

# Rocky Fork Creek

(HUC: 05060001-140 -120)



## Watershed Action Plan & Inventory

January 2010

Prepared and Written by Friends of Big Walnut  
Creek & Tributaries and Mid-Ohio Regional  
Planning Commission

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**-Rocky Fork Creek (HUC: 05060001-140 -120)**

**I. Introduction**

The purpose of the Rocky Fork Creek Watershed Action Plan is to bring the community together to address water bodies within the watershed that are impaired and to protect areas that are meeting the Ohio EPA water quality standards. The goal is to restore and maintain physical and biological integrity of all water bodies within the watershed by 2010. This includes jurisdictional streams and wetlands.

The Rocky Fork Watershed is a sub-watershed of Big Walnut Creek located in Franklin County, Ohio, within the townships of Plain, Jefferson, and Harlem; within the municipalities of New Albany and Gahanna; and within the City of Columbus, Ohio. All of these jurisdictions fall within the MS4 definition for NPDES Stormwater Phase I or II regulations (*F1-jurisdictional map*). The length of the mainstem of Rocky Fork Creek meanders 13.0 miles from the headwaters in Delaware County, Ohio, until it reaches the confluence with Big Walnut Creek in urban Gahanna. This sub-watershed drains approximately 30 square miles.

Two tributaries named Rose Run and Sugar Run are significant water sources to Rocky Fork Creek and are both located in Plain Township. Rocky Fork Creek is being impacted primarily from run-off and siltation from increasing land development in the basin and from poorly treated sewage from failing Home Sewage Treatment Systems (HSTS) and several small package plants. According to Ohio EPA, Big Walnut TMDL, the biological communities in the upper part of Rocky Fork were performing as badly as or worse than at any time since the initial study in 1991 (Ohio EPA, 1992). Sugar Run and Rose Run were showing varying degrees of impact from land development in the New Albany area (Ohio EPA, Big Walnut Creek, TMDL).

The lower section of the Rocky Fork Creek is designated as "Exceptional Warmwater Habitat (EWH) but is only partially in attainment due to degradation by urbanization. Some of the sedimentary rock outcroppings along the sides of the Rocky Fork Creek are about 350 million years old. They comprise a unique exposure, especially "ripple rock sandstone," prized and studied by geologists and valued by those who live near them because of their natural beauty.

Big Walnut Creek is a major source of drinking water for the residents of the greater Columbus area. Rocky Fork drains into Big Walnut approximately 3 miles downstream of the intake of the City of Columbus' Hap Crimean Water Treatment Plant.

Park districts and land trust agencies in the Rocky Fork Watershed include the Jefferson Township Land Trust, the Plain / New Albany Park District, the Columbus & Franklin County Metropolitan Park District, the City of Columbus Recreation & Parks Department, and the City of Gahanna Parks & Recreation Department.

It is the hope and goal of the Rocky Fork Watershed Protection Task Force and the Friends of the Big Walnut that the watershed's integrity may be preserved and, where impaired, may be restored and that once again an attainment of Exceptional Warmwater Habitat status will be achieved

***Table 1. Demographics of the Lower Big Walnut Creek Watershed.***

	U.S. Census 2000	2030 Projection
Population	222,260	320,653
Houses	99,419	143,350
Jobs	109,578	198,408
Age	141,958 (18-64 years old) 59,924 (under 18) 20,258 (65 and over)	
Education	32% earned college degrees	
Income Levels (average median household income)	\$47,958	
Race	71.3% White	

*Source:* 2000 US Census and MORPC 2030 projections from local long-range plans and reasonable regional growth forecasts.

Figure 1: Big Walnut Watershed Census Area (Source: MORPC).

## **Big Walnut Watershed Census Area**

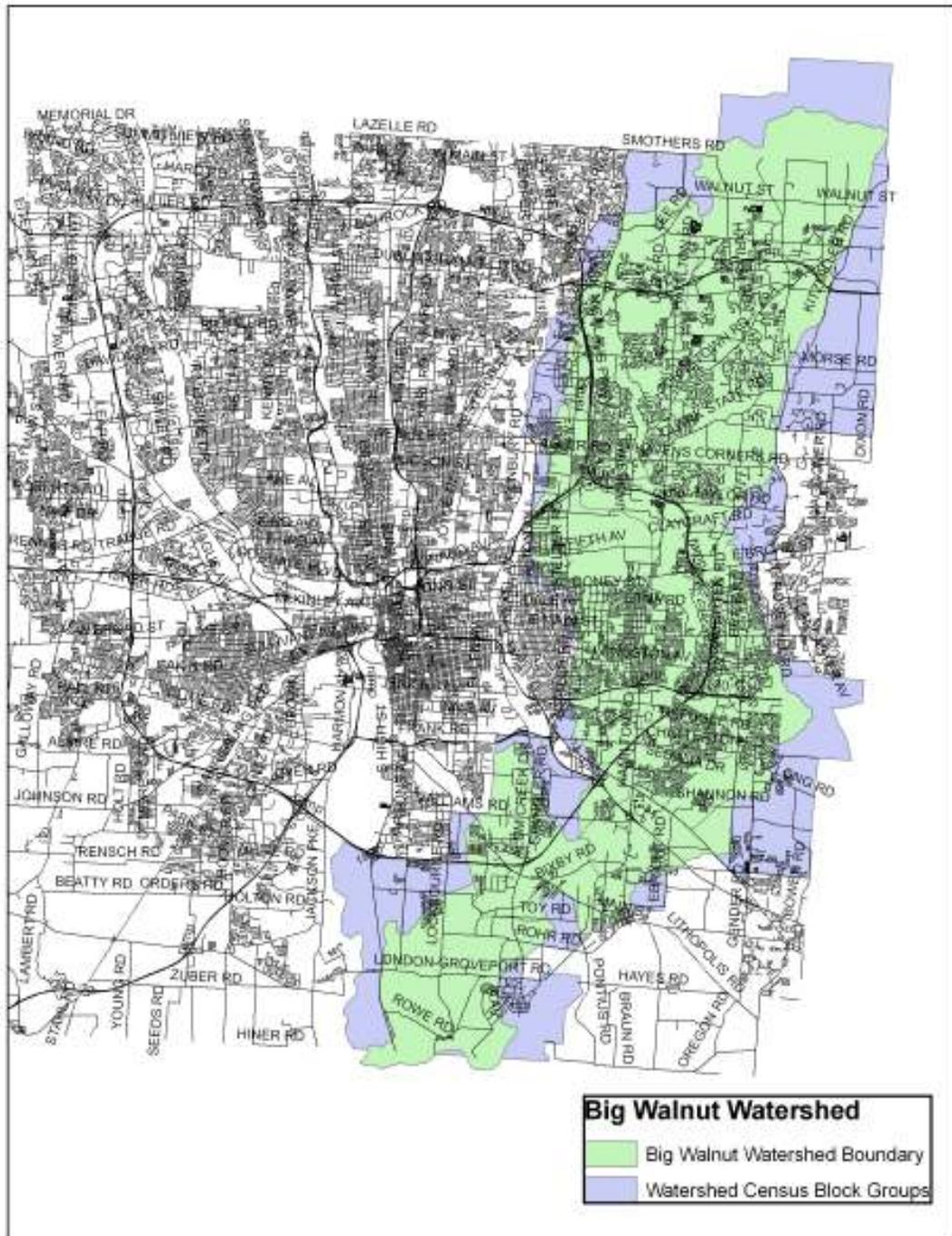


Figure 2: 2000 Census Data.

2000 Census: SF3  
Big Walnut Watershed

**Household Income**

Less than \$10,000	6,457	7%
\$10,000-\$14,999	4,614	5%
\$15,000-\$19,999	4,640	5%
\$20,000-\$24,999	6,055	7%
\$25,000-\$29,999	5,928	7%
\$30,000-\$34,999	6,621	7%
\$35,000-\$39,999	5,906	7%
\$40,000-\$44,999	5,361	6%
\$45,999-\$49,999	4,813	5%
\$60,000-\$59,999	9,650	11%
\$60,000-\$74,999	10,955	12%
\$75,000-\$99,999	9,940	11%
\$100,000-\$124,99	4,400	5%
\$125,000-\$149,99	1,915	2%
\$150,000-\$199,99	1,547	2%
\$200,000 plus	1,800	2%

Population:	222,260	
Households:	90,602	
Population in Poverty:	20,273	9%
Owner Occupied Households	52,331	58%
Renter Occupied Households	38,147	42%

**Education Levels (pop25 years+)**

No School:	698	0%
Fourth Grade Level:	330	0%
Sixth Grade Level:	784	1%
Eighth Grade Level:	2,177	2%
12th Grade (No Diploma)	4,696	3%
High School Diploma:	44,947	32%
College No Degree:	32,914	23%
Associate Degree:	8,894	6%
Bachelor Degree:	25,287	18%
Master Degree:	7,606	5%
Professional Degree:	2,476	2%
Doctoral Degree:	833	1%

**Income Statistics**

Average Median Household Income	\$47,958	Per Capita Income	\$23,016
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**Autos Per Household**

0 Cars:	6405	7%	3Cars:	10014	11%
1Car:	34014	38%	4 Cars:	2390	3%
2 Car:	36840	41%	5+ Cars:	815	1%

**Worker Characteristics**

Unemployed	4,833	4%	Food:	13098	11%
Agriculture	294	0%	Education and	18393	16%
Construction:	6581	6%	Social:		
Manufacturing	12278	10%	Transportation	7660	7%
Wholesale:	5054	4%	and Warehouse:		
Retail:	17391	15%	Public	8386	7%
FIRE:	13181	11%	Administration:		
Professional:	11330	10%	Other:	5161	4%
Information:	3624	3%	Employment		

**Housing Cost Characteristics**

Average of Median Rent	\$605	Average of Median Owner Occupied Housing:	\$127,163
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**Figure 3: 2000 Census Data.**

*Census File SF1*

**2000 US Census Results: Population and Housing**

**Big Walnut Watershed**

**POPULATION CHARACTERISTICS**

	2000	
Total Population	222,140	
Group Quarter Population (% of the total population)	1,129	0.5%
Male (% Male)	106,808	48.1%
Female (% Female)	115,332	51.9%
White (% of Total Population)	158,391	71.3%
African American (% of Total Population)	50,473	22.7%
American Indian/Alaution (% of Total Population)	690	0.3%
Asian (% of Total Population)	5,109	2.3%
Other Race (1) (% of Total Population)	7,477	7.0%
Hispanic (% Hispanic)	4,897	2.2%
Population Under 18 Years (% Under 18 Years)	59,924	27.0%
Population 65 Years and Over (% 65 Years and Over)	20,258	9.1%

**FAMILY CHARACTERISTICS**

Total Families	58,094	
Single Fathers (% Families with Single Fathers)	3,803	6.5%
Single Mothers (% Families with Single Mothers)	12,925	22.2%

**HOUSING CHARACTERISTICS**

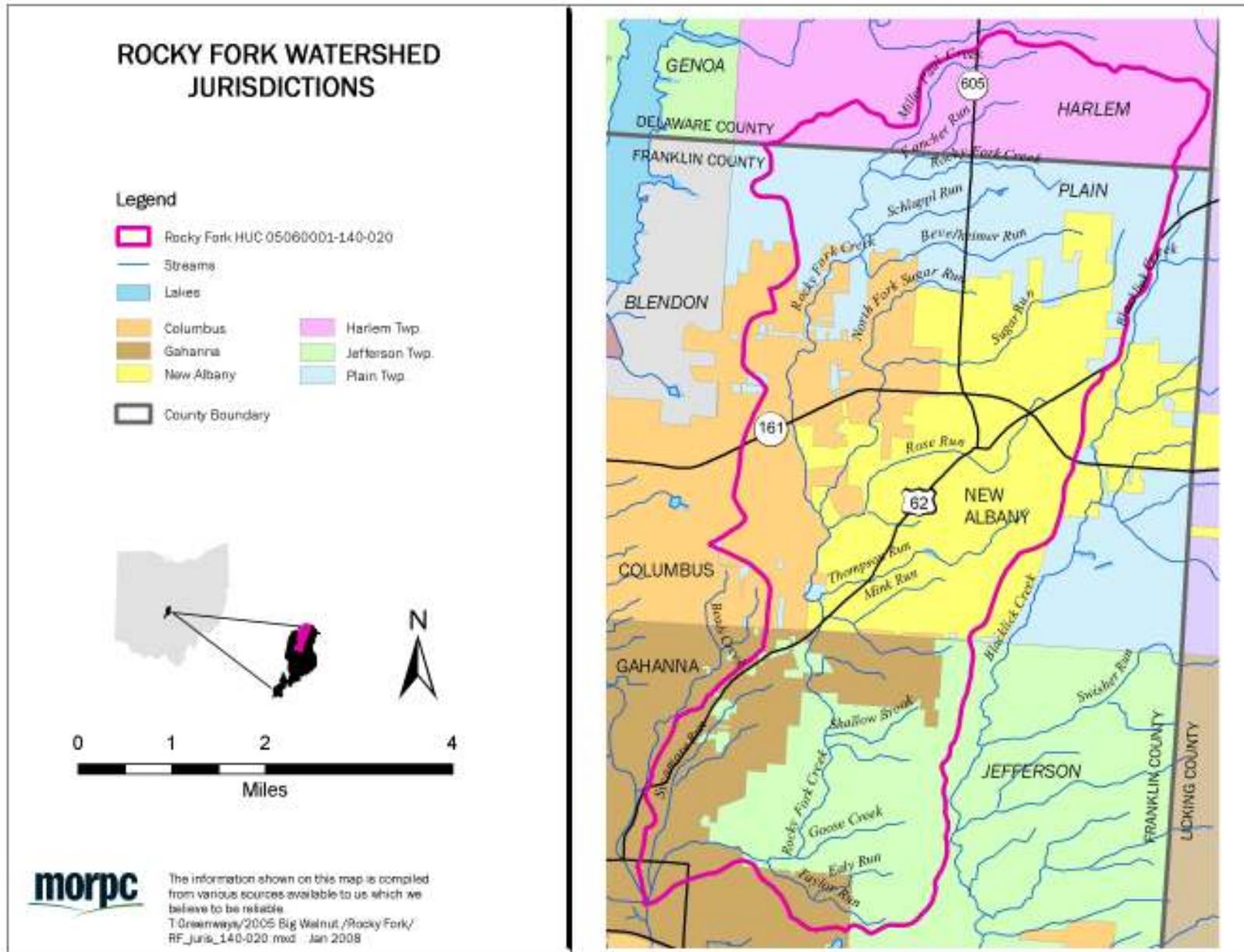
Total Housing Units	96,700	
Total Households (Vacancy Rate)	90,467	6.4%
Households Occupied by Owners (% Owner Occupied)	52,541	58.1%
Households Occupied by Renters (% Renter Occupied)	37,926	41.9%
Single Occupant Households (% Single Occupant)	26,185	28.9%
People Over 65 Years Living Alone (% Living Alone)	5,992	29.6%
Average Household Size	2.46	
Average Household Size Owner Occupied Units	2.64	
Average Household Size Renter Occupied Units	2.17	

Notes 1) Other race includes population that counted themselves as multi-racial

Sources:  
 Source: US Census Bureau, 1990 Summary Tape File 1  
 Source: US Census Bureau, 2000 Summary File 1

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Figure 4: Rocky Fork Creek Watershed Jurisdictions



### Summary of Rocky Fork Watershed Protection Efforts Thus Far

There are four watershed protection groups in the Lower Big Walnut Watershed: (1) the Friends of Alum Creek & Tributaries (FACT), who developed the Lower Alum Creek WAP; (2) the Friends of Blacklick Creek; (3) the Rocky Fork Creek Protection Task Force; and (4) the Friends of Big Walnut Creek. The last three on the list have recently signed a memorandum of understanding to form one group – Friends of the Big Walnut and Tributaries – to work together to protect all of the streams. Many of the jurisdictions have developed plans that address water quality in the Rocky Fork Creek, including the Rocky Fork–Blacklick Accord Plan; Greenways: A Plan for Franklin County; the City of Columbus Comprehensive Plan; and the Gahanna Heartland Concept Plan.

#### *The Rocky Fork Creek Watershed Protection Task Force*

The Rocky Fork Creek Watershed Protection Task Force was formed in 1991 by Louise Smith and Al Harter to protect the creek from the impacts that the New Albany Company was creating during the construction and installation of a sewer line to enhance the New Albany Country Club. Formal complaints were filed with the OEPA alleging various violations of the Ohio Codes against the Jefferson Water and Sewer District for violations incurred by them in crossing Rocky Fork Creek at Clark State Road in Gahanna.

Both cases resulted in settlements in which the New Albany Company paid \$7500 and the Jefferson Water and Sewer District paid \$1500, both of which formed the financial basis of the Rocky Fork Creek Watershed Protection Task Force.

Since those early years, the group has been active in educational efforts within the watershed with citizens, school groups, developers and contractors to inform them of the best management practices to protect the creeks. When education and persuasion have failed the group has turned to the environmental authorities, resulting in fines for various violations

Legally Rocky Fork Creek Watershed Protection Task Force was incorporated in Ohio on March 16, 1994; received a 501 (c) 3 status from the IRS; has EIN # 31-1404203; has an Ohio Charter #866955 and Ohio registration #94-0319. Its purpose is simple: ... to develop, guide, and implement a coordinated comprehensive and effective watershed protection and improvement plan for the Rocky Fork Creek watershed in Franklin and Delaware Counties in Ohio. On an average yearly basis it has from 55 to 65 paid members and formulates its yearly activities through its chair and executive board. At present most of the development, with its attendant erosion and sediment control activities, are in the New Albany area, and thus this area is closely monitored for compliance with the OEPA codes. The Friends of Big Walnut Creek and the Rocky Fork Creek Watershed Protection Task Force are collaborating in the preparation of this Watershed Action Plan for Rocky Fork Creek (supported, in part, by a Watershed Coordinator Grant from ODNR). (Big Walnut Creek WAP)

## **II. Watershed Plan Development**

### **A. Watershed Group**

The Rocky Fork Creek watershed action plan was compiled by the Friends of Big Walnut Creek which includes partners from the following sectors of the community: watershed residents and large landowners, community organizations, local government, state government, educators, educational institutions, nongovernmental organizations, and the regulated community. Members of the Watershed Action Planning Team include those listed in Table 2.

***Table 2. Members of the Watershed Action Planning Team.***

<b>Name</b>	<b>Title</b>	<b>Affiliation</b>
Bryan Knowles	Park Ranger	Blendon Woods Metro Park
Mark Converse	Board Member	Friends of Big Walnut Creek
Sandy Doyle-Ahern	Environmental Division Manager	EMH&T
Mark Kelby	Airport Planner	Columbus Regional Airport Authority
Jerry Iles	Extension Agent	OSU Extension, Watershed Management
Michael Hooper	Parks Development Coordinator	City of Westerville Parks & Recreation
Lynn Kelly	Water Plants Coordinator	City of Columbus
Gary Hopkins	Plant Manager	Hap Cremean Water Treatment Plant
Maureen Lorenz	Planning Manager	Columbus Recreation & Parks
Vince Mazeika	Division of Surface Water	Ohio EPA
Erin Miller	Greenways Program Manager	Mid Ohio Regional Planning Commission
Jeff Cox		Columbus Division of Sewers & Drains
Frances Beasley	Assistant Director of Environmental Policy & Planning	City of Columbus
Stephanie Suter	Urban Conservationist	Franklin SWCD
Brad Westall	Greenways Planner	Columbus Recreation & Parks
Natalie Farber		Ohio EPA
Bob Kyle	Board Member	Friends of Big Walnut Creek
Tony Collins	Director	Gahanna Parks & Recreation
Paul Kennedy	Environmental, Safety & Health Supervisor	Columbus Regional Airport Authority
Thomas Hyatt		City of Westerville

James Krouse		City of Westerville
Terry Emery	Director of Service	City of Gahanna
Joel Allen	Village Engineer	Village of Obetz
Dan Binder	Director of Watershed Programs	The Ohio Environmental Council
Bonnie Gard	Zoning Administrator	City of Gahanna
Andrea Gorzitze	Senior Education Coordinator	Mid-Ohio Regional Planning Commission
Al Harter	Board Member	Friends of Big Walnut Creek
Dr. Joe Bonnell	Program Specialist	OSU Extension
Mike McNutt	Past Watershed Coordinator	Friends of Big Walnut Creek
Anne Baird	Extension Agent	OSU Extension
Larry Korecko	Division of Surface Water	Ohio EPA
Bill Resch	Member	Rocky Fork Creek Watershed Protection Task Force
Rick Noss	Board Member	Friends of Big Walnut Creek
Ken McNutt	Board Member	Friends of Big Walnut Creek
Bob Bostard	President	Friends of Big Walnut Creek
Karen Kellar	Board Member	Friends of Big Walnut Creek
Bill Myers	Board Member	Friends of Big Walnut Creek
Debra Mecozzi	Deputy Administrator	Village of New Albany
Mike Mott	Councilman	Village of New Albany

The mission of the Friends of Big Walnut Creek (FoBWC) is to protect and restore Big Walnut Creek and its tributaries for the mutual benefit of the human and natural communities and to enhance stewardship within the watershed through education, collaboration, monitoring, and community clean-up efforts.

The FoBWC is established as a 501(c)(3) nonprofit organization and is governed by a 9-member Board of Directors. Decisions are made by the majority vote of the Board of Directors at monthly Board meetings. (See Appendix A: Bylaws)

*Plan Development Process and Public Involvement and Education*

The Friends of Big Walnut Creek have held two public meetings which revolved around the creation of the watershed action plan. The first meeting was held on April 30, 2005 at the Whitehall

Community Center. Twenty attendees were present at the meeting. Bob Bostard, President, Friends of Big Walnut Creek, facilitated the meeting and began by discussing the purpose of the group and the watershed action plan. The residents who came to the meeting asked questions about the “state of the watershed” and shared some experiences they have had with the creek. The attendees also discussed concerns and issues that revolved around flooding, including the City of Columbus’ plans to help those who live within the Big Walnut floodplain in Gould Park.

The second public meeting was held on June 1, 2005 at the Gahanna Golf Course clubhouse. Thirty-three attendees were present and encompassed stakeholders and elected officials from all municipalities and townships within the watershed. Others who were present were from the Ohio EPA, MORPC, watershed groups, and park districts. The meeting began with each person sharing his or her personal hopes and aspirations for Big Walnut Creek, including what each would like to see done to preserve the integrity of the watershed. Later in the meeting, a “state of the watershed” was given in order to put everyone on the same page. Subcommittees were set up to assist in the development of the plan, while the Friends of Big Walnut Creek will control the facilitation of the development.

The “Land Use” steering committee met twice. The objective was to compile data from all of the jurisdictions within the watershed and create a readable narrative to compare the different zoning regulations, city/township codes and regulations, and floodplain regulations that affect water quality within the watershed. The watershed coordinator compiled the data with input from this subcommittee.

Seven sub-watershed planning meetings were held to address the Rocky Fork Creek Watershed and the corresponding water quality impairments. Since July 2005, many stakeholders from the municipalities and townships have attended the meetings and participated in the development of this plan. This process has included crucial information that has been instrumental in creating recommendations to address the issues facing the Rocky Fork Creek Watershed.

The Rocky Fork Creek WAP was put on hold in 2005 as the group turned their focus to the Lower Big Walnut Creek WAP. In 2007 Friends of Big Walnut Creek, The Rocky Fork Protection Task Force, and Friends of Blacklick Creek voted to join together into a single group, Friends of Big Walnut Creek & Tributaries. During this time they also asked to be released from the ODNR 319 grant for finishing the Rocky Fork Creek WAP and developing a WAP for Blacklick Creek. The group approached Mid-Ohio Regional Planning Commission (MORPC) to see if they were interested in taking over the grant and completing these two plans. MORPC agreed and assumed the grant in the summer of 2007. In October of the same year they hired David Rutter as the new Watershed Coordinator tasked with finalizing the Rocky Fork Creek WAP and developing the Blacklick Creek WAP.

Two additional meetings of the planning group were held in December of 2007 and January of 2008. All of those listed in Table 2 were invited to attend. Those who attended are listed in Table 3. The group’s primary focus was to become reacquainted with the TMDL report and develop action items that were specific to impairments identified in that report.

**Table 3. Watershed Action Planning Team 2007.**

<b>Name</b>	<b>Title</b>	<b>Organization</b>
David Rutter	Watershed Coordinator	MORPC
Bob Kyle	Board Member	FoBWC & Tribs
Larry Korecko	Division of Surface Water	Ohio EPA
Cathy Gray	Zoning Inspector	Plain Township
Joe Bonnell	Program Director Community Based Watershed Management	OSU Extension
Kyle Wilson	Riparian Conservation	Franklin SWCD
Bill Resch	Board Member	FoBWC & Tribs
Mark Converse	Board Member	FoBWC & Tribs
Dan Binder	Board Member	FoBWC & Tribs
Maureen Lorenz	Planning Manager	City of Columbus Recreation & Parks
Terry Emery	Director	City of Gahanna Service Department
Ellen Walker	Township Administrator	Jefferson Township
Erin Miller	Director, Center for Energy and the Environment	MORPC
Bill Dorman	Assistant to Director of Public Service	Village of New Albany

**B. Outline of Plan Content**

The Rocky Fork Creek Watershed Action Plan (WAP) is a community driven plan that reflects the public’s concerns and provides water quality data. The overall goal of the Rocky Fork Creek Watershed Action Plan is to restore and maintain the chemical, physical and biological integrity of Rocky Fork Creek. This Plan identifies the shared vision of Watershed residents, local government, state agencies and elected officials.

