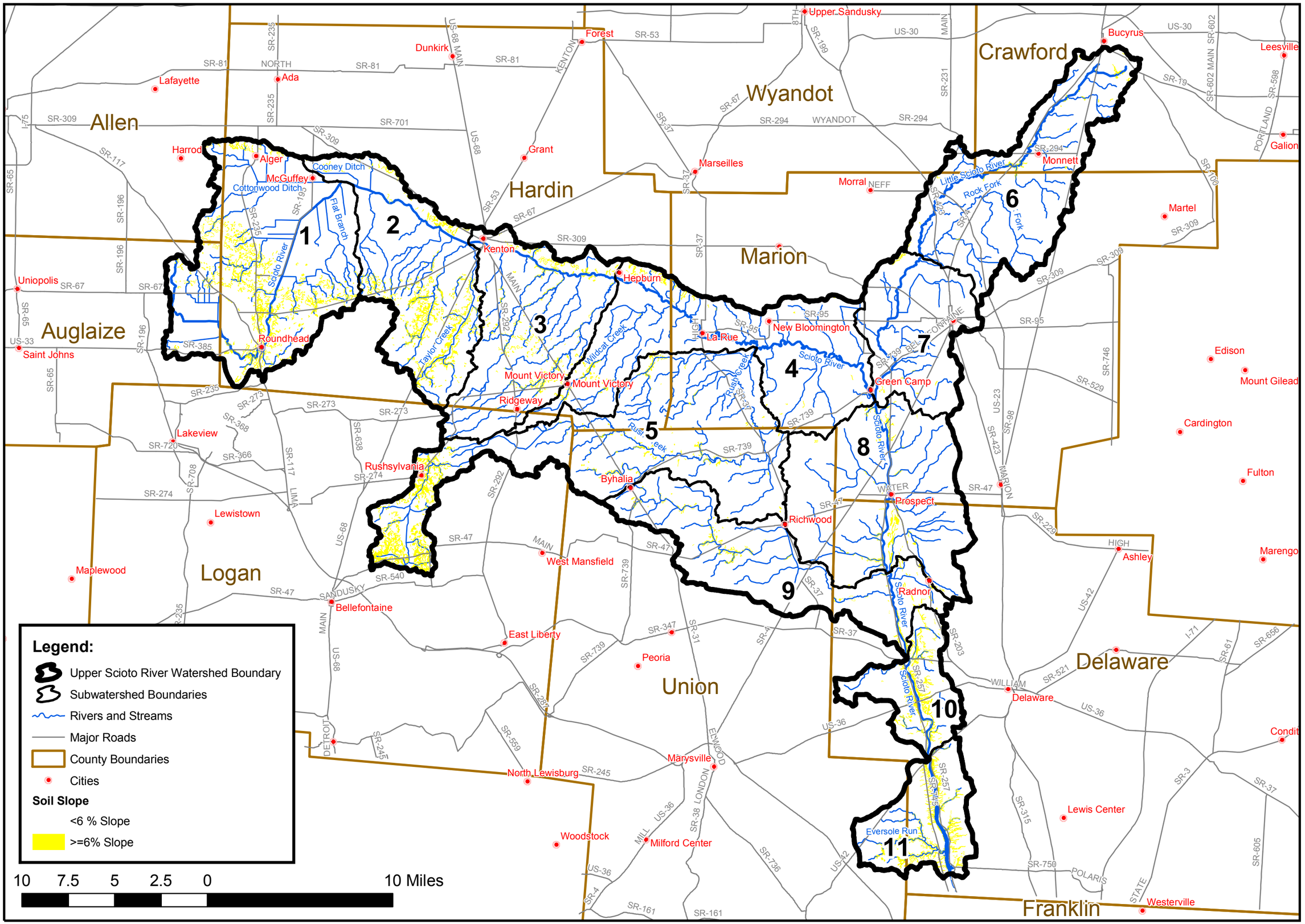
Upper Scioto River Watershed Map #19 Drainage Features