The Watershed Action Plan provides a detailed picture of the Watershed and the project partners dedicated to protecting it. The Rocky Fork Creek Watershed Action Plan was developed to identify the issues facing the Watershed and to offer solutions and directions for the future. The goal is to bring all stream segments up to full water quality attainment and to maintain that status. The Watershed Action Plan is also a “living document,” that will be updated on a regular basis, as additional information is available, to meet future needs of the Watershed.

This Watershed Action Plan is organized to present information about FoBWC and the current condition of the waterbodies and watershed, followed by Goals and Actions/Objectives that have been identified in consultation with the governments, agencies and individuals listed above. The Watershed Action Plan also describes the plans for evaluating progress toward the goals, actions, and objectives and for periodic revisions of the Watershed Action Plan to incorporate additional

information and update the Actions/Objectives that will guide FoBWC's watershed improvement and protection activities.

### **C. Endorsement & Adoption**

MORPC will present the WAP to each of the six jurisdictions board of trustees or city/village councils for local endorsement after it has been endorsed by the state and federal EPA. The endorsement of the Watershed Action Plan will be based upon each jurisdiction's ability to accept and implement some or all of the recommendations put forth by the plan. Some townships and municipalities within the watershed may adopt only certain portions of the plan. We will further discuss resolutions for the jurisdictions by presenting the plan to personnel within the areas of development, utilities, and parks & recreation. Once discussions have concluded, a presentation to city council about the plan will occur, with a vote by the council to adopt or endorse specific resolutions within the plan or the entire plan itself.

### **D. Information & Education**

Education and information needs were identified for several of the issues being addressed in the plan from sediment erosion controls to agricultural BMP's. These needs are included in implementation of target strategies in section four of the action plan. Many of these will be coordinated with Phase I and Phase II communities' Nonpoint Source (NPS) pollution education requirements.

Publicity about the completion of the plan will be shared with local media outlets and will help get the word out to the residents of the watershed. Public comment will be sought by posting the Watershed Action Plan on the MORPC website as well as hosting an open house in the watershed to present the plan to residents and providing a means for comment. Ongoing activities by Mid-Ohio Regional Planning Commission in seeking endorsement of the plan by political jurisdictions will also provide opportunities to publicize the plan.

### **III. Watershed Inventory**

#### **A. Description of the Watershed**

##### ***Geological***

Rocky Fork Creek has a gradient of 22.8 feet per mile. It follows a course that closely approximates the margin of the Wisconsin Glaciers. The creek bottom is composed of various bedrocks, especially Ohio Shale, Siltstone, and Berea Sandstone which is overlain by glacial till and drift from both the Wisconsin and Illinoisan glaciers. Figure 5 shows the general topography of the Rocky Fork Watershed.

Rocky Fork Creek contains rocks that record two distinct intervals of geologic history. The older, the Mississippian, is the story of a shallow sea and abundant sediments derived from the young Appalachian Mountains; Rocky Fork contains the most complete record of these events in central Ohio and is internationally known for flow rolls and ripple marks in the Berea Sandstone. The younger, the Pleistocene, is the story of glacial advances and retreats. Because Rocky Fork sits near the former edge of the glaciers, it is well-known for its record of glacial variations (*The Rocks of Rocky Fork and Their Geologic Significance*, Lawrence A. Krissek, Associate Professor, Department of Geology & Mineralogy, The Ohio State University).

The majority of soil located throughout this area is Bennington Silt Loam with 0% to 6% slopes. Most of the soils are classified as somewhat poorly drained followed by very poorly drained (see Figure 6). This soil type is best suited for vegetation that is tolerant of wetness, and it is often farmed. Row crops, small grains, pasture land, and hay and other cash crops are best suited for agricultural farming for these soil types (Franklin County Soil Survey). The upper stretches of the sub-watershed still maintain a rural setting with urban advancement ensuing. Agricultural production, cattle, horse farms, and residential development populate this changing area. Pathogens, siltation, nutrients, ammonia, habitat alterations, and metals compose the list of pollutants that adversely affect the quality of water within this watershed (Ohio EPA, Big Walnut Creek, TMDL).

Figure 5: Topography of the Rocky Fork Creek Watershed

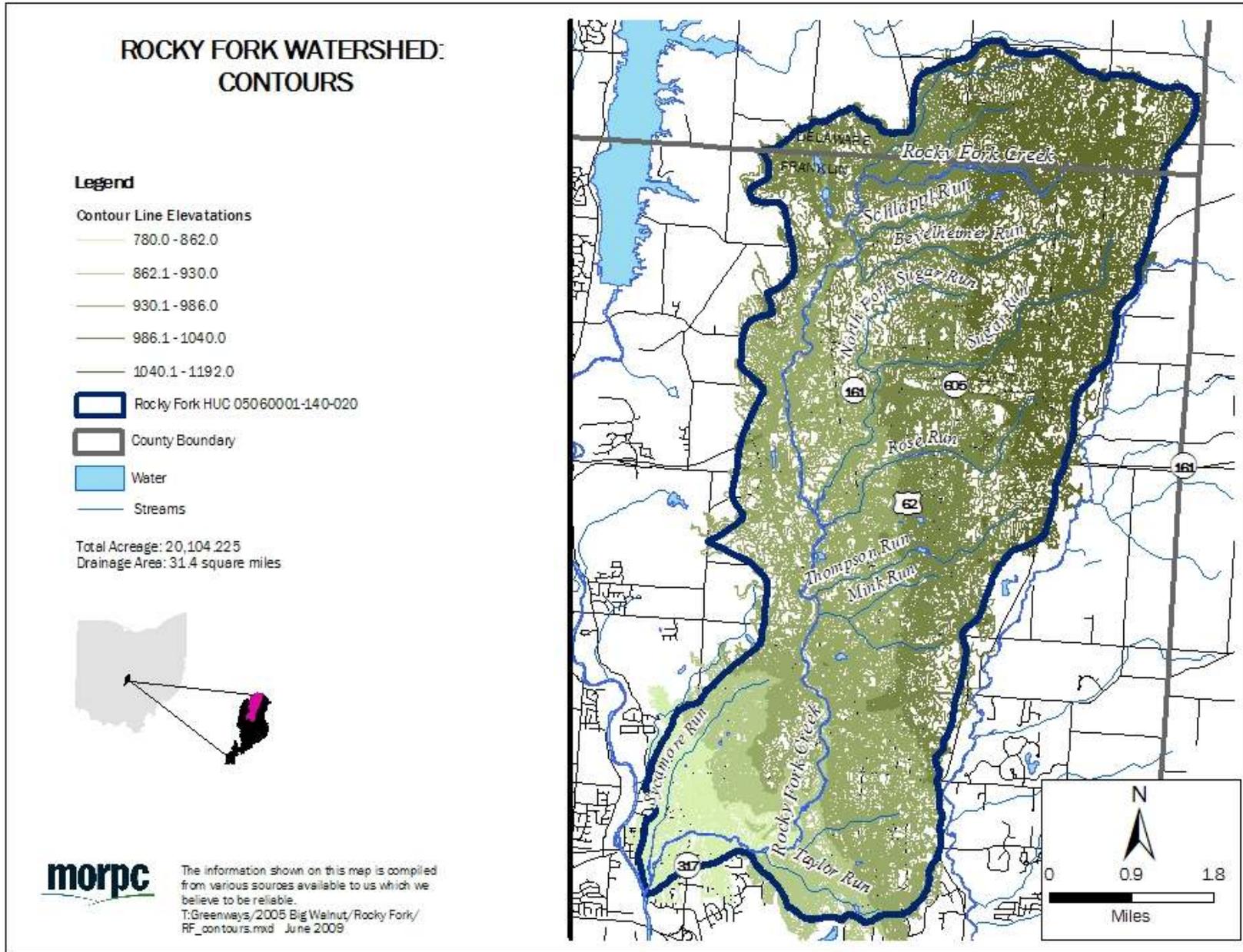
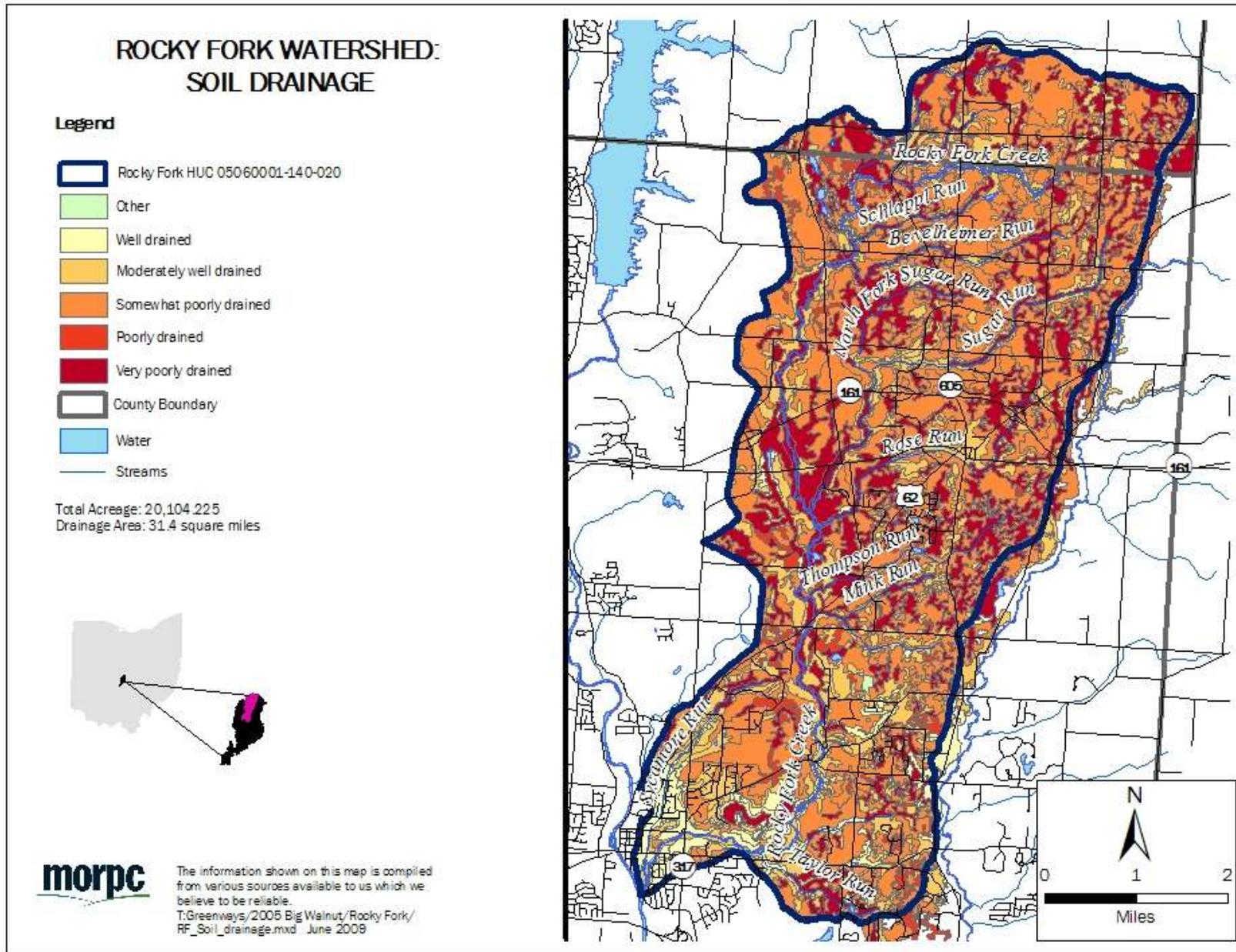


Figure 6: Rocky Fork Soil Drainage Classes



## ***Biological***

Biosurvey sampling was conducted at twelve stations in eight streams that are minor tributaries (including Rocky Fork) to Big Walnut Creek downstream from Hoover Reservoir. One was located in a primary headwater stream. Of these, two stations were in FULL attainment of their existing or recommended aquatic life use designation, two were in PARTIAL, seven were in NON-attainment.

Rocky Fork was impacted primarily by run-off and siltation from increasing land development in the basin and by poorly treated sewage from failing HSTS and several small package plants. The biological communities in the upper part of Rocky Fork Creek were performing as badly as or worse than at any time since the initial study in 1991 (Ohio EPA, 1992). Sugar Run and Rose Run were showing varying degrees of impact from land development in the New Albany area (Big Walnut Creek TMDL).

### *Rare, Threatened, and Endangered Species*

Water quality within a watershed can be ascertained by examining the health and diversity of species within the water, floodplain, and uplands of the watershed. Often, critical lands, such as the floodplain, are disturbed or destroyed by development or by adopted zoning regulations that do not consider stream functions and that adversely affect the biological communities. Many species of pollutant-tolerant fish, such as *Semotilus atromaculatus* (Creek Chub) or *Lepomis cyanellus* (Green Sunfish), can be found in most streams within the Rocky Fork Creek Watershed. Other species, such as *Etheostoma caeruleum* (Rainbow Darter), are pollutant-intolerant species and have been declining in numbers.

According to the ODNR Natural Heritage Database, the Rocky Fork Creek Watershed has several species listed. *Etheostoma maculatum* (Spotted Darter) is State listed as *endangered* and was last observed in May of 1961 near the confluence of Rocky Fork Creek and Big Walnut Creek, and was observed at the headwaters of Rocky Fork Creek in 1983. *Opheodrys vernalis vernalis* (Smooth Green Snake) is State listed as “N” which is *not listed* on the Ohio Division of Wildlife rare, threatened, and endangered species list. However, the Smooth Green Snake is recognized as being uncommon in this area. This species was last observed at the Gahanna Woods Nature Preserve in June of 1986. *Hemidactylium scutatum* (4-Toed Salamander) is State listed as a *species of concern* and was last observed at the Gahanna Nature Preserve in March of 1964.

In the 1950s and as recently as 1981, *Notropis heterolepis* (Blacknose Shiner), an Ohio endangered species, was collected in portions of the Rocky Fork Creek and documented first by Dr. Troutman of OSU and later by Dr. Finney of Otterbein College. This species can no longer be found and is considered to be extirpated from the watershed due to a decline in water quality. In addition, the creek and its headwater tributaries such as the Rose Run and Sugar Run are home to over 216 species of wildflowers, mature stands of trees, as well as abundant wildlife.

Flora listed in the database include the *Carex decomposita* (Cyprus Knee Sedge) which is State listed as *endangered* and the *Juglans cinerea* (Butter Nut Tree) which is State listed as *potentially threatened*.

## *Invasive Species*

The Division of Natural Areas and Preserves has compiled a list of more than 60 plants that are currently impacting nature preserves, wildlife areas, parks and forests throughout the state. Some of the top invasive non-native plants include: bush honeysuckles (Amur, Morrow and Tatarian), buckthorn (glossy and common), garlic mustard, purple loosestrife, common reed grass, reed canary grass, autumn and Russian olive, multiflora rose, Japanese honeysuckle, narrow-leaved cattail, Canada thistle and tree-of-heaven.

Managing invasive plants is a critical issue, because the very characteristics which help these plants flourish make them difficult to control. Traditional management tools such as hand pulling the most aggressive plants are labor-intensive and unsuccessful at eradicating alien plants long-term. Herbicides have become an effective tool in curbing invasive plant infestation, while protecting native plant species. Effective techniques are only just emerging to meet an ecological challenge that will only increase as more invasive plants gain a foothold in our preserves. (source: <http://www.dnr.ohio.gov/dnap/invasive/default.htm>)

Invasive species are no doubt present throughout the Rocky Fork Creek watershed. We are not aware of any organized efforts to address this problem at present.

## *Water Resources*

### *Climate*

Winter precipitation in Franklin County, Ohio, is frequently snow. It results in a good accumulation of soil moisture by spring and minimizes drought during summer on most soils. Franklin County is cold in the winter and uncomfortably warm in the summer (McLoda & Parkinson, 1976).

**Table 4. Precipitation Totals Collected at the Columbus International Airport Authority (2003)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
mm	70.1	58.3	78.8	86.5	96.2	100.1	116.8	86.4	67.0	54.0	76.2	68.2	959.5
inches	2.8	2.3	3.1	3.4	3.8	3.9	4.6	3.4	2.6	2.1	3.0	2.7	37.8

Source: [NCDC Cooperative Stations](#), WorldClimate.com

**Table 5. Average Temperature Totals Collected at the Columbus International Airport Authority's National Climatic Data Center (NCDC) Station.**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
°C	-3.1	-1.3	4.9	10.5	16.2	20.6	22.8	21.9	18.6	12.0	6.0	0.0	10.7
°F	26.4	29.7	40.8	50.9	61.2	69.1	73.0	71.4	65.5	53.6	42.8	32.0	51.3

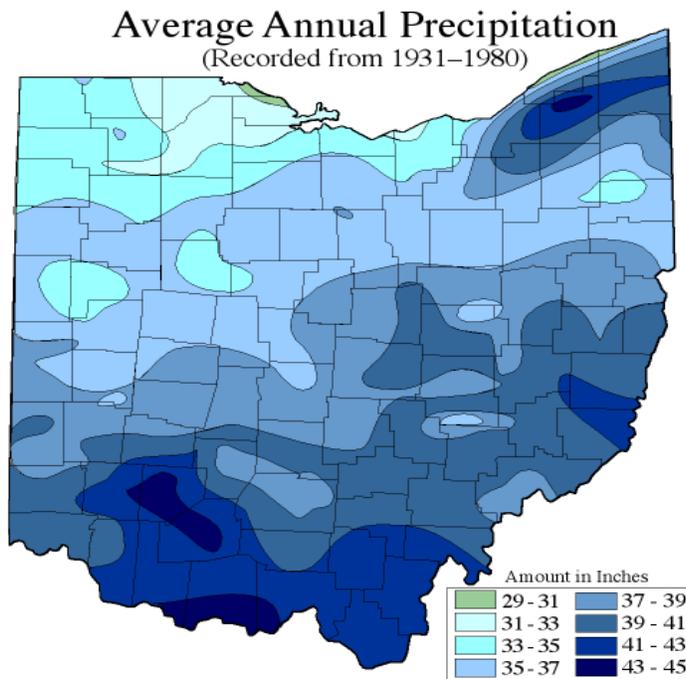
Source: [NCDC TD 9641 Clim 81 1961–1990 Normals](#).

Climate is a contributing factor to the development of natural waterways and soil chemistry. Each eco-region may have a different climate and soil type which creates diversity between streams located in different areas. Because climate governs terrestrial biology and hydrology, waterways in different areas function and perform differently creating uniqueness regarding the effect that climate has on the function of natural waterway systems.

### *Hydrologic Cycle*

Franklin County, Ohio, receives approximately 38 inches of precipitation every year. October, December, January, and February are the months that receive the least amount of precipitation, while May, June, and July are the wettest months. The average monthly precipitation recorded is approximately 3.14 inches.

**Figure 7: Average Annual Precipitation for Ohio (Source: The Ohio Department of Natural Resources, Division of Water).**

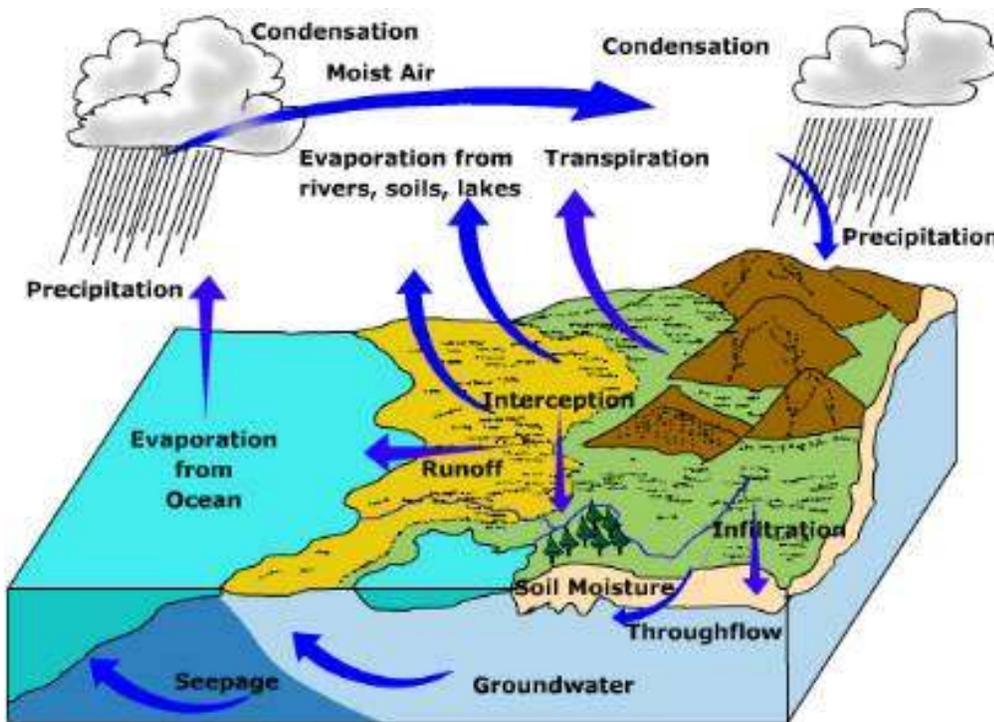


Of these 38 inches, about 10 inches become run-off, which moves immediately to surface-water bodies. Two inches are retained at or near the ground surface and evaporate back into the atmosphere in a relatively short period of time. Twenty-six of the 38 total inches enter the soil surface through infiltration. Twenty of these 26 inches go into soil storage and later are returned to the atmosphere by the combined processes of evaporation and transpiration (evapotranspiration). The remaining 6 inches recharge the groundwater supply. Two of these 6 inches eventually move to springs, lakes, or streams as groundwater discharge. The remaining 4 inches either return to the atmosphere by evapotranspiration or are withdrawn to supply water needs (Brown et al., 1990).

It is important to recognize the significance of the hydrologic cycle, especially how all facets of the cycle are interwoven. This essential cycle is a system that functions between the earth and the atmosphere, providing a replenishment of water for the ground, the air, the vegetation, and the water

courses on the land. Development and the interaction between the environment and population growth have impacted the hydrologic cycle and its ability to function. Impervious surfaces such as roads, driveways, parking lots, rooftops, and buildings cause a disruption in the hydrologic cycle by forcing the water to run off into the city stormwater system rather than be absorbed into the ground to replenish the groundwater, thereby increasing the amount of water and the velocity of water entering the receiving stream.

**Figure 8: The Hydrologic Cycle**  
 (Source: [www.uwsp.edu/geo/faculty/ritter/geog101/uwsp](http://www.uwsp.edu/geo/faculty/ritter/geog101/uwsp)).



Although Ohio is a water-rich state, we must continue to be concerned about the protection and proper use of our valuable water resources. Many human activities (urban, rural, agricultural, and industrial) have an influence on the quantity and quality of water. In order to make wise decisions about the proper protection and use of these resources, we must have a good understanding of the basic processes of the hydrologic cycle through which water continually circulates from the Earth's surface to the atmosphere and back to the Earth (Brown et al., 1990).

### *Surface Water*

#### Wetlands

Wetlands are called “nature’s kidney.” They perform the same function our kidneys do by filtering out toxins and contaminants to help the body or the stream stay healthy. According to many EPA studies performed on Franklin County waterways, most streams are in non-attainment status of current EPA-accepted water quality standards. The continued removal of wetlands in Franklin County exacerbates an already alarming situation.

The United States has a “no-net-loss” wetland filling policy. This often results in removing a wetland in one place, where it naturally exists, and manufacturing a “new,” slightly larger, constructed wetland in another location several counties away constitutes the no-net-loss. This accepted practice presents a major flaw. The stream where the wetland has been destroyed loses one of its kidneys. The cumulative effect of these losses has critically influenced the ability of our waterways to maintain their natural integrity.

The Big Walnut Creek/Rocky Fork Creek Watershed has been experiencing rapid growth for decades and simultaneously has been losing acres upon acres of wetlands in the process. Ohio has lost 90% of its original wetlands since the eighteenth century and continues to lose more. Besides filtering pollutants, wetlands provide a temporary storage area for surface water during heavy precipitation events, are sanctuaries for wildlife, help recharge groundwater supplies, and provide recreational opportunities.

Large areas of hydric soils, which support wetlands, are found along perennial, intermittent streams and drainage swales, and in the few remaining wet woodlands that were not utilized for agriculture. Many known wetlands within the watershed are mitigation wetlands. The New Albany Schools Community Nature Preserve has 18 acres of wetlands, natural and mitigated, along a Sugar Run headwater intermittent stream, a tributary of Sugar Run, which has 22 acres of upland natural buffer. Another 3/4 acre wetland exists within the Rose Run Streamside Forest Park along E. Dublin- Granville Road. Additionally, the Harlem/Walnut Street New Albany Company Mitigation Wetlands comprise nearly 20 acres and lie within the floodplain of the Rocky Fork Headwaters.

Abercrombie & Fitch have mitigation wetlands which are 25 acres located off Kitzmiller Road, just south of the intersection with SR 62. The LifeStyle Communities future 10 acre Wetland Mitigation site is located at the southwest quadrant of E. Dublin-Granville Road and Greensward Road on the merged floodplain of the Sugar Run tributary and the Rocky Fork Creek mainstem.