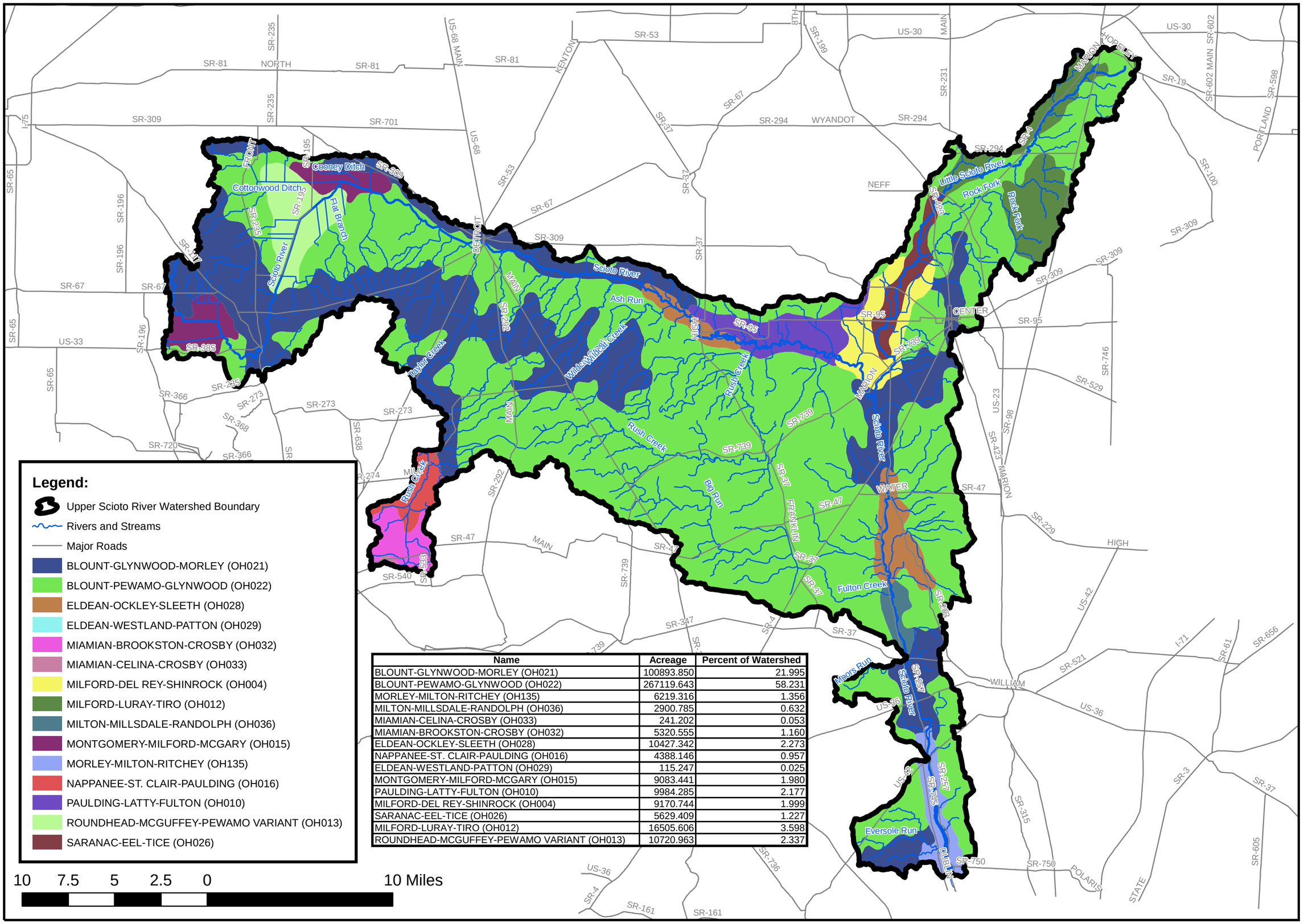
Upper Scioto River Watershed Map #20 Aquatic Life Use Attainment