The Casto Company has mitigated a 15 acre wetland site at the northeast quadrant of E. Dublin-Granville Road and the Hamilton Road Extension. Wooded wetlands (15 acres) were in the M/I Preserve Sub-Division Forested Park just east of Rocky Fork Creek north of Thompson Road, and the Gahanna Woods Nature Preserve Wetlands off Taylor Road, are all of the known wetlands within the Rocky Fork Creek watershed.

**Figure 9: Threatened wooded wetland south of Old 161 east of Hamilton Rd.**



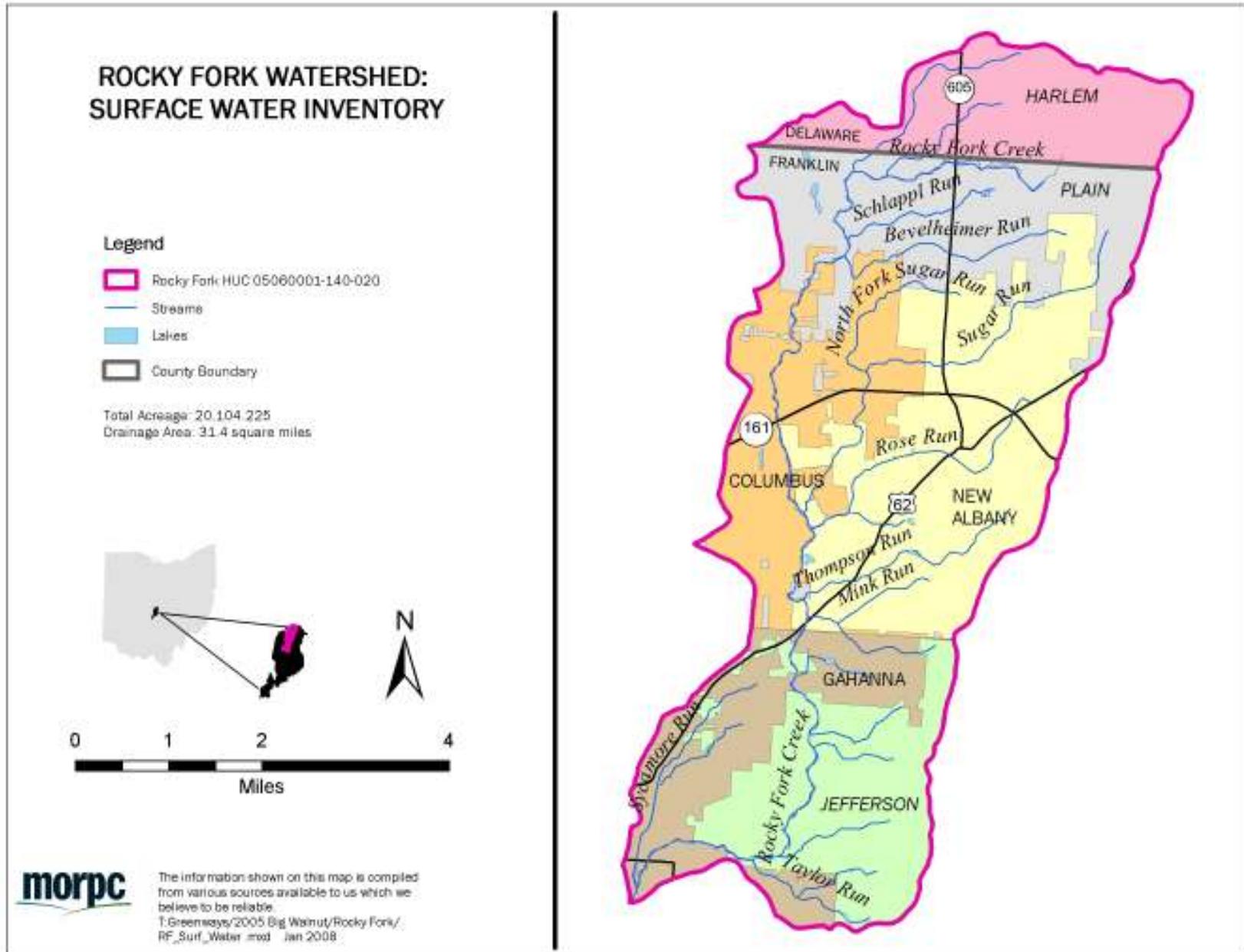
**Streams, Lakes, and Reservoirs**

The Rocky Fork Creek Watershed contains ten named tributaries to Rocky Fork Creek: Miller Paul Creek, Schleppe Run, Bevelheimer Run, Fancher Run, Sugar Run, Rose Run, Thompson Run, Mink Run, Taylor Run, and Sycamore Run. Two of the tributaries were studied in the TMDL - Rose Run and Sugar Run. Rose Run was found to be in non-attainment, while Sugar Run was found to be in full attainment of the WWH water quality use designation. Numerous ponds and storm water basins located on privately owned land are the only known surface reservoirs located within the watershed.

**Table 6. Tributary Data (estimated)(<http://water.usgs.gov/osw/streamstats/ohio.html>)**

<b>Tributary Name</b>	<b>Length (mi)</b>	<b>Watershed size (mi<sup>2</sup>)</b>	<b>Mean Annual Flow (ft<sup>3</sup>/s)</b>	<b>10 Year Flow (ft<sup>3</sup>/s)</b>
<b>Miller Paul Creek</b>	No data	1.06	1.02	215
<b>Fancher Run</b>	No data	1.02	0.98	217
<b>Schleppe Run</b>	No data	0.78	0.75	198
<b>Bevelheimer Run</b>	2.7	1.26	1.21	256
<b>Sugar Run</b>	5.7	4.78	4.64	681
<b>Rose Run</b>	3.2	3.15	3.05	503
<b>Thompson Run</b>	2.6	1.2	1.15	200
<b>Mink Run</b>	1.4	1.27	1.21	270
<b>Taylor Run</b>	1.5	1.37	1.3	251
<b>Sycamore Run</b>	3.0	1.82	1.73	371
<b>Rocky Fork Creek</b>	<b>13</b>	<b>30.5</b>	<b>30</b>	<b>2460</b>

Figure 10: Rocky Fork Creek Surface Water Map.



## Groundwater

Groundwater resources in the RFC watershed are important to the health of the creek and are an important resource for residents. Shallow groundwater moves from the upper watershed areas to wetlands, tributaries, and the mainstem creek. This flow continues throughout the year and makes up the baseflow of the streams during periods between precipitation events.

Deeper groundwater is utilized for drinking water by most Plain Township residents in the Rocky Fork watershed (estimated to be several hundred homes). A small number of residents of Jefferson Township may also rely on individual wells. (Jefferson Township is served by the Jefferson Water and Sewer District.) Residents of Columbus, New Albany, and Gahanna are served by the respective municipal water utility. There are two Public Well Water Supply users in the RFC watershed: CountrySide Child Care and Bevelhymer Park (Village of New Albany). At this time neither of these wells has a Source Water Protection Plan on file.

Aquifers (zones from which the wells withdraw their water) in the RFC watershed are generally small, isolated sand and gravel deposits within the glacial till or deeper sandstone and fractured shale. These aquifers are adequate for individual homes, but do not yield sufficient quantities and rates of water to serve as municipal sources. Land use in the watershed has a great impact on the amount and quality of groundwater. Groundwater recharge decreases when pervious areas are converted to impervious cover such as streets, roofs, and driveways. Activities associated with land uses generate pollutants that can be transported to the groundwater by infiltration. The ODNR has developed a pollution potential rating system based on the hydrogeologic setting and physical characteristics known as the DRASTIC pollution potential index. The letters DRASTIC relate to the characteristics that are evaluated and assigned weights and values in the calculation of the pollution potential index:

Depth to water  
Recharge  
Aquifer Media  
Soil Media  
Topography  
Impact of the Vadose Zone Media, and  
Conductivity of the aquifer (Hydraulic Conductivity)

Most of the RFC watershed has pollution potential index ratings ranging from 105 to 125, which are indicative of moderate pollution potential. Because the pollution potential index takes into account the yield of the aquifer, the fact that aquifers within the RFC watershed are small and low-yielding is partially responsible for the low pollution potential index values. The DRASTIC map for Franklin County is available on the ODNR website: <http://www.dnr.state.oh.us/water/gwppmaps/CountyPages/Franklin.htm>.

The (USGS) operates a streamflow gage (USGS 03228560) on Rocky Fork Creek at Gahanna, Ohio. The gage is located on the north side of the creek, just upstream of the Hamilton Road bridge (Latitude 40°01'18", West Longitude 82°51'57"). The gage is approximately 1 mile upstream from the confluence with Big Walnut Creek. The gage began operation on July 1, 2003. The drainage area upstream of the gage is 28.2 square miles. Only daily streamflow is available for the Rocky Fork gage:  
[http://nwis.waterdata.usgs.gov/oh/nwis/discharge/?site\\_no=03228560](http://nwis.waterdata.usgs.gov/oh/nwis/discharge/?site_no=03228560).

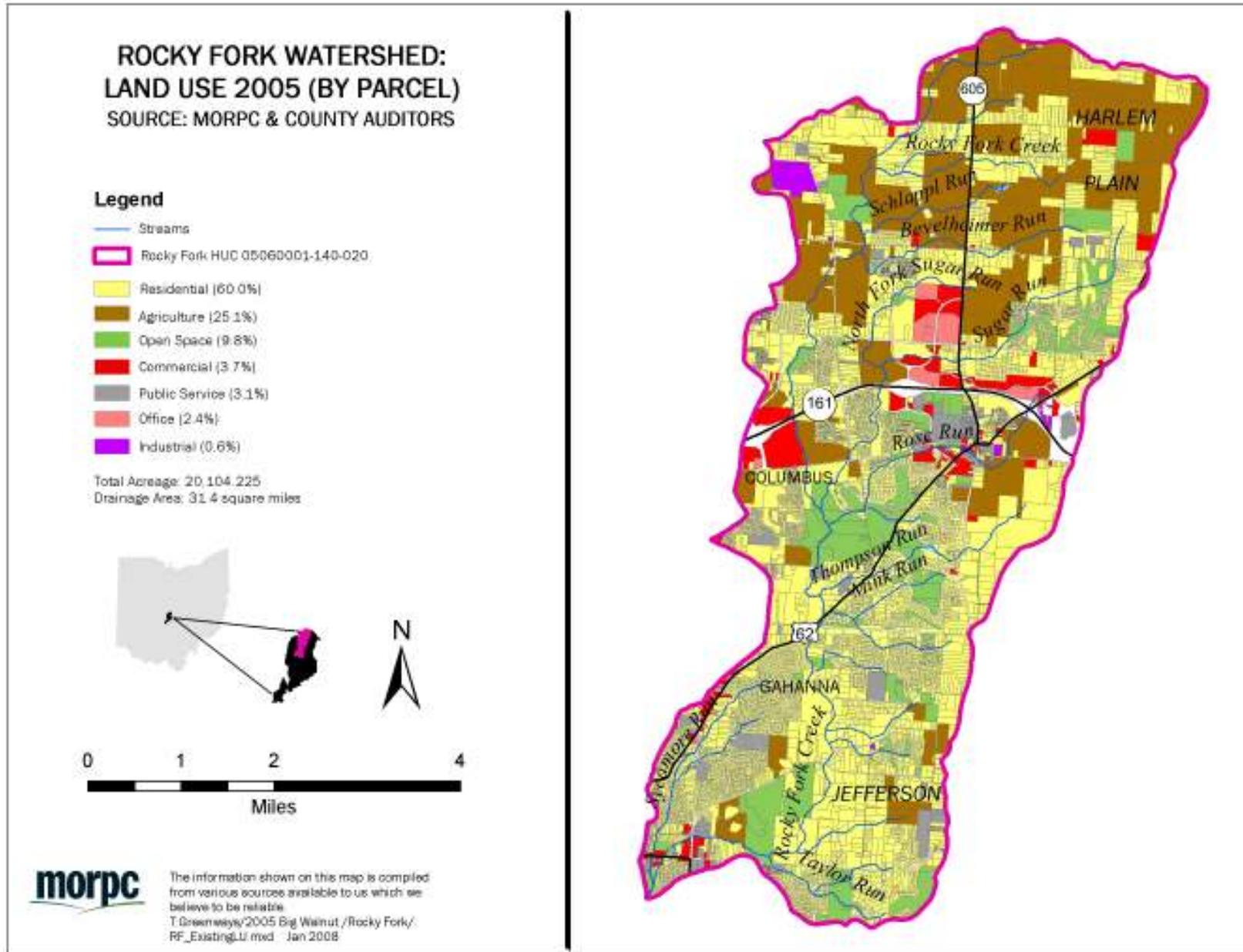
## *Land Use*

As Rocky Fork Creek continues south, the land use changes from rural to urban, therefore creating different pollution problems for the waterway. The riparian cover of Rocky Fork Creek is still substantial and allows for some buffer from surface flows and sheet run-off. Current agricultural land use is calculated at 25.1%. The majority of agricultural land use is located in Harlem and Plain Townships, with a few select areas located in Jefferson Township. The majority of land use, 60.0% of the watershed, is residential. The remaining 14.9% of the land area is split between open space, 9.8%, and commercial, office, industrial, and public service uses, 4.9% (see Fig. 11). It can be easy to derive that a significant amount of impervious cover already exists in the watershed which contributes heavily to the input of various contaminants including metals, urban run-off, and nutrients.

Using the Center for Watershed Protection (CWP) land use coefficients for impervious cover combined with land use by parcel current impervious cover for the watershed is roughly 18.5%. This level of imperviousness indicates the potential for significant impact based on the CWP's research. If future projections of land use are accurate impervious cover could increase beyond 25%. According to the CWP streams at this level of impervious cover have difficulty meeting designated life uses.

Current development strategies, construction site run-off violations, and impervious cover are having negative effects on the health and sustainability of Rocky Fork Creek. Along with increased development come increased impervious surfaces-areas such as roads, parking lots, driveways, and buildings - which prevent infiltration of water into the underlying soil. The impact of urbanization on water courses is difficult to control. To correct the extensive hydrologic alteration of watersheds, i.e., excessive (as well as polluted) run-off from these increased impervious surfaces is also a challenge. Development practices that reduce effective impervious area and include other strategies to protect water quality are more effective and less costly than remedial restoration efforts (<http://www.epa.gov/nerl/research/2004/g4-23.html>).

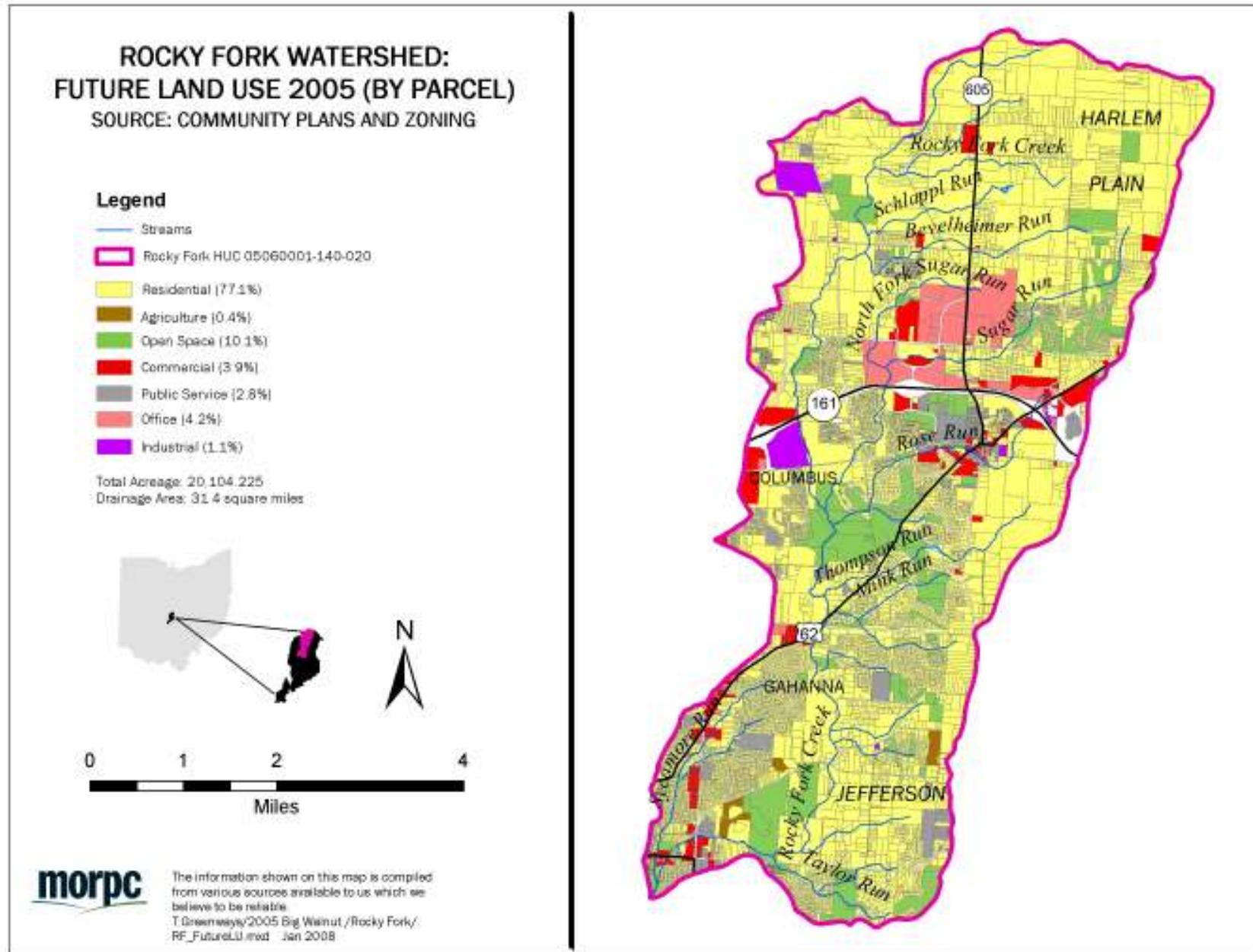
Figure 11: Rocky Fork Creek Watershed Current Land Use Map



Future projections (see Fig. 12) for the Rocky Fork Creek Watershed demonstrate a rapidly developing area that all but eliminates the agricultural land use. Open space may only increase slightly from the current levels. Residential use increases significantly, while office, commercial, public service, and industrial increase moderately. When more people move into an area, more support facilities must be built: housing developments, roads, shopping areas, and commercial and industrial facilities. Not only is land disturbed when development occurs, but the stress on the water resources of the region is increased to supply everyone with water (<http://ga.water.usgs.gov/edu/urbanpop.html>).

Land use within the Rocky Fork Creek sub-watershed of Big Walnut Creek is increasingly becoming urbanized from a rural, agricultural setting. Land use information has been derived from the Franklin County Auditor's office. Recommendations regarding future land use decisions are based upon the necessity to balance development and environmental stability. Clean water resources mean a healthy and stable community, and that means that our communities need to take the appropriate measures to implement proper codes and ordinances which ensure that the environment is a top priority in decision-making processes. "Over the past decade, numerous studies have linked increasing urbanization with stream degradation." Research by Chris Yoder and Ed Rankin perhaps best illustrates this relationship. They report, "Few if any, ecologically healthy watersheds exist in the older most extensively urbanized areas of Ohio and no headwater streams (i.e., draining <20 mi<sup>2</sup>) sampled by Ohio EPA during the past 18 years in these areas have exhibited full attainment of the Warmwater Habitat (WWH) use designation" (Yoder, 1995; Yoder and Rankin, 1996; *Housing Density and Urban Land Use as Indicators of Stream Quality, Technical Note #116 from Watershed Protection Techniques 2(4): 735–739* <http://www.stormwatercenter.net/Library/Practice/25.pdf>).

Figure 12: Rocky Fork Creek Watershed Future Land Use



**Table 7: Rocky Fork Creek Watershed Current and Future Land Uses (by Parcel).**

<b>Land Use</b>	<b>Existing (2005) (in acres)</b>	<b>Future Projections (in acres)</b>
Residential	11,053	15,503
Agricultural	5,037	80
Open Space	1,964	2035
Commercial	751	803
Public Service	623	559
Office	492	841
Industrial	125	224
Warehouse	59	59
<b>Total</b>	<b>20,104</b>	<b>20,104</b>

Source: Franklin and Delaware County Auditors 2005 and MORPC future projections based on locally adopted land use and comprehensive plans.

#### *Agriculture in the Rocky Fork*

On those lands still involved in agricultural production a corn-soybean rotation dominates. Large tracts owned by developers but still being leased out for agriculture tend to be dominated by a continual soybean rotation leading to higher levels of erosion due to the lack of residue. There seems to be little interest by the land owners and the farmers in practicing conservation tillage on these fields. More than 60% of lands in row crop production within the watershed are not using conservation tillage practices. Figure 13 shows the distribution of conservation tillage within the watershed based on a visual tour of agricultural lands by the watershed coordinator and Franklin County NRCS conservationist.

Given the nature of the row crop agriculture being mostly corn and soybean rotations the predominant chemicals used are Round-Up(Glyphosphate) and atrazine. Soybean fields are typically sprayed with one or two applications of Round-Up in the spring. The chemical is quickly absorbed by the plants or binds to the soil and is of limited concern for runoff. Atrazine is typically applied to pre-emergent corn fields in this area at a rate of 1.0 to 1.5 pounds per acre. Atrazine is of concern for its potential human health effects when it contaminates ground or surface water.

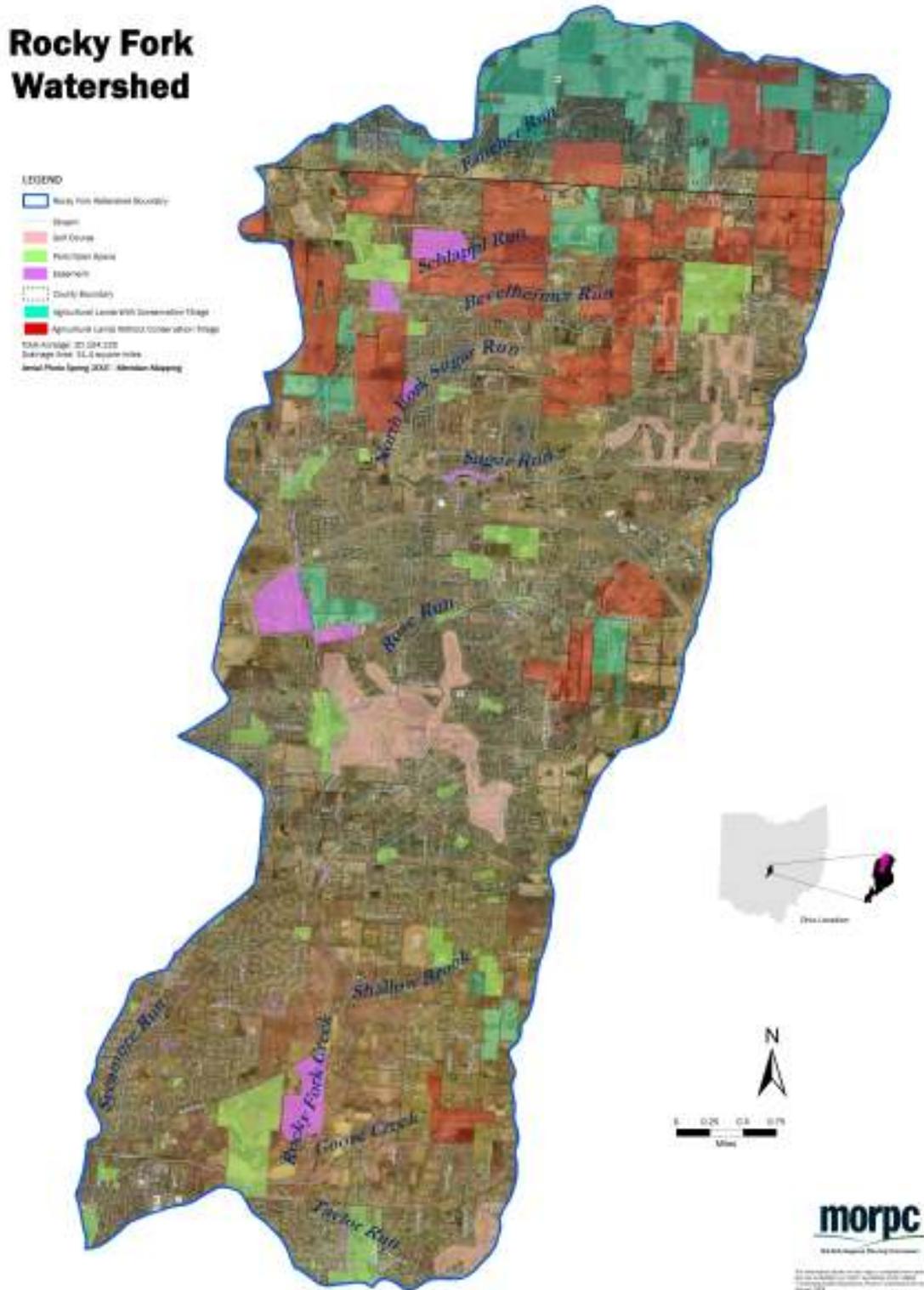
Livestock are not a dominant presence in the watershed. There are approximately 5 significant livestock farms in the vicinity of Walnut St. and Bevelhymer Road, located within Plain Township. There are approximately 10 farms with a total of about 75 horses on Walnut Street. There are also approximately 50 sheep, four bulls and 10 heifers on other farms along Walnut Street. There are approximately 25 llamas, 300 chickens and 45 turkeys near Rt. 62, south of Walnut Street. Furthermore, about ten head of cattle are on a farm located on E. Dublin Granville Rd. (Old Route 161) at the intersection of the Rocky Fork Creek.

The cattle on one farm have direct access to Rocky Fork Creek. This may be a significant contributor of fecal coliform bacteria, pathogens, and nutrient loading. In addition to this farm, other farms in the area practice manure spreading on their fields. This may be an additional

contributing factor to the increased concentration of pollutants flowing into Rocky Fork Creek. Other pollution sources of fecal coliform, pathogens, and nutrients are from domesticated animals and some wildlife such as Canada Geese. Pets on the pedestrian trails and working animals may also contribute to the influx of fecal matter into Rocky Fork Creek. In addition, local wildlife such as, but not limited to, deer, foxes, groundhogs, opossums, and raccoons contribute to the influx.

There are several horse farms in Jefferson Township. One unnamed tributary just north and west of Clark State Road south of Headley Road flows through the middle of horse pastures with open access by the horses to the stream channel. This may be another significant contributor of fecal coliform.

Figure 13: Rocky Fork Agricultural Tillage



## **B. Cultural Resources**

Long before European settlers came to central Ohio, the Rocky Fork watershed area was the home of many tribes of Native American Indians, including mound-building groups such as the Adena, Hopewell, and Fort Ancient Tribes. Later Mingo, Iroquois, and Wyandot tribes lived and died here, leaving behind projectile points such as arrowheads and other artifacts that are occasionally found by local farmers and gardeners.

Dense forest covered most of the land and was cleared in order for the rich soil to support the growing of corn, soybeans, and wheat. Until the 1970s the land use was rural. In the 1980s, large tracts of land that were owned or acquired by developers were planned and platted after central sewer and water were extended from Columbus into northern Gahanna and the New Albany Village.

The Rocky Fork Creek Watershed in the last 2 decades has experienced significant development. However, the watershed still maintains a historical past. The New Albany–Plain Township Historical Society has its museum house in an 1860 mint-condition and restored home called the Ealy House on the Rose Run Stream on Dublin-Granville Rd. There are two Indian Mounds (on Glacial Kames) near the intersection of Morse Road and Rt. 62. One is located across from the entrance of the New Albany Country Club on Greensward Road, and the other is on Shull Headley Road just south of Morse Road adjacent to the Gahanna Harrison Pond Subdivision. Gahanna maintains a Community Center which is the YMCA on Rt. 62 (Johnstown Rd) in Gahanna, and a Senior Center adjacent to the Police Station in Gahanna. The Rocky Fork Creek watershed is home to several golf courses and a private hunt club. These include The New Albany Country Club, New Albany Links Golf Club, Jefferson Golf and Country Club, and the Rocky Fork Hunt and Country Club. The watershed also has many parks and recreational areas:

**Table 8. Parks and Open Space in the Rocky Fork Creek Watershed.**

Parkland & Recreation Sites in the Rocky Fork Creek Watershed

<b>PARK_NAME</b>	<b>ADDRESS</b>	<b>CITY</b>	<b>STATE</b>	<b>ZIP</b>
Hannah Farms Park	6547 Clark State Road	Gahanna	OH	43230
Bryn Mawr Park	1082 Riva Ridge Boulevard	Gahanna	OH	43230
Rathburn Woods	316 Howland Drive	Gahanna	OH	43230
Shull Park	236 Granville Street	Gahanna	OH	43230
Trapp Park	756 Trapp Drive	Gahanna	OH	43230
Gahanna Woods	1501 Taylor Station Road	Gahanna	OH	43230
Bryn Mawr Woods	800 Line Way	Gahanna	OH	43230
Foxboro Basin	514 Tresham Way	Gahanna	OH	43230
Caroway Park	934 Caroway Boulevard	Gahanna	OH	43230
Clarenton Green Park	1294 Fareharm Drive	Gahanna	OH	43230
Community Gardens	167 Clark Street	Gahanna	OH	43230
Headley Park	1031 Challis Springs Drive	Gahanna	OH	43230
Thompson Park	5600 Thompson Road	New Albany	OH	43054
Swickard West Park	South of the Plain Township Aquatic Center	New Albany	OH	43054
Bevelhymmer Park	Between Bevelhymmer Road and Peter Hoover Road	New Albany	OH	43054
Wango Park	Central College and Rocky Fork Creek	Columbus	OH	43081
Walnut St. Parkland	6109 Walnut St., E. of Harlem	Columbus	OH	43081
Rocky Fork/Warner N	Warner Rd	Columbus	OH	43081
Rocky Fork/Warner Rd Parkland	Warner Road	Columbus	OH	43081
Rocky Fork Creek Parkland	5335 Warner Road	Columbus	OH	43081
Rocky Fork Parkland	5495 Central College Rd	Columbus	OH	43081
West Albany Wetland	7007 Robinton Way	Columbus	OH	43081

Source: Mid Ohio Regional Planning Commission.

### *Recreational Opportunities on Rocky Fork Creek*

Recreational opportunities along Rocky Fork Creek are limited due to lack of stream access points. The Rose Run tributary is paralleled by a multi-use trail through the village of New Albany and is used for science study by the students of the local schools but the stream is a head water stream and does not provide for boating or fishing uses. The Rocky Fork mainstem is only a marginally larger stream and does not lend itself to canoeing or kayaking, though during a heavy rain event one might be able to paddle the lower portion of the stream from Jefferson Township through Gahanna. There is public access to the mainstem Thompson Park near the New Albany Country Club as well as at the intersection of Clark State Road and Havens Road with a public parking area. The extreme lower portion of the stream can also be accessed at Shull Park and Friendship Park in Gahanna. Each of these sites offers the opportunity to engage in fishing.

### **C. Previous and Complementary Efforts**

The Rocky Fork Creek Protection Task Force (RFCPTF) has worked collaboratively over the past eight years with the Friends of the Blacklick Creek to protect the watersheds from construction mud pollution and the export/outsourcing of local watershed wetlands to distant rural county wetland mitigation banks. The following is a list of accomplishments from the efforts of the watershed organization:

#### Chronological Summary:

1991: Notarized Verified Complaint filed by citizen Al Harter regarding destruction of the Rocky Fork riparian zone and the lack of BMPs for construction mud pollution containment by the New Albany Company. This action led to the 1992 Ohio EPA Study of the Rocky Fork and the headwaters of the Blacklick and a \$7500 fine imposed on the New Albany Company. The fine funds were granted to the RFCWPTF for use in watershed stewardship outreach education programs.

1998–2001: Seven Sixty-Day Notifications to Sue were filed with the USEPA under the Clean Water Act Section 505 against developers and contractors in the Rocky Fork and Blacklick sub-watersheds for noncompliance with sediment and erosion control regulations.

2002–2006: Public Hearings (US Corps of Engineers and Ohio EPA were requested and held to oppose the granting of permits to the Links Residential & Golf Company to fill Rocky Fork Creek Watershed wetlands and to require mitigation of wetland destroyed without a permit to be within the local watershed and not in distant mitigation banks in rural watersheds. In 2006 the U.S. EPA reached a settlement with the developers. The developers were fined \$115,000 and required to partially restore the stream and wetlands on the golf course. Additionally they were required to restore 36 acres of wetlands with permanent protection in the same watershed.

2004: An Appeal of a Wetland Mitigation Permit granted to the Tuckerman Home Group was filed with the Environmental Review Appeals Commission (ERAC). The developer agreed to mitigate in the Big Walnut Watershed.

The RFCWPTF has received no grants, but its members have worked with the Village of New Albany Government to write Greenspace Preservation Grants, especially for the 80 acre New Albany Community Nature Preserve, as described above.

### **Accepted Land Use Policies According to Jurisdictional Boundaries**

#### ***Current Floodplain Regulations***

**Harlem Township/Delaware County:** Fill permits are issued by the floodplain manager in the Planning Department (none have ever been issued). Typically permits allow only for surface parking; developers can be granted “conditional use” in the floodplain by the Board of Zoning Appeals. Zoning Code 1171.02 (FLOW, WAP, 2003). No new structures shall be permitted within the one hundred year flood way and open space uses are permitted within the flood plain provided they do not require structures, fill or storage of material or equipment. Section 21.09

**Plain Township:** The Floodway is that portion of the Floodplain consisting of the channel and sufficient adjacent lands to convey the Base Flood discharge without increasing the Base Flood Elevation more than one-half (1/2) foot. The Floodway Fringe is that portion of the Floodplain outside of the Floodway.

Floodways within the township are used only for agricultural practices, private or public recreational uses, and residential open space. Floodway prohibited uses consist of the building or placement of structures; storage or processing of materials, trash, garbage, landfill, and waste disposal operations; placement of fill; and encroachments that cause an increase in base flood elevations. Conditional uses of the floodway include navigational and streamflow aids (e.g., marinas, piers, docks); construction, maintenance, placement, or improvement of public services (e.g., utilities, stream crossings, culverts); extraction of resources (e.g., sand, gravel); and alteration or relocation of the channel or watercourse. The conditional regulation uses for the floodway fringe are less stringent and allow residential, commercial, industrial, and manufacturing development; storage or processing of materials; parking and loading areas; waste processing and disposal facilities; flood control or mitigation structures; and temporary or permanent placement of fill, spoil, or material.

[http://plaintownship.org/images/stories/zoning\\_resolution.pdf](http://plaintownship.org/images/stories/zoning_resolution.pdf) PG 46

**Franklin County:** Within the floodplain, flood protection shall be achieved by elevating buildings at least 1 foot above the base flood elevation. Nonresidential structures may otherwise be flood-proofed (FCZR) (FLOW, WAP 2003). The ordinance also designates that a 1½ foot freeboard requirement for residential structures or other structures wishing to use elevation as a flood-proofing technique prohibits floodway development which would increase

the base flood elevation and prohibits floodway fringe development which would increase the base flood elevation more than 0.5 foot (*NFIP, section 610*).

**Jefferson Township:** Follows the Franklin County flood zoning ordinances.

**Village of New Albany SECTION 1155.07:** Residential construction is permitted in the floodplain but needs to be at a minimum of 2 feet above the flood base elevation, and if fill is used to elevate the structure, the increase in elevation should extend 15 feet laterally from the structure. Nonresidential development is also permitted within the floodplain where the basement is required to be a minimum of 2 feet above base flood level, or the structure with all sanitary and attendant utilities must be flood proofed with walls impermeable to the passage of water and be at a minimum of 1 foot above base flood level. Additional requirements include that the structure must be anchored to prevent flotation; the structure must be constructed with materials resistant to flood damage and constructed using methods that minimize flood damage; and all utilities must be constructed so as to prevent water from entering within the components of the flooding conditions.

**City of Gahanna Section 1191.23 :** Development within a floodplain is governed by the zoning administrator who reviews all fill permit applications and can make recommendations, in the form of an attachment, to the permit application. Floodplains can be used for agriculture, loading and parking areas, recreational uses (e.g., golf courses, baseball diamonds, swimming areas, shooting ranges); residential uses (e.g., lawns, play areas, gardens); uses accessible to open spaces (e.g., shelter houses); circuses and carnivals; roadside stands; extraction of gravel and sand; navigational and drainage aids, bridges, culverts, utility lines, pipes, and pipelines; and stables. If a structure is constructed within the floodplain, it must be constructed with low flood damage potential, taking into consideration the minimum obstruction of the flow of water. It must be firmly anchored to not allow flotation; electrical and heating equipment must be placed at or above the regulatory flood protection elevation; storage of material is allowed if properly anchored and stored in a manner as to be removed quickly after a flood warning has been issued; and public utility facilities and water-oriented industries which must be adjacent to watercourses are permitted, provided that the development is located so that it shall not substantially alter flood flows, heights, or velocities of the 100 year flood.

**City of Columbus:** A developer must obtain a certificate of zoning clearance from the development regulation administrator prior to filling of the floodplain. There is no public process (FLOW, WAP 2003).

### ***Riparian Setbacks***

**Harlem Township/Delaware County:** A required 120 foot buffer on either side of the mainstem. The draft comprehensive plan calls for a 60 foot buffer on major tributaries and a 30 foot buffer on all other waterways (FLOW, WAP 2003).

A required 30 foot buffer or to the nearest existing public street or road right of way, whichever is less. The Planning Commission may allow the buffer area be measured from the

center line of the stream, provided a sufficient width is added to the buffer area to ensure that 30 feet is established outside the stream banks. The buffer area shall be preserved in its natural state adjusted outwards to include sensitive areas such as steep slopes, wetlands and woodlands adjacent to the stream. Buffers are intended to be left in a natural state, with minimal clearance of vegetation.

<http://www.delawareohio.net/assets/File/1150%20Flood%20Plain%20Standards%20EFF%2004-22-04.pdf> SECTION 1150.07

**Plain Township:** Conservation Development District calls for not less than 100 feet of riparian buffer along the entire length of a river or perennial stream channel. Walkways may be permitted to be located within riparian buffers when the Zoning Commission determines that such walkways will not materially impact the riparian buffer. In the Plain Township Land Use Plan, adopted in 1997, the strategy was to cooperate with Regional Planning and use the plan to review all zoning proposals to ensure that streams and floodplains are designated on plans and to use the Zoning Resolution as a tool to encourage preservation. The Township is in the process of working on a dedication to the Franklin Soil and Water Conservation District of floodplain and floodplain fringe near the headwaters of the Rocky Fork. Residents in that area will be a part of that dedication. The Land Use Plan Recommendation is for all 100 year flood plains to be set aside as permanent open space within the Township through land dedications under County Subdivision Regulations; as conservation easements dedication; as Township parks district; as or nonprofit land conservancy. (The Plain Township planning commission recently approved an updated draft of the land-use plan, forwarding it to trustees earlier in January 2008.)

**Franklin County:** 120 foot buffer and 25 foot transitional area for all major streams / rivers (Subdivision Regulation 406; FLOW, WAP 2003).

**Jefferson Township:** The Zoning Commission shall have the discretion to require the developer of PSRD (Planned Suburban Residential Development) to plan and develop buffer areas where the particular location causes the necessity of buffering. Size, location, type, and density of buffering shall be defined by the Zoning Commission when deemed necessary.

**Village of New Albany:** According to the Village's Design Standards, all streams with a drainage area greater than 50 acres and their riparian corridors shall be preserved in their natural state. The corridor width shall be a minimum of 100 feet. The Rocky Fork/Blacklick Accord states that stream corridor open spaces are 300 foot-wide strips (150 feet to each side of the centerline of stream) of land following the centerline of the Rocky Fork and Blacklick Creeks. In addition, there is a 200 foot-wide corridor designated along Sugar Run. This open space would remain in, or revert to, a natural state. It would be created by a combination of development restrictions created by wetland and floodplain protection regulations, space that results from the development of abutting residential and commercial projects and from the public acquisition of the space. All of the guiding principles in the Plan were adopted by the VNA and City of Columbus and are considered when an application is submitted to the RFBA for recommendation of approval.

**City of Gahanna:** No codified ordinances requiring setbacks.

**City of Columbus:** It is an unwritten policy in the Parks & Recreation Department to get a 50 foot buffer on small streams and 120 feet on large rivers. The Storm Water Management Section has a written open watercourse policy of 25 for a 50 foot buffer from the top of each bank of USGS blue-line streams and a 25 foot buffer for small streams (FLOW, WAP 2003).

### ***Current Subdivision Regulations***

**Harlem Township/Delaware County:** The Delaware County Regional Planning Commission is currently revising its subdivision regulations to limit subdivision within the floodplain (FLOW, WAP 2003).

**Franklin County:** 120 foot buffer and 25 foot transitional area for all major streams / rivers. (Subdivision Regulation 406; FLOW, WAP 2003).

### ***Current Planned Unit/Residential Development (PUD/PRD)***

**All Counties and Townships:** The Ohio Revised Code gives counties and townships additional zoning authority (including zoning for general welfare) for Planned Unit Developments (FLOW, WAP 2003).

**Harlem Township/Delaware County:** Harlem Township draft Comprehensive plan contains a description recommending the allowance of Conservation Subdivisions, which form a cluster subdivision where natural features and environmentally sensitive areas (conservation areas) are excluded from development and preserved. Homes are clustered in the remaining areas. The draft plan also contains a section recommending the allowance of sub-divisions based on Traditional Neighborhood Design (TND). Traditional Neighborhood Design is based on principles of planning and architecture that work together to create human-scale, walkable communities similar to neighborhoods that were typical in the United States before World War II, such as Delaware's north end historic district and old Sunbury. (Alternative Developments of the draft Comprehensive Plan, Section 13.3, <http://www.harlemtwp.com>).

**Plain Township:** Plain Township implements a narrative that designates land use according to conventional design principles but acknowledges the importance of land preservation. The following are specific codes used in the zoning practices in Plain Township: a useful pattern of open space and recreation areas and, if permitted as part of the project, convenience in the location of accessory commercial uses and services; a development pattern that preserves and utilizes natural topography and geologic features, scenic vistas, trees, and other vegetation, and prevents the disruption of natural drainage patterns; more efficient use of land than is generally achieved through conventional development, resulting in substantial savings through shorter utilities and streets; a development pattern in harmony with land use density, transportation facilities, and community facilities (Objectives of the Comprehensive Plan, Section 302.1, [www.plaintownship.org](http://www.plaintownship.org))

**Jefferson Township:** Jefferson Township implements an alternative form of residential development that is called Planned Suburban Residential Development (PSRD). This strategy is provided as an additional option to the requirements of the standard residential districts. It is intended to promote imaginative, well-designed developments that preserve open space, respect the physical qualities and limitations of the land, and provide improved living environments. Opportunities to reduce development costs also may be provided by the PSR District  
<http://www.jeffersontownship.org/Departments/Zoning/docs/ConservationDevelopmentZoningCategory.pdf>).

**City of Gahanna Section 1108.01:** The City of Gahanna has implemented a template to follow when creating residential communities to preserve the natural features of the site. When developing a large community, consideration is given to preserving (1) unique or fragile areas such as wetlands, (2) significant trees or stands of trees, (3) lands within the 100 year floodplain, (4) steep slopes in excess of 20% as measured over a 10 foot interval, and (5) habitats of endangered plant materials or wildlife.

#### *Current Greenways*

**City of Columbus:** Riverfront Vision Plan recommends stabilization, maintenance, and selective enhancement of the riparian corridor, with particular attention to the vegetated steep banks along the river's edge. It also recommends enhancement and maintenance of the natural bank along the river for wildlife habitat. The Columbus Comprehensive Plan calls for the protection of natural resources throughout the City (wetlands, natural habitats, river valleys and banks, natural drainage ways, forested areas and floodplains). The Comprehensive Plan also supports bicycle facilities, parks, and greenways. It supports the establishment of a greenways zoning overlay and a protective zoning overlay for ravines to tie them into the city's greenway system (FLOW, WAP 2003).

**New Albany:** New Albany's Corridor Strategies document recommends Green Corridors. These corridors are located along the Rocky Fork Creek, Blacklick Creek, Sugar Run and Rose Run as well as along roadways. The corridors along the streams are meant to preserve a buffer for the protection of the water quality of the streams. The buffer protects the water from non-point source pollutants and stormwater runoff impacts. Additionally, the stream buffers provide open spaces and opportunities to locate additional trail miles in New Albany. Stream corridor setbacks are recommended at a minimum of 150' per side for a total of no less than a 300' riparian preservation zone.

#### *Preservation Zones*

**City of Gahanna Section 1167.21:** Preservation zones are natural areas that protect both the aesthetic appearance and environmental significance including, but not limited to, woodlands, wetlands, ravines, flood plains, streams, lakes, ponds, and/or steep slopes and can provide effective buffers between different or same land uses. It is the intent of this section to encourage the use of these preservation zones in new developments including single family subdivisions and multifamily, commercial, and industrial construction. It is the further intent of

this section not to preclude and/or prevent development, but to protect and preserve environmentally significant areas by fostering the use of buffer zones that could be integrated within the development. Preservation zones shall be used in a manner to promote and protect the public safety, convenience, comfort, prosperity, and general welfare of the City (<http://www.conwaygreene.com/Gahanna/lpext.dll?f=templates&fn=main-hit-h.htm&2.0>).

**New Albany Section 1171.03:** The Village of New Albany has adopted a tree preservation code that states, “when preparing and reviewing subdivision plans, good faith effort shall be made to preserve natural vegetation areas. Streets, lots, structures and parking areas shall be laid out to avoid unnecessary destruction of heavily wooded areas or outstanding tree specimens” ([http://www.amlegal.com/nxt/gateway.dll/Ohio/newalbany\\_oh/codifiedordinancesofnewalbanyohio?f=templates\\$fn=default.htm\\$3.0\\$vid=amlegal:newalbany\\_oh](http://www.amlegal.com/nxt/gateway.dll/Ohio/newalbany_oh/codifiedordinancesofnewalbanyohio?f=templates$fn=default.htm$3.0$vid=amlegal:newalbany_oh) ) (<http://www.conwaygreene.com/lpnewalbany/lpext.dll?f=templates&fn=main-hit-h.htm&2.0>)

**Jefferson Township:** The township has adopted a policy of implementing conservation zoning practices rather than conventional zoning practices. “Conservation zoning was developed to permit the designer to implement these values. The increased flexibility of conservation zoning enables the landowner to work with the constraints of the site, to preserve natural areas, and to buffer adjoining uses and roads. It provides a necessary protection for the welfare of the community without depriving the developer of a profitable return” (Jefferson Township, 2005).

#### *Planned Districts Open Space*

**New Albany:** Open space of 2400 square feet per dwelling unit is the designated allocation of open space required by the Village of New Albany.

**Jefferson Township:** Since 1990, Jefferson Township has implemented a zoning regulation that designates a minimum of 35% of the total land to be developed as open space.

**City of Gahanna:** The City of Gahanna has adopted a land use equation that designates a certain portion of the developed plat to be used as open space. The ER-1 district (Estate Residential District) requires 1.5% of the total site to be designated as open space. SF-1 district (Single Family Residential District) requires 2.5%; SF-2 (Single Family Residential District) requires 7.5%; and SF-3 (Single Family Residential District) requires 10%. AR-1 (Multi-Family Residential District) requires 15%, and PRD (Planned Residential District) requires 20%.

**City of Columbus:** Parkland dedication (Chapter 3318). Upon submission for rezoning of land in excess of 1 acre, the Recreation & Parks 27 Commission will determine if land or monetary donation will be required. The goal is to provide 5.5 acres of park for every 1000 residents. (FLOW, WAP 2003).

## **D. Physical Attributes of Streams and Floodplains**

### ***Early Settlement Conditions***

#### **WATERSHED HISTORY** (Taken from Big Walnut Action Plan Appendix 3)

##### **Native Americans pre-1500 A.D.**

**Mound Builders\***, in North American archaeology, is the name given to those people who built mounds in a large area from the Great Lakes to the Gulf of Mexico and from the Mississippi River to the Appalachian Mountains. The greatest concentrations of mounds are found in the Mississippi and Ohio valleys.

\*Archaeological research indicates the mounds of North America were built over a long period of time by very different types of societies, ranging from mobile hunter-gatherers to sedentary farmers. The prehistoric mounds had a wide variety of forms and fulfilled a range of functions. Many served as burial mounds, individual or collective funerary monuments. Others were temple mounds or platforms for religious structures. Burial mounds were especially common during the Middle Woodland period (c.100 B.C.-A.D. 400), while temple mounds predominated during the Mississippian period (after A.D. 1000).

During the Woodland period (c.500 B.C.-A.D. 1000), hunting and gathering was combined with a set of domesticated native agricultural plants (sunflower, goosefoot, erect knot weed, and may grass) to bring about increased population densities and a greater degree of sedentism throughout the Ohio and Mississippi valleys. The Middle Woodland period (c.200 B.C.-A.D. 400) saw the construction of elaborate earthworks from the Great Lakes to the Gulf Coast. Large, mainly dome-shaped mounds appeared throughout the Ohio and Tennessee River valleys, some in the form of animal effigies. In the Hopewell culture, centered in southern Ohio and Illinois, earthen geometric enclosures defined areas ranging from 2.5 to 120 acres (1 to 50 hectares), and some mounds reached 65 ft (20m) in height. Mica, ceramic, shell, pipestone, and other material were traded over a vast area, indicating the growth of a system of widely shared religious beliefs but not overall political unity. Analysis of mortuary remains suggest Middle and Late Woodland communities were characterized by a system of social rank: Particular kin groups are believed to have had high social prestige, differential access to rare commodities, and control over positions of political leadership. In the Late Woodland period (c.A.D. 400-1000), burial mounds decreased in frequency, and the elaborate burial goods of the Hopewell culture largely disappeared. However, there was probably no general decline in social complexity or population density at this time. In the Mississippian period (after A.D. 1000), maize agriculture spread throughout the East. . Populations expanded and became increasingly sedentary Mississippian societies are thought to have been complex chiefdoms, the most hierarchical form of political organization to emerge in aboriginal North America. ([www.infoplease.com/ce6/sci/A0834239.html](http://www.infoplease.com/ce6/sci/A0834239.html))

##### **Native Americans 1500 - 1843 A.D**

###### **The Wyandotte**

The Wyandots belong to the Iroquoian Family of North American Indians. They are the descendants of the Tionnontates or Tobacco Nation of the Huron Confederacy. Their legends and folklore indicate that they are of extreme Northern origin as a tribe, and their history confirms this.