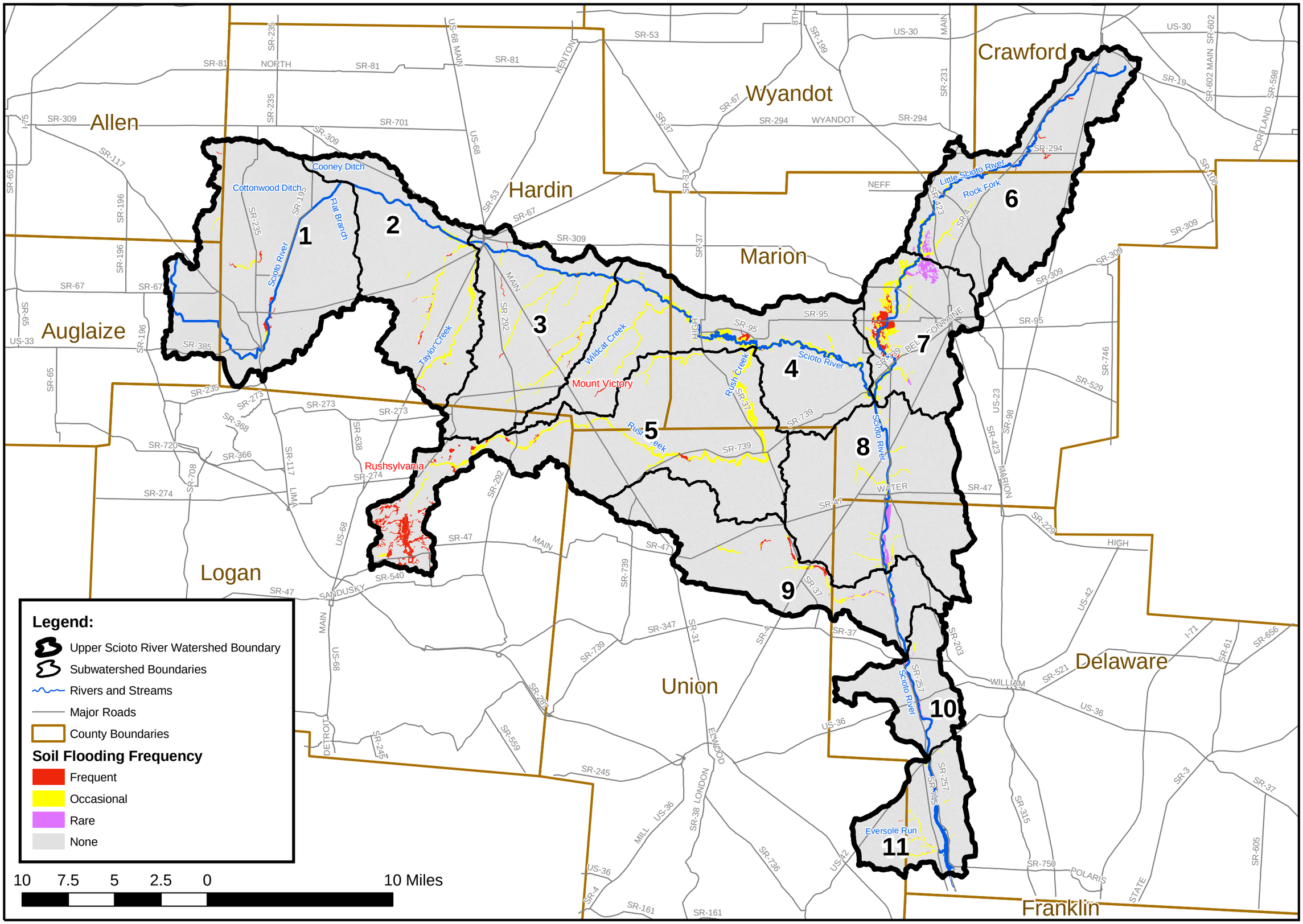


Upper Scioto River Watershed
Map #21
Slope >=6%



Upper Scioto River Watershed Map #22 STATSGO - General Soil Associations



Name	Acreage	Percent of Watershed
BLOUNT-GLYNWOOD-MORLEY (OH021)	100893.850	21.995
BLOUNT-PEWAMO-GLYNWOOD (OH022)	267119.643	58.231
MORLEY-MILTON-RITCHEY (OH135)	6219.316	1.356
MILTON-MILLSDALE-RANDOLPH (OH036)	2900.785	0.632
MIAMIAN-CELINA-CROSBY (OH033)	241.202	0.053
MIAMIAN-BROOKSTON-CROSBY (OH032)	5320.555	1.160
ELDEAN-OCKLEY-SLEETH (OH028)	10427.342	2.273
NAPPANEE-ST. CLAIR-PAULDING (OH016)	4388.146	0.957
ELDEAN-WESTLAND-PATTON (OH029)	115.247	0.025
MONTGOMERY-MILFORD-MCGARY (OH015)	9083.441	1.980
PAULDING-LATTY-FULTON (OH010)	9984.285	2.177
MILFORD-DEL REY-SHINROCK (OH004)	9170.744	1.999
SARANAC-EEL-TICE (OH026)	5629.409	1.227
MILFORD-LURAY-TIRO (OH012)	16505.606	3.598
ROUNDHEAD-MCGUFFEY-PEWAMO VARIANT (OH013)	10720.963	2.337

Upper Scioto River Watershed Map #23 Flooding Frequency (SSURGO)