As they increased in strength and became blended into a single tribe or people with the name Wyandot, they gathered about Mackinaw, and from thence began slowly to descend the Great Lakes, and stopped at Detroit. Here they were Pontiac's best and bravest warriors. In the wars between the British and Americans they were on the side of the English until the war of 1812, when about half the tribe sided with the Americans. At the close of the war that portion of the tribe that had adhered to Great Britain settle permanently in Canada, and those who had espoused the cause of the united States remained about the western end of Lake Erie, in what is now Ohio and Michigan. Their Ohio lands were in what is now Wyandot County. Here Methodism was introduced among them and a mission established. On March 17, 1842, they ceded their Ohio lands to the United States. They were the last of the tribes to relinquish their lands in Ohio.

In July, 1843, the Wyandots followed in the steps of the other tribes and moved beyond the Mississippi. Here in the "Indian Territory" they purchased the land in the fork of the Missouri and Kansas Rivers from the Delawares. They brought with them from Ohio a well organized Methodist Church, a Free Mason's Lodge, a civil government, and a code of written laws which provided for an elective Council of Chiefs, the punishment of crime and the maintenance of social and public order.

The Wyandots were always brave and humane warriors. They adopted persons captured in war; no instance is known of their burning and torturing a prisoner. The Wyandot tribe stood at the head of the Confederacy of the northwestern tribes formed to oppose the settlement by white people of the Territory Northwest of the Ohio River. The tribes composing this Confederacy were all removed. (Walker, [www.wyandot.org/ww1.htm#1](http://www.wyandot.org/ww1.htm#1).)

### **The Mingo**

The Mingo Indians were a small group of natives related to the Iroquois Indians. They are sometimes called the Ohio Seneca Indians. By 1750, the Mingos had left the Iroquois and migrated to the Ohio Country. In the 1760s, the Mingo Indians lived in eastern Ohio near Steubenville. By the early 1770s, they had moved to central Ohio. One of their villages was on the banks of the Scioto River at the site of modern-day Columbus.

Captain William Crawford led an attack against the Mingo village on the Scioto River at the close of Lord Dunmore's War in 1774. The Mingos fled across Ohio and became scattered. By the 1800s, the Mingo Indians had villages along the Sandusky River as well as at Lewistown. The Mingos began to live with other tribes, hoping that together they would be able to stop the westward expansion of white settlers. Some Mingo Indians lived with the Miami Indians, while others lived with the Shawnee Indians. In 1831, the United States forced the Mingos to sell their land, and the natives moved to reservations in the West. Logan was the most famous chief of the Mingo Indians.

*Ohio Historical Society, 2005, "Mingo Indians", Ohio History Central: An Online Encyclopedia of Ohio History*

### **The Delaware**

The Delaware Indians, also called the Lenape, originally lived along the Delaware River in New Jersey. They speak a form of the Algonquian language and are thus related to the Miami Indians, Ottawa Indians, and Shawnee Indians. The Delawares are called

“Grandfathers” by the other Algonquian tribes because of their belief that the Delawares were the oldest and original Algonquian nation.

As British colonists immigrated to North America, the Delawares fled westward away from the land-hungry Europeans. While trying to escape the British colonists, the Delawares encountered the Iroquois Indians, who proceeded to conquer the Delawares and drive them further west. Some Delaware Indians came to live in eastern Ohio along the Muskingum River, while others resided in northwestern Ohio along the Auglaize River. Once in Ohio, the Delawares grew into a powerful tribe that could resist the further advances of the Iroquois.

Upon arriving in the Ohio Country, the Delawares formed alliances with Frenchmen engaged in the fur trade. The French provided the natives with European cookware and guns, as well as alcohol, in return for furs. This alliance would prove to be tenuous at best, as French and English colonists struggled for control of the Ohio Country beginning in the 1740s.

Following the American victory in the Revolution, the Delawares struggled against whites as they moved onto the natives’ territory. In 1794, General Anthony Wayne defeated the Delawares and other Ohio Indians at the Battle of Fallen Timbers. The natives surrendered most of their Ohio lands with the signing of the Treaty of Greenville in 1795.

In 1829, the United States forced the Delawares to relinquish their remaining land in Ohio. They were sent to live in Kansas

*Ohio Historical Society, 2005, “Delaware Indians”, Ohio History Central: An Online Encyclopedia of Ohio*

### **White Settlement – Europeans and Americans**

The first white settlers came from the east by way of the Ohio River and up the Scioto.

### **New Albany Plain Township**

The first survey of Plain Township was done according to the Land Act of 1796.

In 1802 John Huffman bought from Dudley Woodbridge, the whole southwest quarter of Plain Township (4000 acres) for 4000 gallons of whiskey. Huffman, Swickards and some other related families were German farmers in western Pennsylvania who had difficulty getting grain to eastern markets and so made it durable as well as transportable by turning it into whiskey.

A log school building was erected on Central College Road and Cedar Grove around 1820.

Archibald Smith constructed a sawmill in 1833 on Blacklick Creek, ushering in the water powered sawmill era (to 1853) in Plain Township. Noble Landen and William Yantis laid out the village of New Albany in 1837.

### **Columbus, Ohio History**

Columbus, which is both the capital of Ohio and the county seat of Franklin County, was first laid out in 1812 and incorporated in 1816. Columbus was not the original capital, but the state legislature chose to move the state government there after its location for a short time at both Chillicothe and Zanesville. Columbus was chosen as the site for the new capital because of its central location within the state and access by way of major transportation routes (primarily rivers) at that time. The legislature chose it as Ohio’s capital over a number of other competitors, including Franklinton, Dublin, Worthington, and Delaware. Prior to the state legislature’s decision in 1812, Columbus did not exist. The city was designed from the first as the state’s capital, preparing itself for its role in Ohio’s political, economic, and social

life. In the years between first ground-breaking and the actual movement of the capital in 1816, Columbus grew significantly.

The town was surveyed, and various city lots were put up for sale. By 1813, a penitentiary had been built, and by the following year the first church, school, and newspaper had been established. The statehouse was built in 1814 as well. Columbus grew quickly in its first few years, having a population of seven hundred people by 1815. It officially became the county seat in 1824. By 1834, the population of Columbus was four thousand people, officially elevating it to “city” status. In that year, Columbus residents elected John Brooks as its first mayor.

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### **Gahanna, Ohio History**

Gahanna was founded along the Big Walnut Creek in 1849 by John Clark of Ross County from 800 acres that Joseph Clark had purchased from governor Worthington in 1814. Clark named his farm the Gahanna Plantation.

Gahanna maintained a considerable rivalry with the town of Bridgeport. Located directly across Granville Street and also along the banks of the Big Walnut creek, Bridgeport was founded in 1853 by Jesse Baughman, a former commissioner. The two towns eventually put aside their differences and merged into one. They adopted the name as there was already another town of Bridgeport in Ohio.

Its population grew over time, and it was incorporated in 1881. The first mayor of Gahanna was L. John Neiswanter. According to the Gahanna Historical Society, the community was not named for the Biblical Gehenna, but from a local Native American word describing the meeting of three creeks, as the community is located at the confluence of branches of Big Walnut Creek, once called Gahanna Creek, sycamore and rocky fork Creeks. The City of Gahanna’s Official Seal refers to this confluence with the inscription “Three in One”.

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### ***Floodplains***

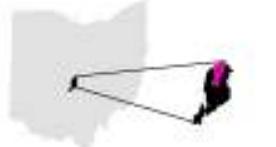
The importance of floodplains cannot be overstated. Floodplains serve as a storage area for increased water quantities during and after large rain or snow-melting events. A floodplain allows water to slowly infiltrate into the ground, recharging groundwater levels. Floodplains allow sediment, nutrients, and other pollutants to filter out of the water column before being taken downstream. Floodplains are buffer lands that absorb the impacts encountered from increasing development and surface flows by retaining pollutants and absorbing the nutrients into the vegetation. Wetlands are often found in these areas. They assist in filtering out pollutants and cleaning water. Vegetation in floodplains also provides shade from the sun to help keep waters cooler and the streams’ inhabitants alive. Many species of birds, amphibians, reptiles, and mammals find refuge in floodplains. The single most important function of floodplains to humans is the ability to keep floodwaters away from structures built by humans, unless we build in the floodplain. Many municipalities, cities, and townships have specific floodplain regulations that govern how development is performed within these areas. Some recognize the environmental importance of keeping floodplain development at a minimum;

others do not. Economically, floodplain land is less expensive than lands out of the floodplain, making development in these areas more attractive.

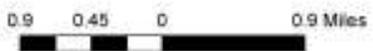
Figure 14 shows the floodplain as well as wetland soils, 150 ft and 300ft buffer zones, easements, parks, open space, as well as steep slopes. These are all areas that should be looked to for preservation to protect the water quality in Rocky Fork Creek.

Figure 14:

Rocky Fork Watershed:  
Environmentally Sensitive Areas



The information shown on this map is compiled from various sources available to us which we believe to be accurate.  
 T.G. Greenway, 2007 Big Walnut / Rocky Fork / RP\_Drains.mxd Jan 2008



### *Current Floodplain Conditions within the Rocky Fork Creek Watershed*

It is an established fact that the Rocky Fork Creek Watershed is undergoing an incredible change. Urbanization, and the corresponding increase in impervious cover, is creating a circumstance that requires all communities residing within the watershed to take the appropriate measures to reduce the impacts that urbanization is producing, and will produce. “Land development affects both the quantity and the quality of stormwater run-off, which in turn has impacts on watercourses. By enhancing and channeling surface drainage in favor of natural drainage systems, impervious surfaces like asphalt, concrete, and roofing increase the volume and velocity of the run-off, often resulting in flooding, erosion, and permanent alterations in stream form and function. In addition, by blocking the infiltration of water and its associated pollutants into the soil, impervious surfaces interfere with the natural processing of nutrients, sediment, pathogens, and other contaminants, resulting in degradation of surface water quality” (<http://ohioline.osu.edu/aex-fact/0443.html>).

Currently, the Rocky Fork Creek Watershed land use is characterized by 25.1% agricultural, 9.8% open space and 65.1% residential and commercial development. Future projections based on existing land use plans show a decrease in agricultural use to 0.4%, an increase in open space to 10.1%, and an increase to 89.5% for residential, commercial, industrial, public service, office, and warehouse combined. To put things in perspective, agricultural land use could be decreasing by 98.4%, open space increasing by only 3%, while land used for development is increasing by 73%.

### ***Streamside Forests***

Streamside Forests provide many benefits to the water quality and aquatic habitat of streams and rivers. These strips of forests, also referred to as riparian buffers or corridors, play a major role in protecting water resources that in many instances provide vital drinking water sources for humans and livestock.

The following are just some of the many services of streamside forests:

- Stream bank stabilization - the roots of trees along the stream banks provide excellent biological structure for holding soils in place.
- Nutrient absorption - the shrubs and trees act as a “sink” for nutrients from fertilizer and animal-waste run-off; they help absorb and process these nutrients before they can reach the stream, river, or lake.
- Temperature control – reduce water temperature by shading the water and allowing for higher dissolved oxygen levels.
- Wildlife habitat – streamside forests form habitat that allows a wide variety of fauna to thrive.
- Detritus – leaves and woody debris that fall into the stream are integrated into the stream ecosystem and provide energy
- Sediment runoff reduction - suspended sediment in surface run-off from exposed areas such as construction sites and eroded pasture and agricultural fields is trapped

in streamside vegetation. This prevents covering the rocky substrate of the creek bottom. Sediment may inhibit the feeding and reproduction cycles of fish and aquatic macroinvertebrates. If these species are affected, the disturbance is felt throughout the food web. (<http://east.osu.edu/anr/BB%20March%2001.htm> and [http://www.dnr.state.oh.us/water/pubs/fs\\_st/stfs13.htm](http://www.dnr.state.oh.us/water/pubs/fs_st/stfs13.htm) ).

### ***Current Easements***

**City of Columbus:** The Riverfront Vision Plan recommends the implementation of the environmental and public access provisions of the Riverfront Vision and Franklin County Greenways Plan to obtain conservation Easements and right-of-way acquisition to extend the trail system and enable public access along and to the river's edge. Columbus Comprehensive Plan calls for land acquisition to establish greenway systems including but not limited to fee-simple purchase, mandatory dedication, easement purchase or donation, and restrictive covenant (FLOW, WAP 2003).

**Plain Township:** A proposed 1200+ acre "Rocky Fork Headwaters " MetroPark between Ulry Road on the west and Peter Hoover Road on the east and north of Walnut Street to the Franklin/Delaware County Line.

**New Albany:** 0.98 acre of land located on private property, on Johnstown Rd. that buffers Rocky Fork Creek.

**Jefferson Township:** The Jefferson Township Land Conservation Association currently owns 98 acres in easements. These areas are located within the boundaries of the Rocky Fork Hunt Club, an Indian Mound, and at the corner of Havens and Clark State Roads.

**City of Gahanna:** There is a rather large conservation easement within the Foxwood development on Taylor Road. There are also two other conservation easements on single lots, one on Olde Ridenour Road and one on East Johnstown Road.

### ***Headwater Streams in the Rocky Fork Creek Watershed***

Primary headwater streams are like the capillary system of a blood supply network—just as the health of the whole organism depends upon a functioning capillary system, the health of larger streams and rivers depends upon an intact primary headwater stream network. Headwater streams provide many benefits to a stream, in particular if they have vegetated buffers. Some of these benefits include: (1) sediment control – sediment running off construction sites or agricultural lands are kept out of the main stem; (2) nutrient control – healthy headwater streams keep excess nutrients and pesticides out of larger streams; this reduces water treatment costs; (3) flood control - because of their connection to wetlands and groundwater, headwater streams can help control the flow regime of water; (4) wildlife habitat - they provide much-needed wildlife habitat and help maintain biological diversity; and (5) water and food supply –

they provide nourishment and water to downstream portions of the stream.  
([http://www.epa.state.oh.us/dsw/wqs/headwaters/HWH\\_import\\_jan2003.pdf](http://www.epa.state.oh.us/dsw/wqs/headwaters/HWH_import_jan2003.pdf)).

Rocky Fork Creek begins in Harlem Township in Delaware, Ohio. The headwaters of Rocky Fork Creek begin 800 feet north of the Franklin/Delaware County Line between Ulry Rd. on the west and Bevelhymer Ditch on the East within the Bevelhymer Park. Because the park allows protection from urbanization, Rocky Fork Creek still maintains its headwater capabilities in this area. Rose Run's headwaters begin 200 feet north of the intersection of State Route 62 and the State Route 161 Bypass. Sugar Run also has headwaters that begin 150 feet north of Walnut Street between Rt. 605 and Rt. 62, primarily in the Links Golf Course and the residential development built around the golf course.

Both tributaries have development directly affecting the condition and functionality of the streams headwaters. Sedimentation from urbanization and failing HSTS continue to take an adverse toll on the health of the streams. These tributaries need to be protected in order for them to continue controlling the health and behavior of the downstream portions of the waterway. By disrupting the hydrologic functions and biological connection in primary headwaters of river systems, an adverse cumulative affect will result and affect the rest of the system.

### ***Dams***

Awareness of the impact of dams on water quality and aquatic communities has increased over the past several years. Dams act as barriers to fish migration and recreational activities such as canoeing. Removing or retrofitting dams can improve fish habitat and other recreational opportunities. Despite the benefits of removing dams, the potential for environmental degradation exists if contaminated sediments accumulate behind the dam and are released during removal ([http://www.epa.gov/R5water/wqb/wqb\\_r5mon.htm](http://www.epa.gov/R5water/wqb/wqb_r5mon.htm)).

Within the Rocky Fork Creek Watershed there are five dams:

The first is 110 feet north of Morse Road on the Rocky Fork mainstem. It was a former mill site. It is still in place, but much of the upper part has eroded and crumbled. At present there is no difference in stream characteristics above or below the dam and removal would have little impact on water quality

The second dam is located on the Rose Run Tributary, 400 feet west of the Market Street Bridge within the Historic Village Center. This dam was removed in 2008.

The third dam is located on the Sugar Run Tributary, 210 feet south of Central College Road just west of Cedar Brook Drive. This dam was constructed by Tom Kesse to create a ponded area within the Sugar Run stream. There is an appeal to the Village of New Albany Government and to the Ohio EPA by downstream riparian property owners to have the dam removed and the natural hydrology and morphology of the Sugar Run restored. There is no



evidence of an ODNR Dam Construction Permit being issued and or of approval by the Village of New Albany Engineer. This appeal was put forth in 2005. As of 2008 no action has been taken and the land owner is unwilling at this time to remove the dam.

***Figure 15: Kesse Dam On Sugar Run***

The fourth is located at the intersection of Carpenter Rd. and Sycamore Run. This is a low-head dam that seems to have been crudely constructed several years ago. The pool behind the dam is less than two feet deep and provides habitat during low flows for larger fish. During rain events the dam does not present a barrier to fish movement.

***Figure 16: Sycamore Run Lowhead Dam***



The fifth is located at the intersection of Belcross Dr. and Mink Run. This low-head dam also has a pond associated with it and appears to be part of the storm water infrastructure. As such it is not a candidate for removal.

### ***Bridges***

The Friends of Big Walnut Creek in conjunction with the Rocky Fork Creek Watershed Protection Task Force conducted a bridge survey within the Rocky Fork Creek Watershed the first 2 weeks of September 2005. It has been noted that minor flooding was occurring at the time the survey was being conducted from the remnants of Hurricane Katrina. The lower bridges are in the City of Gahanna and are urban roadways and streets. The central bridges are in Jefferson Township and are suburban roadways. The upper bridges are in New Albany and Plain Township and are mostly rural roadways. Most of the roads and bridges will need modification in the upper stretches of the watershed as traffic increases from the heavy development occurring in that area.

*Bridge Inventory: Rocky Fork Creek Mainstem*

***Table 9: Rocky Fork Creek Mainstem Bridge Inventory.***

<b>Location</b>	<b>Bridge Type</b>	<b>Notes</b>
Granville St.	Pier & Beam	
Hamilton Rd.	Column Beam/Support Beam	
Clark State Rd.	Pier & Beam	Piers in Floodway
Morse Rd.	Pier & Support Beam	Piers in Floodway
S.R. 62	Pier & Beam	Piers in Floodway
Thompson Rd.	Columns Piers Beams	Piers in Floodway
Dublin-Granville Rd.	Column Beam/Support Beam	Piers in Floodway
S.R. 161	Column Beam/Support Beam	2 bridge piers in floodway Construction
Warner Rd.	Abutment & Beam	Construction
Central College Rd.	Column Beam/Support Beam	Construction Columns in Floodway
Harlem Rd.	Column Beam/Support Beam	Columns in Roadway
Walnut St.	Column Beam/Support Beam	
Schleppi Rd.	Column Beam/Support Beam	
S.R. 605	Column Beam/Support Beam	
Bevylheimer Rd.	Concrete Tile	One bank mowed to edge of floodway

**Table 10: Sycamore Run Bridge Inventory.**

<b>Location</b>	<b>Bridge Type</b>	<b>Notes</b>
Gahanna Service Rd.	Concrete Abutment	
Granville St.	Box Culvert	
Carpenter Rd.	Box Culvert	Low-Head Dam Mowed to edge
Heil Dr.	Pier & Support Beam	Pier in floodway and mowed to edge
Larry Lang Dr.	Concrete Oval Tile	
Private Driveways (2)	Box Culvert	Off Johnstown Rd.
Hamilton Rd.	Box Culvert	Good Riparian Edges
Clotts Rd.	Box Culvert	Too small for flow
Dark Star Dr.	Round Tile	Retention Pond w/ weir mowed
Uenention Way	Round Tile	Mowed to edge

**Table 11: Sycamore Run Tributary Bridge Inventory.**

<b>Location</b>	<b>Bridge Type</b>	<b>Notes</b>
Hamilton Rd. So. of Peale Ct.	Concrete Tile	Mowed
Hamilton Rd. b/t Hornburn & Medwing	Concrete Tile	Forested

**Table 12: Mink Run Bridge Run Inventory.**

<b>Location</b>	<b>Bridge Type</b>	<b>Notes</b>
S.R. 62	Corrugated Steel	No signage
Evelyton Rd.	Concrete Culvert	Mowed
Morse Rd.	Box Culvert	Little Riparian
Belcross Dr.	Box Culvert	Low-head Dam & Pond in stream
Sedgefield Dr.	Box Culvert	Mowed
Morse Rd.	Box Culvert	Recently enlarged & mowed
Harlem Rd.	Box Culvert	Mowed to edges
James River Rd.	Box Culvert	Also footbridge
Head of pond		Pond in stream weir box

**Table 13: Thompson Run Bridge Inventory.**

<b>Location</b>	<b>Bridge Type</b>	<b>Notes</b>
S.R. 62/Thompson Rd./Harlem Rd.	?	Under construction / Closed
Stanning Pass	Concrete Arch	
Lampton Green North	Tile	Retention Pond
Lampton Park	Concrete Arch	
Bauchman Grant	Concrete Oval Tile	Golf Course / Mowed
Reynoldsburg-New Albany Rd.	Round Tile	Mowed

**Table 14: Rose Run Bridge Inventory.**

<b>Location</b>	<b>Bridge Type</b>	<b>Notes</b>
Harlem Rd.	Abutment & Slab	Dead End Rd ./ Good Cover
Harlem Rd.	Box Culvert	Dead End Rd ./Good Cover
Greensward Rd.	Box Culvert	Great Riparian / No floodplain development
Market St.	Concrete Arch	Good Cover
S.R. 62 (Main St.)	Abutment & Beam	Good Cover
Reynoldsburg-New Albany Rd.	Abutment/Slab/Pier	Pier in floodway

**Table 15: Sugar Run Bridge Inventory.**

<b>Location</b>	<b>Bridge Type</b>	<b>Notes</b>
Greensward Rd.	Pier & Beam	Pier in Floodway
Dublin-Granville Rd.	Pier Beam Slab	Pier in Floodway
Harlem Rd.	Abutment & Slab	
Fodor Rd.	Concrete Arch	Rock Dam
S.R. 161	Box Culvert	
New Albany Rd. West	Concrete Arch	
New Albany Rd. East	Concrete Arch	
S.R. 605	Abutment & Slab	
Central College	Box Culvert	Damned pond in stream
New Albany Rd. East	Box Culvert	Links
Bevelhymer Rd.	Abutment & Beam	
Walnut St.	Box Culvert	

**Table 16: Sugar Run Tributary Bridge Inventory.**

<b>Location</b>	<b>Bridge Type</b>	<b>Notes</b>
Dean Farm Rd.	Box Culvert	Links East Bridge Also
Bevelhymer Rd.	Box Culvert	

### ***Channelization and Levees***

There are no known engineered channelized stream lengths and engineered levees within the Rocky Fork Creek Watershed. However, the Table shows all of the 401 permits issued within the watershed; 401 permits are issued when watercourses are subject to hydromodification due to actual stream relocation and development occurring within the floodplain. The filling of these areas also contributes to channelization and the development of an unnatural levee system that reduces the stream's ability to use its floodplain. The negative impacts caused by channelizing can reduce the functionality of the stream, destroy needed wildlife habitat, reduce water quality, and increase flooding potential.

***Table 17: Rocky Fork Creek Issued 401 Permits.***

<b>Object ID</b>	<b>Ohio EPA #</b>	<b>Core Place</b>	<b>Permit Action</b>	<b>Associated</b>
209	020633	Slane Co Commercial/Residential	Preferred Alternative	Slane Company
221	020728	Hamilton Road North Development	Min. Deg. Alternative	Donald W. Kelley & Associates, Inc.
355	032616	New Albany Links Golf Course		New Albany Links Golf Company
795	048634	Tuckerman Home Group Subdivision	Min. Deg. Alternative	Tuckerman Home Group

### ***Floodplain Development***

The creation of buildings, parking lots, and roads; the draining of wetlands; mining; deforestation; and agricultural activities can alter the quality and quantity of water that flows over and infiltrates into the ground. These changes can change watershed functions by eliminating critical water storage sites (e.g., wetlands and floodplains) and by contributing additional sediments and chemicals to run-off. Human activities can also eliminate critical natural habitat sites, thereby limiting biodiversity in the watershed (<http://ohioline.osu.edu/ws-fact/0001.html>).

Floodplain development also can have detrimental effects upon structures that are constructed within areas that are naturally designed to hold water during high precipitation events. Therefore, floodplain usage should be designated to open space uses rather than residential communities and commercial functions.

**Table 18. Land uses within the 100-year floodplain for Franklin and Delaware counties.**

<b>Rocky Fork Watershed: Land Uses within the 100 year Floodplain (parcel based). Franklin County</b>											
<i>Land Use (Existing '05)</i>	<i>Acreage</i>	<i>Land Use (Future*) and associated acreage</i>									
Agriculture	<b>869.1</b>	Residential	<b>700.8</b>	Office	<b>152.1</b>	same					
Commercial	<b>36.8</b>	same									
Office	<b>0.9</b>	same									
Open Space / Park	<b>824.7</b>	same									
Public Service	<b>50.0</b>	Park	<b>6.7</b>	Commercial	<b>3.1</b>	same					
Residential	<b>1232.5</b>	Park	<b>12.6</b>	Commercial	<b>19.1</b>	Office	<b>2.0</b>	same			
Vacant Res, Comm, etc.	<b>631.7</b>	Park	<b>7.6</b>	Commercial	<b>59.0</b>	Office	<b>16.6</b>	Residential	<b>445.7</b>	Industrial	<b>102.8</b>
<b>Total:</b>	<b>3645.7</b>										
* future - according to local land use plans, comprehensive plans and zoning: Columbus zoning; Gahanna Future LU Plan; Jefferson Twp Comp Plan; New Albany Strategic Plan and NASP / Rocky Fork Update; Northland Plan Vol 2; Rocky Fork Update.											

<b>Rocky Fork Watershed: Land Uses within the 100 year Floodplain (parcel based). Delaware County</b>											
<i>Land Use (Existing '05)</i>	<i>Acreage</i>	<i>Land Use (Future*) and associated acreage</i>									
Agriculture	<b>2.2</b>	Residential	<b>2.2</b>								
Vacant (Res)	<b>41.6</b>	Residential	<b>41.6</b>								
<b>Total:</b>	<b>43.8</b>										
* future- according to the Harlem Twp Com Plan 1988.											

***Forested Corridor Assessment***

The Friends of Big Walnut Creek with the assistance from the Rocky Fork Creek Watershed Protection Task Force have begun assessing the Rocky Fork Stream corridor in order to locate areas that need restoration consideration. Forested stream channels are necessary to promote stream health and water quality. Streamside forests nurture Ohio’s streams. The stream and its adjacent land (riparian area) together form the most vital and diverse feature of Ohio’s landscape. Without trees in this land-water transition zone, streams typically become wide and shallow, habitat is degraded, and water quality drops. (Figure 17 shows the current acreage of streamside land still intact, 965 acres.)

***Figure 17: Rocky Fork Creek Streamside Riparian Forest within 100-yr Floodplain***

Rocky Fork Creek  
100-yr floodplain  
965 acres

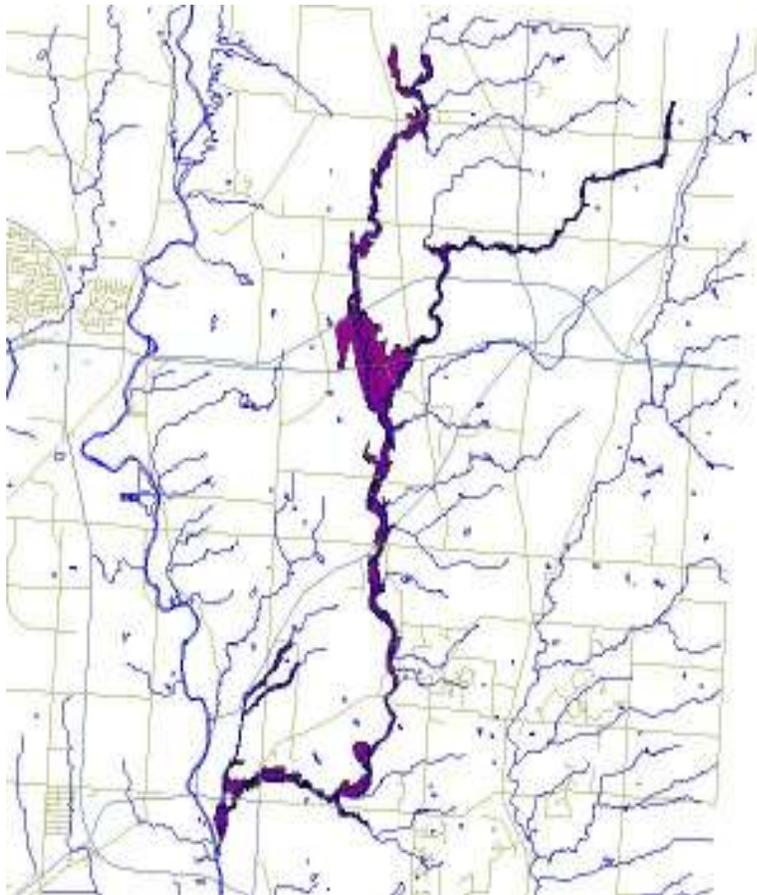


Table 19 is a listing of the known stream corridor areas which need consideration of restoring and/or improving the much-needed transition zone from land to water. The Friends of Big Walnut Creek will continue to gather data of other areas that should be considered for restoration work.

***Table 19. Potential Restoration Areas within the Rocky Fork Creek Watershed.***

<b>PID</b>	<b>NAME</b>	<b>ADDRESS</b>	<b>INFO</b>
170-001291 170-001255; 170-001334; 170-000561		4279 Shull Road. Jefferson Township 3636, 3616 Pamela Drive. Jefferson Twp Shull Road. Gahanna;1154 NCreekway Ct Gahanna	east side lacking in trees within 150 foot buffer  west side lacking in trees within 150 foot buffer
025-008928; 025-010402	New Albany Co, Johnson Price		east side lacking in trees within 150 foot buffer
222-001792	New Albany Country Club	Morse Road. New Albany	east side lacking in trees within 150 foot buffer
220-000385		5600 Morse Road. Plain Twp 4657 Collingville Wy	west side lacking in trees within 150 foot buffer
010-262334; 010-260632		Columbus. 4680 Wenham Pk	west bend lacking in trees within 150 foot buffer
010-214639	New Albany Co	5100 Morse Road. Columbus	west side lacking in trees within 150 foot buffer
223-000001	New Albany Co	Thompson City Road	east side encroachment from golf course in 150 ft
010-268340	New Albany Plain Park District	Harlem Road. Columbus	west side lacking in trees within 150 foot buffer
010-268340; 545-268341	New Albany Plain Park District (both)	Harlem Road. Columbus	west side lacking in trees within 150 foot buffer
545-268341; 545-198842	New Albany Plain Park Dst; New Albany Co	Harlem Road. 5021 Harlem Rd. Harlem Road. New Albany	west side lacking in trees within 150 foot buffer
222-002948; 222-002952	New Albany Co	(both)	east side major encroachment from golf course

### **Access to Floodplain**

The Friends of Big Walnut Creek will perform a field survey of Rocky Fork Creek to determine the accessibility of the stream to its floodplain. No data have been collected for Rocky Fork Creek concerning stream morphology. This access is crucial to the health and function of the stream and is necessary to determine points of concern.

### **E. Water Resource Quality**

The Qualitative Habitat Evaluation Index (QHEI) is designed to provide a measure of habitat that generally corresponds to those factors which affect fish communities and which are generally important to other aquatic life (e.g., invertebrates). Because the presence and abundance of fish species is strongly related to the physical and chemical characteristics of a stream (Gorman & Karr, 1978; Schlosser, 1982), increased human activities, channel dredging, and agricultural modification of watersheds can alter nutrient cycling patterns and, in turn, fish community structure (Marsh and Luey, 1982). Much of the degradation observed in fish communities related to habitat disturbance is strongly influenced by the extent of modification. As the extent of modifications increases, the probability of local extinctions increases, and a more disturbed community results ([http://www.epa.state.oh.us/dsw/documents/BioCrit88\\_QHEIIntro.pdf](http://www.epa.state.oh.us/dsw/documents/BioCrit88_QHEIIntro.pdf)).

QHEI scores can range from 12 to 100. Scores greater than 75 indicate excellent stream habitat, scores between 60 and 75 indicate good habitat quality, and scores less than 45 demonstrate habitat not conducive to WWH. Scores between 45 and 60 need separate evaluation by trained field staff to determine the potential aquatic life use for the stream (TMDL, Big Walnut Creek Watershed). The QHEI score for Rose Run, a tributary of Rocky Fork Creek, is 55.5 a deviation of 4.5 from the target of 60. Rocky Fork Creek was sampled at two separate monitoring locations. River mile 7.1 achieved a 60.0 QHEI score, and river mile 5.9 achieved a 73.5 score. Both met or exceeded the target of 60. A QHEI assessment was not performed for the Sugar Run tributary of Rocky Fork Creek.

### ***Water Quality Monitoring Locations***

Rocky Fork Creek has six monitoring locations. The initial sampling location is at river mile 10.2, just north of Walnut Street in Plain Township. The non-attainment status given to this location is primarily due to agricultural run-off, grazing practices, manure application, failing HSTS, and increasing development. These sources are combining to contribute to increased amounts of nutrients, pathogens, sediment, phosphorus, and fecal coliform entering the creek in this area of the sub-watershed.

River mile 7.1 has a designated full-attainment status. The monitoring location is located at the intersection of Rocky Fork and East Dublin-Granville Road. From the first monitoring location, the creek flows through additional agricultural areas in Plain Township, through a

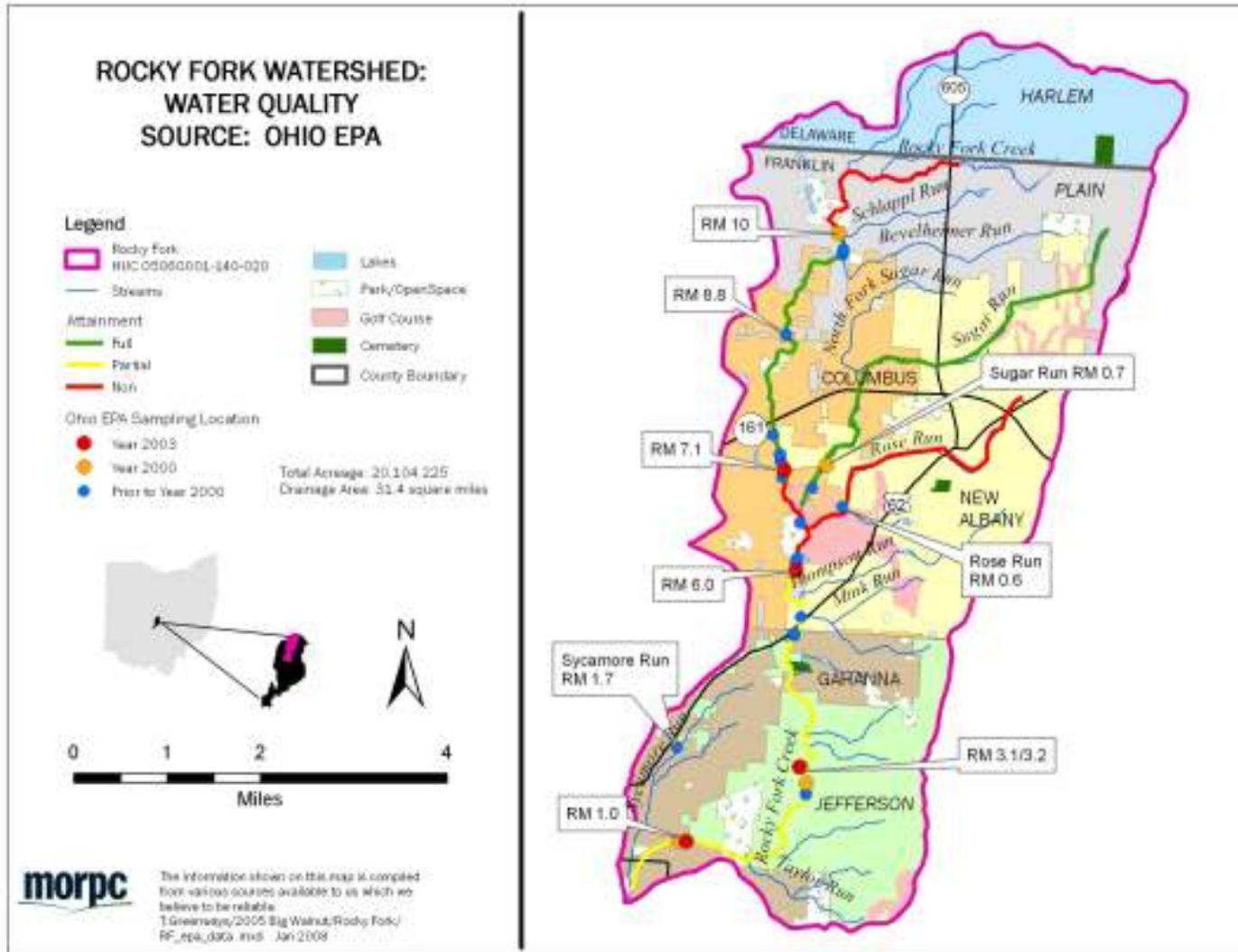
small residential neighborhood, and continues within the New Albany Corporation limits until its intersection at SR161. A proper riparian corridor and a healthy aquatic habitat significantly contribute to the health of the stream through this stretch of the creek. However, impairments from surface run-off continue to influence the waterway and its health.

The next monitoring location is at river mile 5.9 at the intersection of Thompson Road and Rocky Fork Creek. The creek flows south through additional incorporated land and the New Albany Country Club. Two tributaries, Rose Run and Sugar Run, also intersect Rocky Fork within the boundaries of the New Albany Country Club. The monitoring location has been found to be in non-attainment according to the data collected. Both Rose Run and Sugar Runs are under assault from construction activities and poor riparian cover. Sugar Run flows east to west; it begins in Plain Township and flows through the New Albany Links Golf Course. It continues through the Village of New Albany and several residential neighborhoods before meeting Rocky Fork at the New Albany Country Club. Rose Run flows north and east of New Albany and also flows east to west through the incorporated part of New Albany. Several residential neighborhoods populate the small sub-watershed of Rocky Fork before it confluences with Rocky Fork in the New Albany Country Club property. The monitoring location is located south of the Country Club. The non-attainment status given reflects the combination of golf course run-off and the mixing of tributary waters which also have water quality problems associated with them.

Monitoring was performed at river mile 3.3 located at the intersection of Clark State Road. and Rocky Fork Creek. According to the TMDL, this location is in partial attainment and has an existing water quality designation of EWH. As the creek continues south, it flows through a few residential neighborhoods; however, the majority of the creek is located within Jefferson Township. For the most part, private landowners with acres of green space, in addition to the zoning ordinances implemented by Jefferson Township, account for the health of this stretch of Rocky Fork Creek.

The last monitoring location is at river mile 1.1, at the intersection of Hamilton Road. and Rocky Fork Creek. It also is in partial attainment and has an existing water quality designation of EWH. The creek flows through Jefferson Township and enjoys the conservation strategies that Jefferson Township employs. The Rocky Fork Country Club is located within the creek's course and has permanent easements associated with the stretch of creek that flows through this location. Therefore, from Clark State Road. until the confluence with Big Walnut Creek in central Gahanna, Rocky Fork has exceptional water quality. The criteria for formulating a designated use status do not depend alone upon water chemistry, but take into account the quality of habitat. Because this area contains exceptional riparian cover and has land easements associated with the creek stretches in this area, the EWH designation is given.

Figure 18: Rocky Fork Creek Attainment Status Map.



**Water Quality Impairments: Point Sources**

*Phosphorus, Pathogens, and Fecal Coliform Point Sources*

The point source allocation figures indicate that the two WWTPs are the only known sources for an influx of total phosphorus and fecal coliform to Rocky Fork Creek. The current NPDES permits allow 1 mg/L of total phosphorus to be input into the discharge effluent. The total fecal coliform limits, according to the TMDL, are 1000 cfu. The actual phosphorus effluent discharge for Taylor Estates is 76 lb/year and 213 lb/year for Westerville Estates. However, these sources are not a significant contributor to fecal coliform influx.

Nutrients and pathogen content have shown large deviations from the prescribed target allocations reported in the Big Walnut TMDL. Rose Run, a small tributary to Rocky Fork Creek, has a slight deviation from the target allocation for its habitat QHEI score. This suggests that Rose Run still has quality habitat for aquatic life but suffers from development and nutrient run-off. Known sources of impairment for the Rocky Fork Creek watershed consist of WWTPs which are named Taylor Estates, Westerville Estates, and the Windrush Road. plants. All plants have NPDES permits, and the Windrush Plant became inoperative in 2005.

**Table 20 Existing Point Source Loads in HUC 05060001-140 (Ohio EPA, Big Walnut Creek TMDL)**

Resources	Facility Name NPDES Permit #	Median <i>Q</i> MDG	[TP] <sup>2</sup> mg/l	[FC] <sup>3</sup> cfu	Facility Loads		HUC Loads	
					TP lb/year	FC cfu/season	TP lb/year	FC cfu/season
140-020	Taylor Estates 4PA00001	0.012	3.00	20.8	110	1.72E+09	850	4.06E+10
	Westerville Estates MHP 4PA00011	0.043	3.00	113.9	393	3.41E+10		
	Jefferson WSD WWTP Windrush Rd. 4PQ00001	0.38	3.00	18.1	347	4.78E+09		

*Spills*

**Table 21: Reported Spills in Rocky Fork Creek Watershed**

PRODUCT	DATE	YEAR	CITY/TWP	LOCATION	SPILLER ENTITY
DEBRIS	9/14/2002 00:00:00	2002	GAHANNA	CARPENTER RD & HAMILTON RD	UNKNOWN
MATERIAL WHITE GROUT	9/9/2003 10:25:05	2003	JEFFERSON TWP	STRATSHIRE LANE OFF OF CLARKSTATE RD	VINH DAI TRAN
SEWAGE, PARTIALLY TREATED	10/6/2004 08:38:50	2004	GAHANNA	5593 HAVENS CORNERS RD	WILLIAM BISHOFF
NO SPILL	11/27/2006 22:46:27	2006	COLUMBUS	US 62 & MORSE RD	UNK
FOAM ("NATURAL" PHENOMENON)	1/3/2006 10:43:22	2006	GAHANNA/JEFFERSON TWP	ROCKY FORK CREEK BEHIND 3668 PAMELA DR	NATURAL PHENOMENON

***Water Quality Impairments: Non-Point Sources***

*Phosphorus, Pathogens, and Fecal Coliform Non-Point Sources*

Causes of non-attainment for the recreational use and the aquatic life use categories were pathogens, with nutrients being a contributing factor, especially in the headwaters. Sources for these pollutants were determined to be failing HSTS and land development (Ohio EPA, Big Walnut Creek, TMDL).

Rocky Fork Creek’s non-point source loading of fecal coliform primarily occurs from surface run-off, cattle, and failing aerators. Non-point source phosphorus loading occurs principally from surface run-off, but also has substantial loading from failing aerators and groundwater. Existing loading of fecal coliform and phosphorus within the Rocky Fork Creek watershed is attributed to non-point source run-off and point sources. The TMDL has been determined using these known quantities and the equation  $WLA + LA + MOS = TMDL$ . The Waste Load Allocation (WLA) figure is used to quantify the point source loading areas, whereas the Loading Allocation (LA) figure is given to the non-point source amount. The Margin of Safety (MOS) is based upon acceptable EPA water quality standards. The TMDL is then figured using the predetermined “acceptably safe” loading amount (the TMDL target) and dividing that figure by the actual existing loading amount. The result is the target loading reduction percentage or the TMDL. Table 20 shows the existing non-point source loads for Rocky Fork Creek.

It has been determined that household sewage treatment systems (HSTS) are a significant contributor of phosphorus and fecal coliform entering the Rocky Fork Creek mainstem and its corresponding tributaries. A total of 682 HSTS are currently operating within the watershed, with OEPA estimating that 578 of those are failing, see table 21 (OEPA Big Walnut Creek TMDL).

The Ohio EPA has documented excessive bacteria counts above Primary Contact Recreation standard for the Rocky Fork Creek mainstem. The contents and bacteria from HSTS can make their way to our surface waters in the following ways: (1) the direct discharge of untreated wastewater (due to inadequate technology or faulty systems) into our drainage ways, ditches, tributaries, and streams; (2) the illicit interconnection of HSTS with storm sewers or farm drains; (3) urban or rural run-off (due to faulty leaching fields, saturated soils, or plugged-up leach beds) containing untreated HSTDS wastewater; and (4) leaking septic tanks or leach fields discharging into highly permeable bedrock near streams (Friends of Lower Olentangy Watershed Action Plan, 2003).

Mean dissolved oxygen values found in the 2000 survey of Rocky Fork compared well with historical information obtained the previous decade. In most cases, the 2000 data showed higher concentrations of dissolved oxygen than those found in other years. This is a positive trend in the upper portion of this sub-basin. However, the lower portion of the basin experienced significantly higher concentrations of dissolved oxygen, which were probably indicative of supersaturated conditions and nutrient enrichment. Biochemical oxygen demand was elevated above historical values only at river mile 7.10, possibly due to lingering effects from the Taylor Estates WWTP. Total suspended solids averages were low or comparable with most historical information, except at river mile 7.10 where the mean value was nearly 5 times higher than the data collected in 1994. Development pressures in this area may be the major cause of this spike due to construction site run-off and changes in flow dynamics causing increased bank erosion during storm flows. Fecal coliform bacteria concentrations generally were similar over the different survey periods, although the 2000 survey did reveal a spike at the site near the mouth, possibly due to the Windrush WWTP. Nutrient concentrations trended similarly, with past data including increased concentrations upstream which attenuated downstream. Nutrient reduction downstream may have been influenced by increased uptake and primary productivity inferred from supersaturated dissolved oxygen concentrations (Ohio EPA, Big Walnut Creek, TMDL).

**Table 22: Existing Non-Point Source Loads in HUC 05060001-140**

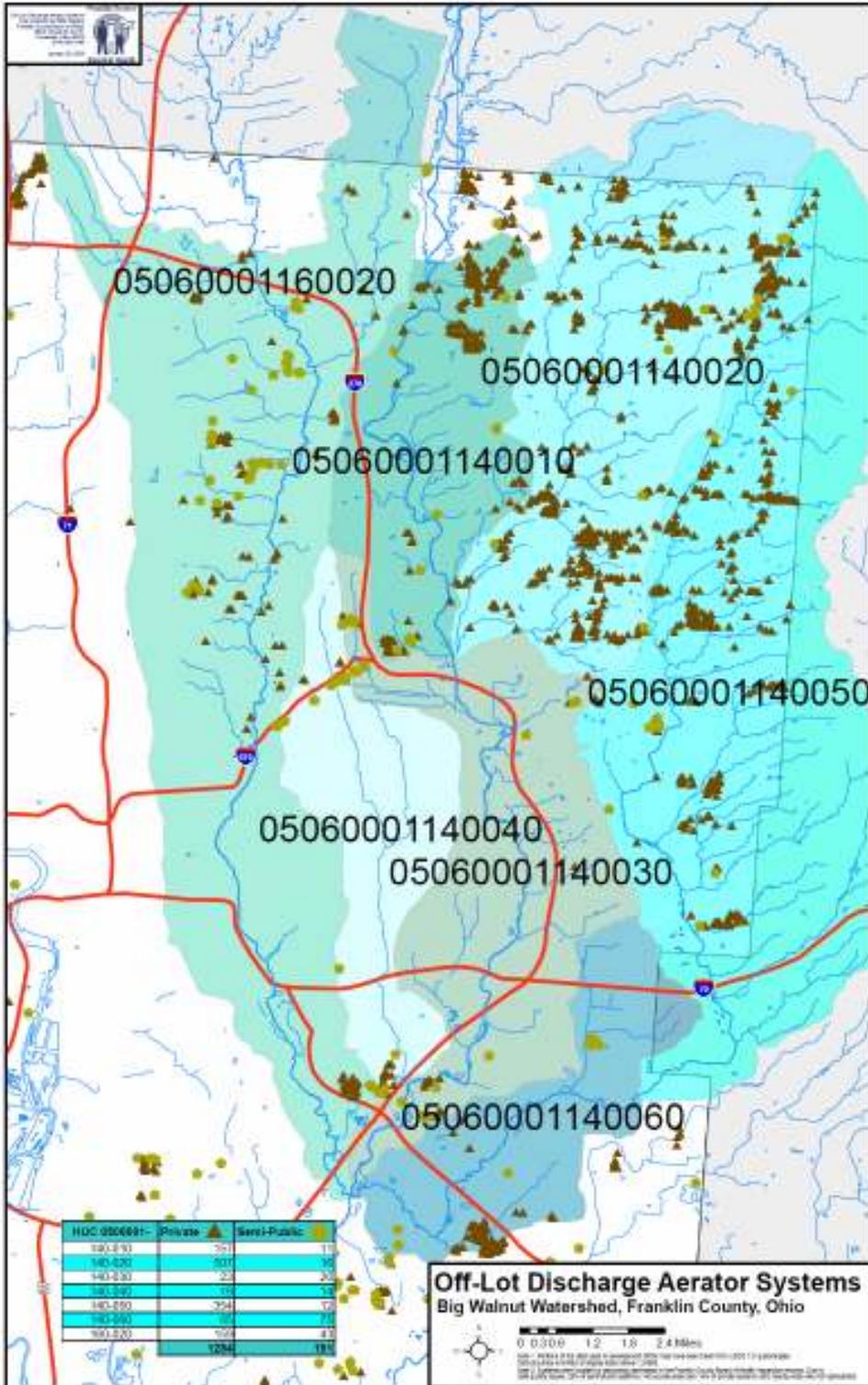
14-Digit HUC <sup>1</sup>	Sub-Watershed	Sub-Watershed Extent (Upper RM-Lower RM)	Parameter (units)	Existing Non-Point Source Loads						
				Runoff	Cattle	Septic	Aerator	GW	Upstream	Total
140-020	Rocky Fork	Entirety	FC (count • 10 <sup>13</sup> • season <sup>-1</sup> )	29.4	25.8	0.125	2.62	0	0	57.9
			TP (lbs • year <sup>-1</sup> )	16,343	0	244	5,124	872	0	22,583

<sup>1</sup>All presented 14-digit HUCs are within the 8-digit HUC 05060001. The complete HUC identifier is the 8-digit stem followed by the 14-digit extension.

**Table 23: Off-lot system, septic system, and total HSTS fecal coliform loads**

14-Digit HUC	Total Systems		Failed Systems		PERSONS/SYSTEM	Fecal Coliform Load (count/season)		
	DISCHARGING	SEPTIC	DISCHARGING	SEPTIC		DISCHARGING	SEPTIC	TOTAL
Rock Fork Creek 05060001-140-020	551	131	551	26	2.83	2.62E+13	1.25E+12	2.74E+13

Figure 19: Home Sewage Treatment Systems Map.



## *Sediment*

Run-off, cattle grazing, failing aerators, and groundwater discharges are the four influences that prevent optimum water quality within the Rocky Fork Creek watershed. However, sedimentation is not discussed within the EPA technical documents and is a significant contributor to water quality problems.

Some of the detrimental effects of excessive sediment in streams include:

- Elevated levels of turbidity (sediment suspended in the water) can
  - lower primary biological productivity by preventing sunlight to penetrate the water and reducing plants growth. This may also have an effect on plant feeding fish species.
  - affect the gills of fish and can be lethal
  - change water temperate
- Elevated levels of sediment on the stream bottom can
  - Adversely affect the reproduction of macro-invertebrates and thereby reduce food availability to fish
  - Fill in interstitial spaces between rocks that can provide shelter to fish when seeking cover from predators
  - Adversely affect fish egg development

Furthermore, toxic chemicals can become attached to sediment particles and be transported to and deposited in other areas. These pollutants may later be released into streams.

[http://www.ec.gc.ca/water/en/nature/sedim/e\\_effect.htm](http://www.ec.gc.ca/water/en/nature/sedim/e_effect.htm)

## *Metals*

The TMDL does not thoroughly discuss the metal pollutant concern indicated for Rocky Fork Creek. The metals are found to be adhered to the sediment particles found within the substrate of Rocky Fork Creek. Two monitoring locations were sampled for metal pollution. The first, river mile 7.1, indicates that cadmium, copper, lead, nickel, and zinc all exceed the probable effect concentration (PEC). The objectives of this study were to compare approaches for evaluating the combined effects of chemical mixtures on the toxicity in field-collected sediments and to evaluate the ability of consensus-based probable effect concentrations (PECs) to predict toxicity in a freshwater database on both a national and a regional geographic basis, (MacDonald et al., 2000). The second monitoring location, river mile 1.1, indicates copper, lead, and zinc to be contaminants that exceed the PEC threshold.

The New Albany Country Club used to have a shooting range located within the floodplain of Thompson Run, a tributary to Rocky Fork Creek. It has been established that a significant amount of lead shots have fallen into Thompson Run. The monitoring location at river mile 7.1 near the intersection of Thompson Run and Rocky Fork Creek reflected high lead contamination levels in 2000. It is believed that this is due to the remnants of the former

shooting range. The Country Club has since then removed the contaminated substrate from the site and shipped the lead contamination to Toledo, Ohio, for impoundment.

**Table 24: Metal contaminants found within Rocky Fork Creek.**

Big Walnut Creek Tributaries Sediments												
Analyte	AT	RF1	RF2	SR	LWC	DR	RC	AC	BC1	BC2	BC3	DyR
Solids	54.5	25.6	36.8	41.7	49.8	54.6	28.7	50.9	51.1	46.3	51.1	44.0
pH	7.38	7.08	7.53	7.1	7.28	7.44	7.29	7.54	7.4	7.4	7.4	7.15
Ammonia	NA	63.7	NA	23.7	25.7	23.5	24.4	NA	NA	NA	NA	36.7
T-Phosphorus*	NA	1730•	NA	765•	742•	696•	1080	NA	NA	NA	NA	762•
Aluminum	25400•	63600	38800•	53800	32800	32300	42900	20200	23200	24800	23200	39400
Arsenic	10.5•	30.5•	27•	27.5•	13.7•	14.6•	11.8•	11.2•	12.1•	13.7•	12.1•	15.9•
Barium	244•	415•	296•	370•	182•	206•	268•	144•	152•	161•	152•	233•
Cadmium	1.15•	1.46•	0.941•	1.43•	0.965	0.594•	1.25•	1.33•	0.715•	0.962•	0.715	0.647
Calcium	9690	25600	35900	8650	9160	13100	5530	30100	20200	58400	20200	20800
Chromium	28.4•	66.6•	39.8•	51.9•	34.5•	33.2•	46.4•	28.2•	25•	28.8•	25•	39.3•
Copper	80.3•	46.1•	36.9•	28.3•	20.4•	19.4	27.6•	32.1•	20.9•	25.2•	20.9•	26.2•
Iron	23700•	54900•	39700•	51600•	27000	23900•	29100	21000	21400	23800•	21400	28700
Lead	27.7	51.2•	50.5•	37.7	28.2	29.7	48.7•	76•	27	36.0	27	30.8
Magnesium	4850	14100	11600	7080	5640	6220	5530	11800	8770	10800	8770	7700
Manganese	264	566•	591•	1640•	261	369•	228	263	307	399•	307	650•
Mercury*	0.0478	0.124	0.0642	0.0624	0.0526	0.0456	0.0932	0.096	0.048	0.068	0.048	0.0496
Nickel	27.7	58.9•	38.8•	58.2•	28.9•	31.1•	44.2•	26.2	27	36•	27	30.8•
Potassium	7620	16600	12600	14900	8450	8980	11100	6550	6750	6290	6750	10000
Selenium	1.38	2.56	1.94	1.57	1.41	1.38	2.21	1.31	1.35	1.80	1.35	1.54
Sodium	3460	6400	4850	3930	3520	3460	5530	3270	3370	4500	3370	3850
Strontium	38.8	110	105	79.4	66.9	46.3	75.2	70.7	61	115	61	57.8
Zinc	217•	255•	128•	148•	118•	108•	171•	197•	109•	143•	109•	132•

AT=Airport Tributary, RF1=Rocky Fork at RM 7.1, RF2=Rocky Fork at RM 1.1, SR=Sugar Run at RM 0.7, LWC=Little Walnut Creek at RM 1.4, DR=Duncan Run at RM 2.7, RC=Rattlesnake Creek at RM 0.1, AC=Alum Creek at RM 3.8, BC1=Blacklick Creek at RM 22.4, BC2=Blacklick Creek at RM 11.3, BC3=Blacklick Creek at RM 1.9, DyR=Dysar Run at RM 1.6.

Table 20. Results of chemical/physical sediment quality sampling conducted in the Big Walnut Creek

**Table 25: EPA-Identified Attainment Status and Causes and Sources of Impairment of Rocky Fork Creek.**

<b>River Segment</b>	<b>River Mile</b>	<b>Use</b>	<b>Full Attainment</b>	<b>Partial Attainment</b>	<b>Non-attainment</b>	<b>Cause of Impairment</b>	<b>Sources of Impairment</b>
Upstream Walnut St. Upstream Trib.	10.2	WWH			13.0 – 10.2	agricultural run-off, grazing practices, manure application, failing HSTS, and increasing development Very poor <b>IBI</b> score of <b>32</b> w/ significant departure from eco-region bio-criterion <b>ICI</b> score also indicates a similar departure from the eco-region bio-criterion <b>QHEI</b> score of <b>60</b> does meet minimum for habitat criterion for WWH designation	Increased impervious cover allowing more sheet flow Pockets of failing HSTS Manure application from crop farms Grazing practices which allow cattle to be in direct contact with waters
Old SR 161	7.1	WWH	10.2 – 7.1			Surface run-off, the ICI criteria suggests modified but not significant. QHEI scores at target Very poor <b>IBI</b> score of <b>38</b> but with a non-significant departure from the eco-region bio-criterion <b>ICI</b> score is <b>MG Modified Good</b> and a non-significant departure from the eco-region bio-criterion <b>QHEI</b> score of <b>60</b> does meet minimum for habitat criterion for WWH designation	Poor farming BMP's to reduce nutrient loading
Thompson Rd.	5.9	WWH			7.1 – 5.9	Surface run-off from New Albany Country Club, mixing	Golf Course run-off, nutrient enrichment from tributary

						of Sugar and Rose Run's impaired waters <b>IBI</b> score is very low, <b>28</b> <b>ICI</b> score is poor with a <b>Fair</b> and significant departure from the eco-region bio-criterion However, the <b>QHEI</b> score is <b>73.5</b> which is higher than other sampling locations	waters
Clark State Rd.	3.3	EWH		5.9 – 3.3		Surface run-off, nutrient loading <b>IBI</b> score of <b>36</b> with a significant departure from the eco-region bio-criterion The Modified Index of Well Being shows a low score of <b>7.4</b> with significant deviation from the eco-region bio-criterion <b>ICI</b> score is good at <b>50</b> <b>QHEI</b> score is good at <b>66</b>	Agricultural landscape, high QHEI scores give EWH status
Hamilton Rd.	1.1	EWH		3.3 – 1.1		Surface run-off, nutrient loading <b>IBI</b> score is very good at <b>46</b> with a non-significant departure from the ecoregion bio-criterion The <b>ICI</b> score is <b>46</b> The Modified Index of Well Being shows a low score of <b>8.6</b> with significant deviation from the eco-region bio-criterion <b>QHEI</b> score is very good at <b>81</b>	Agricultural landscape, high QHEI scores give EWH status

**Table 26: EPA-Identified Attainment Status and Causes and Sources of Impairment of Rocky Fork Creek Tributaries.**

River Segment	River Mile	Use	Full Attainment	Partial Attainment	Non-attainment	Cause of Impairment	Sources of Impairment
Sugar Run @ Old SR 161	.7 Only sample location	WWH	FULL			<b>IBI</b> score is <b>38</b> <b>ICI</b> score is <b>MG Modified Good</b> and a non-significant departure from the eco-region bio-criterion <b>QHEI</b> has a very good score of <b>66.5</b>	Sedimentation, urban development
Rose Run @ Harlem Rd.	.5 Only sample location	WWH			Non-attainment	<b>IBI</b> score is poor with a rating of <b>32</b> with a significant departure from the eco-region bio-criteria <b>QHEI</b> score is <b>55.5</b> and below the WWH threshold of 60 for WWH designation	Sedimentation, urban development

MWH = Modified Warmwater Habitat—This aquatic use designation applies to streams and rivers that have been subject 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 tolerant of pollution and poor-quality habitat.

WWH = Warmwater Habitat—This aquatic use designation defines the “typical” warmwater assemblage of aquatic organisms for Ohio rivers and streams. This use designation represents the principal restoration target for the majority of water resource management efforts in Ohio.

EWH = Exceptional Warmwater Habitat—This aquatic use designation is reserved for waters that support “unusual and exceptional” assemblages of aquatic organisms which are characterized by a high diversity of species, particularly those highly intolerant and/or rare, threatened, endangered, or species status (i.e., declining). This designation represents a protection goal for water resource management efforts dealing with Ohio’s best water resources.

Biological indices are used to measure and assess level of attainment or impairment:

IBI = Index of Biotic Integrity—A measure of fish species diversity and species populations. Score range 0–60.

MIWB = Modified Index of Well Being—Based on the performance of fish populations.

ICI = Invertebrate Community Index—Based on measurements of the macroinvertebrate community. Score range 0–60.

QHEI = Qualitative Habitat Evaluation Index—A measurement of the ability of the physical habitat to support biological communities. The threshold for WWH aquatic use designation is a QHEI score of 60+ (FLOW, WAP 2003).

## **IV. Watershed Impairments, Recommendations, and Implementation**

### ***A. Pollutant Loading***

In the Rocky Fork the primary causes of non-attainment of the recreational use and the aquatic life use were pathogens, with nutrients being a contributing factor, especially in the headwaters. Sources for these pollutants were determined to be failing HSTS and land development. The two primary tributaries to the Rocky Fork are Sugar Run and Rose Run. Sugar Run was found to be in full attainment of its designated use of warm water habitat and the dominant causes of non-attainment of the aquatic life use in Rose Run were direct alteration of the physical habitat of the stream. Sources of the impairment are attributed to channelization and land development.. Sources of the bacteria are HSTS that are either failing, or inadequate to treat for bacteria. (Ohio EPA, Big Walnut Creek TMDL) Table 25 provides a brief summary of the aquatic life use designation, attainment status, causes of impairment, and sources of impairment identified by the Ohio EPA. As can be seen the largest sources of impairment can be linked to two sources, increased development and agricultural practices. With the ongoing development pressures for this part of the county the impacts from agriculture will become less severe with projections of agricultural land dropping from 20 % of land use to less than one percent. With most of that agricultural land projected to be developed as residential the potential for severe degradation of the watershed is a distinct possibility.

***Table 27: Causes and sources of impairment in the Big Walnut Creek basin.(Ohio EPA, 2000 Big Walnut Creek TSD)***

Watershed Stream Segment [Upper River Mile/Lower River Mile]	Aquatic Life Use Designation	Attainment Status (Miles)			Causes of Impairment <sup>1</sup>	Sources of Impairment <sup>1</sup>
		Full	Partial	NON		
<b>Rocky Fork</b> [RM 13.0-0.0]	WWH-EWH	2.15	4.6	3.95	Pathogens-H,S Siltation-M Nutrients-M Ammonia-S Habitat alterations-S Metals-M	Home sewage treatment syst.- H,M Land development-H Range land-M Package plants-M Contaminated sediments-M
<b>Sugar Run</b> [RM 5.83-0.0]	WWH	1.0				
<b>Rose Run</b> [RM 3.4-0.0]	WWH			1.0	Habitat alterations-H Flow alterations-S Siltation-S	Channelization-H Land development-H Urban runoff-M

<sup>1</sup> The magnitude (i.e. relative contribution) of the cause or source of impairment is estimated as follows: H-High magnitude, M-moderate magnitude, S-Slight magnitude, T-identifies a threat.

It is therefore extremely important for the development to happen in a planned way that meets the TMDL requirements for the watershed. Table 26 shows the existing load, the TMDL, and the Allocations for the Rocky Fork Creek from both point sources and non-point sources. Table 27 further breaks down the non-point source allocations by impairment.

**Table 28: Total Existing Load, TMDL, and Allocations for HUC 05060001-140**

14-Digit HUC <sup>1</sup>	Sub-Watershed	Sub-Watershed Extent (Upper RM-Lower RM)	Parameter (units)	Existing Loads			% Reduction	TMDL	Allocations		
				PS	NPS	Total			WLA	LA	MOS
140-020	Rocky Fork	Entirety	FC (count • 10 <sup>13</sup> • season <sup>-1</sup> )	0.004	57.9	57.9	77%	13.4	6.72	6.68	0
			TP (lbs • year <sup>-1</sup> )	850	22,583	23,433	62%	8,897	2,851	5,156	890

<sup>1</sup>All presented 14-digit HUCs are within the 8-digit HUC 05060001. The complete HUC identifier is the 8-digit stem followed by the 14-digit extension.

**Table 29: Non-Point Source Allocations for HUC 05060001-140**

14-Digit HUC <sup>1</sup>	Sub-Watershed (Upper RM-Lower RM)	Parameter	Non-Point Source Allocations					
			Cattle	Septic	Aerator	GW	Upstream	
140-020	Rocky Fork (Entirety)	FC (count • 10 <sup>13</sup> • season <sup>-1</sup> )	Allocation:	0	0	0.606	0	0
			% Reduction:	100%	100%	77%	0%	0%
		TP (lbs • year <sup>-1</sup> )	Allocation:	0	0	1947	872	0
			% Reduction:	0%	100%	62%	0%	0%

<sup>1</sup>All 14-digit HUCs are within the 8-digit HUC 05060001. The complete HUC identifier is the 8-digit stem followed by the 14-digit extension.

<sup>2</sup>Allocated loads are expressed in cfu C10<sup>13</sup> C season<sup>-1</sup> for fecal coliform and lbs C year<sup>-1</sup> for total phosphorus

### ***Total Maximum Daily Loads (TMDL's)***

At the time of publication of this document, the Ohio EPA had produced a Total Maximum Daily Load (TMDL) restoration plan for the Big Walnut Creek basin, which includes Rocky Fork Creek, Alum Creek, Big Walnut Creek, and Blacklick Creek (Ohio EPA, 2004). TMDL's are developed by Ohio EPA for impaired waters to determine the extent of pollution reduction necessary for a given stream to regain ecological health, or achieve full use attainment. This is accomplished by identifying pollutant sources, estimating their load contributions, and determining the extent of load reduction needed from each source.

In the Rocky Fork Creek watershed, TMDL's have been developed for sediment, pathogens, and habitat. The pathogen TMDL follows the methodology described above; load allocations and reductions have been prescribed for various NPS sources. For sediment and habitat, however, traditional load based TMDL's were not developed because these two parameters were considered environmental conditions rather than pollutants. The TMDL target for both sediment and habitat is based on composite scores for specific parameters within the Qualitative Habitat Evaluation Index (QHEI).

The QHEI is comprised of measures of six components: substrate, instream cover, riparian characteristics, channel condition, pool/riffle quality, and gradient/drainage. However, the Ohio EPA has found that some of these components are more strongly correlated with attainment than others. As stated in the TMDL report, "Further analysis of the QHEI components as they relate to IBI scores led to the development of a list of attributes that are associated with degraded communities. These attributes are modifications of natural habitat and were classified as high influence or moderate influence attributes based on the statistical strength of the relationship" (Ohio EPA, 2004: 37).

Based on this information, a TMDL Habitat Target was developed based on three components, each worth one point: QHEI score/Target Ratio (1 point) + moderate influence attribute score (1 point) + high influence attribute score (1point) = 3.

Similarly, a Sediment TMDL Target was developed that assigns a point to each of three QHEI attributes that reflect sediment loading. A target score equal to or greater than 33 is based on scores for substrate (14), channel morphology (14), and riparian zone/bank erosion (5) (Alum Creek Watershed Action Plan). Sediment scores are the sum of the substrate, channel, and riparian categories. The target sediment score of greater than or equal to 33 is analogous to a loading capacity, and the target scores for substrate, channel, and riparian are the rough equivalent of allocations (Ohio EPA, Big Walnut Creek, TMDL). The influence of sediment into Rocky Fork Creek according to the TMDL study indicated that the TMDL target is 33. The actual loading figures were determined at river mile 7.1 (31.0) and 5.9 (32.0) and indicate that sediment loading at both sampling locations is close to the target TMDL goal.

**Table 30: Existing and Target Habitat and Sediment Conditions**

Habitat Limited Stream	River Mile	Assessment Results								TMDL Scores			
		QHEI Categories							QHEI	Modified Attributes		Sediment	Habitat
		Substrate	Cover	Channel	Riparian	Pool	Riffle	Gradient		High Influence	Moderate Influence		
<b>Targets</b>		≥14	≥12	≥14	≥5	Sum ≥15		≥60	<2	Total Modified Attributes <5	≥33	3	
Rocky Fork	7.1	12.5	13.0	13.5	5.0	9.0	1.0	6	60.0		③④⑦⑧⑨	31.0	2
	5.9	16.0	17.0	13.0	5.0	10.0	2.5	10	73.5		③④⑦⑧⑨	34.0	2
Rose Run	0.5	13.0	9.0	14.0	4.0	4.0	1.5	10	55.5	④⑤	③④⑦⑧⑨	31.0	0
<b>Key to High-Influence Modified Attributes:</b>					<b>Key to Moderate Influence Modified Attributes:</b>								
① Channelized with no recovery					① Channelized, but recovering				⑥ Intermittent or poor pool quality				
② Silt or muck substrates					② Sand substrate				⑦ No fast current				
③ Low sinuosity					③ Hardpan substrate origin				⑧ High to moderate substrate embeddedness				
④ Sparse or no cover					④ Fair or poor channel development				⑨ Extensive to moderate riffle embeddedness				
⑤ Max. pool depth less than 40 cm					⑤ Only one or two cover types				⑩ No riffle				

*Rose Run*

In the fall of 2007 Dr. Andy Ward and a class of graduate students from Ohio State University’s Food, Agricultural, and Biological Engineering Department conducted an in depth study of Rose Run along a section from an old mill dam just west of Market Street to just upstream of Dublin-Granville Road. Their study was to determine the effects of removing the old mill dam on the upstream sections of the stream. As a part of their research they assessed the habitat and fish assemblages using the QHEI and IBI indices. Their results are shown in Table 31 below (Wahl, et.al., 14)

**Table 31: Biological and Habitat Indices for Rose Run**

Site	QHEI (0-100)	IBI (12-60)
Rose Run upst. Market St.	58.5	16
Rose Run upst. Dam to Market	38.	20
Rose Run downst. Dam	61	20

The scores indicate that the dam is impacting habitat and possibly acting as a block to fish migration. However, the low IBI scores indicate that something else may be going on with the water quality in the stream as those fish present were pollution tolerant species.

Further exploration upstream of these test sites by both the members of this class and by David Rutter, the watershed coordinator indicate that Rose Run is out of equilibrium with severe instream erosion occurring from the head waters region near the State Route 161 by-pass downstream to Reynoldsburg-New Albany Road. Within this reach the stream is more like a trapezoidal ditch with little or no access to its flood plain (Figures ).

**Figures 20&21: Erosion and Channel Shape of Rose Run Upstream of Reynoldsburg New Albany Road**



## ***B. Land Use, Habitat Conditions, and Recommendations***

Though the Rocky Fork Creek faces the challenges associated with encroachment of the riparian corridor and flood plain from agriculture as well as commercial and residential development the stream's future health can be insured through concerted community action. Much of the headwaters are intact though subject to agricultural uses. These uses will be declining in the coming years but without further protections from zoning entities these same lands will be subject to development as is happening in the Walton Parkway and Smith Mill Road area of New Albany where headwater streams for Rose Run are being filled and channelized. The remaining head water wet agricultural fields should be identified and prioritized for wetland mitigation banks for further development in the watershed.

The riparian corridor is wooded and intact along many sections providing high quality habitat. There are five small dams in the watershed and though removal of the dams would help to improve water and habitat quality in the streams a focus on protecting and improving the riparian corridor has the potential for more immediate and greater improvements in the short term. It is with this in mind that the Watershed Action Planning Team has identified the following recommendations for achieving the recreational and aquatic life use designations, and the TMDL targets.

### *Floodplain Recommendations for All Jurisdictions*

1. Allow no development in 100 year floodplain, using FEMA mapping data to determine floodplain boundaries.
2. Adopt specific floodplain uses that are compatible with the risks associated with floodplain development and take into consideration the inherent value of floodplain land to habitat, and natural stream functions, (e.g., baseball diamonds, parkland, golf courses, soccer fields).
3. The nature of a floodplain carries value beyond "another acre to develop." The ratification of a list of inappropriate land uses within the floodplain is needed to protect the sensitivity of floodplain land (e.g., structural development, stables, shooting ranges, parking areas).
4. Allow a 30 day public comment period for any floodplain development, and advertise the comment period in local news publications.
5. Provide incentives for redeveloping existing development locations (e.g., waive permit fees, encourage faster permit reviews).
6. Any redevelopment should apply "new" development standards.
7. Endorse and promote the idea of political jurisdictions purchasing easements and fee-simple land acquisition of undeveloped floodplain.
8. Increase permits fees for floodplain development.
9. Allow no retention/detention ponds to be constructed within the floodplain.

### *Setback Recommendations for All Jurisdictions*

1. Endorse the use of the ODNR equation (**129 x drainage area to the 0.43 power**) as the accepted mechanism to determine the minimum area of riparian corridor needed for the stream to maintain its health and natural integrity.
2. The value (width) of the calculation can be considered a *minimum*, but additional setback figures should be considered. (This calculation is applied to new development only.)
3. Existing zoning and developed areas within the drainage area are “grandfathered” and are not subject to ODNR calculation. However, if redevelopment would occur, conservation development should be required.

### *Development Recommendations for All Jurisdictions*

1. Reduce impervious cover.
2. Minimize street width within areas of new development and areas of redevelopment.
3. Embrace Conservation Development techniques.
4. Reconsider minimum parking requirements for commercial areas, and create pervious parking surfaces.
5. Set up a monitoring program that identifies current impervious cover within the jurisdiction to keep it below a predetermined percentage.
6. Prioritize floodplain lands when considering preserving open space with new or redevelopment decision making.
7. Green roofs. (See below.)

### *Recommendations for Construction Site Management for All Jurisdictions*

1. Enforce current regulations governing stormwater management and construction site best management practices..
2. Increase funding and authority for personnel who inspect and monitor development within the jurisdiction.
3. Provide appropriate incentives to encourage compliance with development regulations, (e.g., fines and fees, expediting the permit process).
4. Establish an incentive of a refund of a percentage of permit fees if the development has been in compliance from the beginning of the construction (post-construction for elevated level by following compliance).

### *Stormwater Recommendations*

1. Decrease the amount of stormwater entering adjacent waterways by increasing residence time in detention basins.
2. Increase the use of stormwater in residential yards by using rain barrels and creating rain gardens.

3. Institute a local backyard conservation program.
4. Treat stormwater run-off by using bio-retention techniques which assist in the removal of many pollutants.
5. Local municipalities may consider incentives to those residents and businesses that implement the use of green roofs.  
(explanation not part of the recommendation).
6. Enforce sediment and erosion BMPs and the environmental regulations that make them effective.
7. Issue stop-work orders when necessary.
8. Continue urban tree plantings and urban forest development to help reduce the amount of run-off and increase the absorption of pollutants.
9. Adopt the 4-principal policy that requires stormwater to be controlled, collected, conveyed, and cleansed using conservation techniques with dense vegetation.

#### *Recommendations for Easements/Preservation Zones for All Jurisdictions*

1. Provide a tax reduction to those who offer a portion of the developing land to easements.
2. Identify, prioritize, and field-verify existing wetlands within each jurisdictional boundary.
3. Create localized areas for wetland mitigation sites.
4. Establish a priority protection list when development decisions are made:
  - Floodplain
  - Potential impact on water quality and streamside habitats
  - Protect headwater streams and habitats
  - Determine high-quality areas in jeopardy of development
  - Wetlands
  - Wood lots
  - Potential areas suitable for restoration

#### *Recommendations for Sediment*

1. Public education workshops.
2. Posting signs similar to litter prevention.
3. Issuing stop-work orders to contractors not following sediment control BMP protocols.
4. Citizen monitoring of construction sites.
5. Acceptance of alternative BMPs for erosion/sediment control.
6. Establishing a protocol for how to expedite the approval process of alternative BMPs.

7. Pulling charters from chronic environmental offenders

Metals Recommendations

1. If known sources are identified, a discussion of possible removal strategies should be discussed if the substrate is contaminated.
2. Since non-point source pollution significantly contributes to metals entering watercourses from impervious surfaces, new development or redevelopment, and the corresponding storm sewer infrastructure, should require stormwater to be treated using bioengineering techniques with dense vegetation to absorb pollutants prior to the introduction of the water into the receiving stream.

### ***C. Action Items for Rocky Fork Creek and Tributaries (HUC: 05060001-140 -120)***

#### *Background*

The Rocky Fork Watershed is a sub-watershed of Big Walnut Creek located in Franklin County, Ohio, within the townships of Plain, Jefferson, and Harlem; within the municipalities of New Albany and Gahanna; and within the City of Columbus, Ohio. The mainstem of Rocky Fork Creek meanders 13.0 miles from the headwaters in Delaware County, Ohio, until it reaches the confluence with Big Walnut Creek in urban Gahanna. This sub-watershed drains approximately 30 square miles.

Two tributaries named Rose Run and Sugar Run are significant water sources to Rocky Fork Creek and are both located in Plain Township. Rocky Fork Creek is being impacted primarily from run-off and siltation from increasing land development in the basin and from poorly treated sewage from failing Home Sewage Treatment Systems (HSTS) and several small package plants. According to Ohio EPA, Big Walnut TMDL, the biological communities in the upper part of Rocky Fork were performing as badly as or worse than at any time since the initial study in 1991 (Ohio EPA, 1992). Sugar Run and Rose Run were showing varying degrees of impact from land development in the New Albany area with Rose Run being in non-attainment of its Warm Water Habitat designation and Sugar Run being in full attainment of Warm Water Habitat (Ohio EPA, Big Walnut Creek, TMDL).

The entire Rose Run watershed is under heavy development pressures and is subject to increased sediment runoff from both construction and stream bank erosion resulting from habitat alteration and change in storm flow patterns. Its effects are evident throughout the Rocky Fork and tributaries but only identified as a cause of non-attainment in Rose Run. Likewise pathogens and nutrients were identified as a concern for the entire basin with pathogens being significantly higher in the upper reaches, above RM 10.2, and in the lower reaches below RM 1.10. The sources of pathogen and nutrient impairment were generally identified as failing Home Sewer Treatment Systems (HSTS), three small package plants, and agriculture in the headwaters area.

The lower section of the Rocky Fork Creek (RM 5.9 to 1.1) is designated as "Exceptional Warmwater Habitat (EWH), but with only partial attainment, it has been reduced to WarmWater Habitat (WWH) due to degradation by urbanization. The middle portion of the mainstem (RM 7.1 to 5.9) is in non-attainment of WWH due mainly to the increase of urban runoff and nutrient enrichment from the tributaries. From RM 10.2 to 7.1 the stream is in full attainment of WWH but is borderline and suffering from nutrient enrichment from agricultural runoff, increased impervious surfaces, and failing HSTS's. From RM 10.2 to the head waters the Rocky Fork is in non-attainment as the result of failing HSTS's, and agricultural runoff.

*Problem Statement:* The data collected by Ohio EPA for the TMDL report was collected between 1999 and 2003. Conditions in the stream may have changed significantly since that time with the rapid change of land use from agricultural to urban/suburban characteristics as well as the connection of many HSTS households to central sewer and the decommissioning of the Windrush WWTP. Up to date data is needed to help guide future actions and allocation of resources.

Goal:

1 – Establish a volunteer water quality monitoring program for Rocky Fork Creek

<b>Task Description/Objective</b>	<b>Resources</b>	<b>How</b>	<b>Time Frame</b>	<b>Performance Indicators</b>
Write and implement a volunteer water quality monitoring education program to document stream conditions on an ongoing basis.	Staff time to write the plan and submit to OEPA. Apply for \$5,000 mini grant with OEEF to develop and implement the plan, pay for equipment, train students and community volunteers	Partner with New Albany-Plain local Schools, Gahanna Jefferson Schools, Friends of Big Walnut Creek and Tributaries, and The Rocky Fork Watershed Protection Task Force to develop a monitoring program that will be used to educate students and the public about the water resources in their communities while at the same time providing a current picture of stream health for planning purposes.	2010-2011	Plan written and submitted, Grant application submitted, 20 volunteer monitors trained and assigned sampling locations, 100 K-12 students participate in a stream monitoring workshop.

*Problem Statement:* Rocky Fork Creek in its entirety is not in attainment of its recreational use designations. The TMDL report identifies pathogens as the primary causes of impairment and lists failing Home Sewage Treatment Systems, failing package plants, and runoff as the sources. The TMDL calls for a 77% reduction in Fecal Coliform (FC) in the entire watershed. FC loads from runoff are  $29.4 \times 10^{13}$ /season and  $25.8 \times 10^{13}$ /season for cattle. Allocations for FC from cattle are 0 and represent a 100% decrease. Runoff allocations are  $6.72 \times 10^{13}$ /season and represent a 77% decrease.

Goal:

1- Reduce Fecal Coliform by 77%

<b>Task Description/Objective</b>	<b>Resources</b>	<b>How</b>	<b>Time Frame</b>	<b>Performance Indicators</b>
Identify illicit discharges to Rocky Fork and Tributaries	Franklin County Health Department FSWCD Village of New Albany Plain Township (costs not known)	The Health Department has contracted with FSWCD to map all outfalls into Franklin County Rivers and streams and identify those that are potential illicit discharges. FSWCD will then go back and collect dry weather samples from those outfalls and test them for illicit discharge. They are working across the county from west to east.	2007-2009	List of outfalls with illicit discharges that can be used to take action to eliminate the discharge.
Connect HSTS systems to sewer	City of Columbus sewer service plan Village of New Albany (Costs not known)	Extend sewer lines to Walnut street Big Walnut Trunk Extension. New Albany reports approximately 38 HSTS systems have been abandoned in Rocky Fork Watershed since 2002.	2009	Reduction in FC from failing HSTS. Approximate reductions from abandoned systems are $1.8 \times 10^{12}$ /season for FC. <sup>1</sup>
Identify farms located in the watershed with cattle having access to the stream	Watershed Coordinator, FoBWC and FSWCD time.	Satellite images to locate possible farms with on the ground verification	2010	List of verified farms and length of fencing needed to keep livestock from the stream.

<b>Task Description/Objective</b>	<b>Resources</b>	<b>How</b>	<b>Time Frame</b>	<b>Performance Indicators</b>
Work with one farmer who has cattle with access to the stream to fence off the stream.	Fencing costs will be approximately \$3.00/ft. Estimate of total costs will depend on the results of survey task above.	Work with NRCS to identify farm bill funds that can be used to pay for fencing.	2011-2013	Linear feet of fencing put up, number of livestock kept out of the stream, and reduction in Fecal Coliform counts in the stream.
Take Windrush WWTP off line	Jefferson Sewer and Water District, Columbus Sewer and Water	Pump waste water from this facility to Wengert Road facility where it will be sent into the Columbus Waste Sewer System	Completed in 2005	Reduced FC to stream of $4.78 * 10^9$ cfu/season

<sup>1</sup> Calculations are based on dividing the total TP load from failing Aerator systems by the number of failing systems as reported in the Big Walnut Creek TMDL then multiplying by 38. The same process was applied to determine approximate reductions of FC.

**Figure 22: Rose Run Upstream of Village of New Albany Center**



*Problem Statement:* Rose Run a tributary of Rocky Fork Creek is not meeting its Aquatic Life Use designation due to sedimentation and habitat alteration. QHEI scores for Rose Run are below the target of score of 60 for warm water habitat. The observed scores at four sites range from a low of 38 to a high of 61 with three of the four sites below the target. The QHEI factors (substrate, channel, and riparian) that taken together provide a sediment score seem to be the primary reason for these low QHEI scores, specifically the substrate and channel scores. The sediment scores are analogous to a load and are below the target level of 33. Inventory data shows roughly 5000 linear feet of stream channel upstream of State Route 62 with little or no access to its floodplain resulting in severe in stream erosion and the inability of the stream to process the current sediment load.

Goal 1: Reconnect approximately 5000 linear feet of stream to its flood plain.

<b>Task Description/Objective</b>	<b>Resources</b>	<b>How</b>	<b>Time Frame</b>	<b>Performance Indicators</b>
Contact New Albany Company and explore ways to restore head waters of Rose Run on NACO property.	Staff time, FSWCD, USDA, NACO, Village of New Albany, OEPA	Contact and meet with representatives	January 2008	Meeting held Establish working relationship
Seek money for a study that will identify flows from upstream of New Albany Co. properties, what the storage capacity of stream restoration is, and what will be the effects downstream.	Village of New Albany, MORPC \$10,000	Apply for grants or identify resources among partners to complete the study.	2009-2010	Money acquired and study completed that shows flows and sediment loads.

<b>Task Description/Objective</b>	<b>Resources</b>	<b>How</b>	<b>Time Frame</b>	<b>Performance Indicators</b>
Reconnect 2800 linear feet of Rose Run North of Dublin-Granville Road to its flood plain using natural channel design, two stage channel or self forming channel.	Aproximately \$25/ft <sup>2</sup> totals \$70000	Village of New Albany, MORPC, and FOBWC will work with New Albany Co to identify funding sources. Possibly 319, Clean Ohio Funds, or stream mitigation requirements from development.	2011	Linear feet restored increase in QHEI over 60 and increase in sediment score above 33.
Reconnect 2200 linear feet of Rose Run Between State Route 62 and Dublin Granville Road to its flood plain using natural channel design, two stage channel or self forming channel.	Aproximately \$25/ft <sup>2</sup> totals \$55000	Village of New Albany, MORPC, and FOBWC will work with New Albany Co to identify funding sources. Possibly 319, Clean Ohio Funds, or stream mitigation requirements from development.	2012	Linear feet restored increase in QHEI over 60 and increase in sediment score above 33.
Remove 100 year old low head dam near the Ealy House and restore stream banks	Village of New Albany - \$175,000 319 Grant from OEPA - \$23,622 U.S. Army Corps 594 Grant - \$525,000	Village of New Albany will contract with company to remove dam. Oxbow River & Stream Restoration inc. will do stream restoration in the impounded area	Spring 2008	Increase QHEI score in channel, cover, and substrate scores. Increase IBI scores as fish have access to reaches above the dam site.
Educate homeowners on importance of vegetated riparian buffers to stream bank stabilization, erosion reduction and property protection.	FOBWC and tribs MORPC \$3000	Create a brochure for home owners along the streams showing the importance of vegetated riparian buffers to stabilize banks and reduce erosion	2009	Brochures mailed to every home along Rose Run

*Problem Statement:* Rose Run a tributary of Rocky Fork Creek is not meeting its Aquatic Life Use designation due to sedimentation and habitat alteration. The QHEI factors (substrate, channel, and riparian) taken together provide a sediment score. For Rose Run the sediment scores are analogous to a load and are below the target level of 33. Roughly 200 acres along the stream are being farmed using conventional tillage resulting in increased sedimentation from agricultural runoff. Ohio averages 2 tons of sediment loss per acre per year.

Goal 2: Institute conservation tillage on 200 acres along headwaters

<b>Task Description/Objective</b>	<b>Resources</b>	<b>How</b>	<b>Time Frame</b>	<b>Performance Indicators</b>
Implement conservation tillage on 200 acres in headwaters of Rose Run .	CWP, federal farm programs	Partner with New Albany Company to utilize federal funds to reduce agricultural runoff from fields	Immediately	Reduce soil loss from fields by approximately 30% or 120 tons/yr <sup>1</sup> . Increased sediment scores in stream above 33.

<sup>1</sup>. Calculations are based on Ohio average sediment runoff of 2 tons/acre/year \* 200 acres \* 30% reduction by implementing conservation tillage.

*Problem Statement:* Rocky Fork Creek above RM 10.2 is not in attainment of its aquatic life use designations. The IBI score for this section is 32 where a score of 40 is considered attaining. The TMDL report identifies nutrients as a primary cause of impairment and lists failing Home Sewage Treatment Systems, failing package plants, and runoff as the sources. The TMDL calls for a 62% reduction in Total Phosphorus (TP) in the entire watershed. Cattle are not a significant source of TP but runoff loads are 16,343 lbs/year. The allocation of 5,477 lbs/year represents a 62% decrease.

Goal:

1- Reduce TP by 62%

<b>Task Description/Objective</b>	<b>Resources</b>	<b>How</b>	<b>Time Frame</b>	<b>Performance Indicators</b>
Plant 10 acres of trees along streams to increase riparian cover and act as buffers to runoff.	Franklin County Commissioners, Plain Township Trustees, FSWCD (\$5000 included some money for educational materials)	Franklin Soil and Water Conservation District Tree planting in the Rocky Fork Watershed. Funding was provided by Franklin County Commissioners and Plain Township Trustees. FSWCD with over 100 volunteers planted the trees.	Spring 2008	Acres of riparian corridor reestablished. Decrease in Phosphorus runoff of approximately 144 lbs/yr.
Connect HSTS systems to sewer	City of Columbus Village of New Albany	Extend sewer lines to Walnut street Big Walnut Trunk Extension. New Albany reports approximately 38 HSTS systems have been abandoned in Rocky Fork Watershed since 2002.	2009	Reduction in TP from failing HSTS. Approximate reductions from abandoned systems are 353 lbs/year of TP
Establish conservation tillage on 1442 acres of fields near stream channels currently using conventional tillage.		NRCS, FSWCD, and DSWCD work with farmers to implement	2009-2012	Reduction in Phosphorus of approximately 456 lbs/yr
Plant 50ft buffers along 3200 linear feet/3.6 acres of agricultural head water streams.	NRCS, EQIP, CREP (average of \$199/acre to establish * 3.6 acres = \$716)	Franklin and Delaware County NRCS representatives work with land owners along the stream to establish 50 foot buffers along streams through their fields	2010	Acres of buffer planted reduction of phosphorus approximately 88 lbs/yr.

<b>Task Description/Objective</b>	<b>Resources</b>	<b>How</b>	<b>Time Frame</b>	<b>Performance Indicators</b>
Create a 1200 acre Metro Park between Delaware County line and Walnut Street that will preserve open space and restore natural areas	City of Columbus Village of New Albany Plain Township Franklin Metro Parks	Purchase properties in large blocks in the 2000 acre park district to assemble 1200 acre park	2008-2013	Land acquired and incorporated into park. Approximately 800 of 1200 acres will be land currently used for ag production. This change in use will result in a TP decrease of roughly 653lbs/year. <sup>2</sup>

<sup>1</sup>. Calculations are based on dividing the total TP load from failing Aerator systems by the number of failing systems as reported in the Big Walnut Creek TMDL then multiplying by 38. The same process was applied to determine approximate reductions of FC.

<sup>2</sup>. This figure was calculated using the Simple Method described in Big Walnut Creek TMDL Appendix B. Runoff for 800 acres in agricultural land use was calculated and then the same done for 800 acres open/forest land. The difference between the two represents the approximate reduction in TP loading from a change in land use. The other 400 acres of land in the park was assumed to already be open/forest land and inclusion in the park would not represent a change in land use. The benefit of this park in surface runoff could be greater or lesser depending on the total amount of land that is acquired and its previous land use.

*Problem Statement:* The Rocky Fork Creek from RM 5.9 to the mouth is in partial attainment of its Exceptional Warm Water Habitat (EWH). This is due primarily to surface runoff and nutrient loading. A significant source of nutrient loading came from the Jefferson Water and Sewer District's Windrush Rd. WWTP. The TMDL calls for a 62% reduction in Total Phosphorus (TP) in the entire watershed. Runoff loads are 16,343 lbs/year. The allocation of 5,477 lbs/year represents a 62% decrease.

Goal:

1- Reduce TP by 62%

<b>Task Description/Objective</b>	<b>Resources</b>	<b>How</b>	<b>Time Frame</b>	<b>Performance Indicators</b>
Take Windrush WWTP off line	Jefferson Sewer and Water District, Columbus Sewer and Water	Pump waste water from this facility to Wengert Road facility where it will be sent into the Columbus Waste Sewer System	Completed in 2005	Reduced TP to stream by 347 lbs/year
Reconnect 5.81 acres of flood plain along 825 feet of stream channel in Gahanna Woods Park to help reduce peak flows downstream. <sup>1</sup>	City of Gahanna 319 grant \$350,000	City of Gahanna will apply for a 319 grant for stream restoration and flood plain reconnection	Apply for grant in 2010 project finished in 2013	Reduce TP by 91 lbs/year, reduced sediment load from in stream erosion, reduced surface runoff.
Create 0.53 acres of Vernal Pools to capture sheet flow in Gahanna Woods Park. <sup>1</sup>	City of Gahanna 319 grant \$50,000	City of Gahanna will apply for a 319 grant for vernal pool creation.		
Redesign outfalls and retrofit storm pipes for neighborhood along Clotts/Souder Ditch. <sup>1</sup>	City of Gahanna public services (cost dependent on design)	Use of devices such as the Steinscrub flow regulator that would allow for storage of runoff within the volume of the existing pipes.	2015	Reduced TP by approximately 49 lbs/year, reduced peak runoff volume, reduced sedimentation from in stream erosion caused by high flows.

<sup>1</sup>For discussion of current conditions, problems, and possible solutions for the Clotts/Souder ditch sub watershed see appendix C.

## **V. EVALUATION**

Evaluation criteria are listed with the actions in the above tables. Additional evaluation criteria will be developed as additional objectives and actions are determined. A tracking tool will also be developed to help monitor and assess completion of the action items. The tool will allow responsible parties for each action item to input progress made in completion. This tool will allow the guiding person or persons for the plan as well as the local stakeholders to monitor and assess the progress of implementation. An outline with the purpose and scope of this tool is attached in appendix B. The Friends of Big Walnut Creek will be meeting with the partners identified in the above action plans to move forward on mutual objectives.

### *Process for Implementation of WAP*

An annual forum will be held with each of the jurisdictions or stakeholders represented. The members of this forum will review what each entity responsible for action items has accomplished as well as what is being worked on. Upcoming opportunities or emerging priorities will also be shared. This will also serve as the venue for updating the plan as implementation goals are accomplished. The group will not be the primary decision maker as each jurisdiction and entity will make those choices for their own areas. Outlined below are the roles of those involved in implementation of the plan.

#### Role of the Watershed Coordinator

- Coordinator's primary tasks are to work with stakeholder groups to develop Watershed Action Plans for Rocky Fork Creek and Blacklick Creek
- Aid in implementation of plans
  - "Implementation" entails
    - Education (of self, stakeholders, and community)
    - Coordination (e.g., building partnerships, focusing resources on critical areas, identifying target audiences)
    - Coordinator is not a watch dog or regulator looking for violations
- Report to ODNR on annual progress of work plan and actions taken to improve water quality in the stream
- Represent MORPC's interests in regional solutions to water quality issues

#### Role of the Rocky Fork WAP Implementation Steering Work Group

- Providing support and guidance to Watershed Coordinator
  - guidance on plan implementation
  - review progress of implementation (help evaluate progress)
  - Identify emerging issues or unanticipated issues that require urgent attention
  - Identify opportunities for collaboration and partnership to achieve WAP goals
  - Assist coordinator in adapting and updating the plan as needed in response to changing circumstances

- Promote awareness among key stakeholder groups and residents about the WAP and implementation goals/activities.

## **VI. PLAN UPDATES AND REVISIONS**

The Rocky Fork Creek Watershed Action Plan is a “living document” which will be updated and revised as new information emerges and implementation practices are put into place. As stakeholders reflect on the past accomplishments and forge ahead into the future to plan the watershed’s new direction. This Action Plan has been written to aid the development of water quality and community support. Short and long term benefits will come from the implementation of the Action Plan. The Plan is designed to be flexible and continuously updated. The Goals and Actions will be written on a ten-year time frame with updates inserted as needed. The plan will be reevaluated on a yearly basis. Additions to the plan can be submitted to the Watershed Coordinator at any time.

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## Appendix A

### FRIENDS OF BIG WALNUT CREEK BYLAWS

#### ARTICLE I. NAME

The name of this organization is FRIENDS OF BIG WALNUT CREEK.

#### ARTICLE II. OBJECT

The objects of this organization are:

A. To preserve and protect Big Walnut Creek, its tributaries and watershed, from Hoover Dam as the northern limit, to its termination at the confluence with the Scioto River, for the benefit of the people and wildlife that use them.

B. To educate the public about the benefits of Big Walnut Creek as greenspace and a natural resource which is an ecosystem at risk because of its urban environment.

C. To exercise legal means of preservation and dedication of watershed areas through regulatory actions such as conservation easements and donations of land.

D. To advocate for the protection and preservation of natural ecosystems within Big Walnut Creek watershed, its banks, its floodplain, its tributaries, and their ephemeral streams.

E. To promote restoration activities for damaged or compromised areas of the Big Walnut Creek watershed.

#### ARTICLE III. MEMBERS

A. There shall be four types of membership.

1. Individual, one adult or child.
2. Joint, two adults from the same household or a family.
3. Nonprofit Organization, organization or agency operating without profit.
4. Business, any commercial, for-profit enterprise.

B. Membership is open to any individual, family, business, government agency, educational institution, church, or other organization that supports the objectives of Friends of Big Walnut Creek.

C. Dues.

1. Annual dues are payable to the Treasurer, Friends of Big Walnut Creek, on or before January 2 each year. The amount of the dues is determined by a majority vote of the Board of Trustees, may differ based on type of membership, and may be revised annually.

2. The Treasurer shall notify members who are two months in arrears. Those members who do not pay within sixty days of notification shall be automatically dropped from membership.

**3. A majority vote of the Trustees may levy an assessment on the membership, if needed for a special event, but not in excess of twenty dollars (\$20.00) per membership.**

**D. Any member may resign by sending a written resignation to the Secretary, who shall present it to the Board of Trustees for action. Any member whose resignation is accepted shall be reinstated on receipt of their request accompanied by current dues.**

**E. The Board of Trustees may select Honorary Members by a two-thirds majority vote after thirty days written notice of the nomination for honorary membership. Honorary membership is for life and without dues. Honorary membership should be awarded as testimony to at least five years of outstanding service and dedication to Friends of Big Walnut Creek.**

#### **ARTICLE IV. OFFICERS**

**A. At the first meeting of the Board of Trustees following the Annual Meeting the Board shall elect a President, a Vice-president, a Secretary, and a Treasurer, from the members of the Board. These officers of the Trustees shall serve a term of one year and shall conduct the business of the Board of Trustees as well as the general meetings. No Trustee shall hold more than one office at one time. These officers shall perform the duties prescribed by these bylaws and by the parliamentary authority.**

**B. The Board of Trustees may select, by a majority vote, a person from the membership to fill the expired term of a Trustee who resigns.**

**C. The Treasurer shall arrange for an annual, independent audit of the organization's complete finances, to be available to the membership at the Annual Meeting in March. The Treasurer shall submit to the Board of Trustees a monthly accounting of finances. The monthly report may be submitted at the regular meeting of the Board or by E-mail to each Trustee. The fiscal year for Friends of Big Walnut Creek shall be the calendar year beginning January 1.**

#### **ARTICLE V. MEETINGS**

**A. The Annual Meeting shall be on the second Tuesday of March each year unless noticed to all members at least two weeks in advance.**

**B. Each member in good standing shall have one vote except that joint memberships have two votes. Members must be present at the meeting to vote.**

**B. Six members of the general membership shall constitute a quorum.**

**C. Trustees are elected at the Annual Meeting.**

**D. Other meetings of the general membership may be called if approved by a majority of the Board of Trustees and noticed to all members at least two weeks in advance.**

#### **ARTICLE VI. BOARD OF TRUSTEES**

**A. All activities and services of the Friends of Big Walnut Creek shall be controlled by the Board of Trustees, consisting of at least seven and not more than fifteen members who shall be elected for a term of two years from the membership at the Annual Meeting. Half of the Trustees up to a total of eight Trustees shall be elected at each annual meeting.**

**B. Nomination to the office of Trustee may be made from the floor at the Annual Meeting or by a Nominating Committee if the President has appointed such a committee. To be elected to trusteeship a member must receive a plurality of the votes cast at the Annual Meeting. There is no limit to the number of terms a Trustee may serve.**

**C. The Board of Trustees shall meet at least six times each year. The meeting will be on the second Tuesday of each month unless otherwise determined and noticed at least two weeks in advance to all Trustees.**

**D. Four Trustees shall constitute a quorum for a Board of Trustees meeting. Each Trustee shall have one vote when deciding matters that come before the Board. A Trustee must be present at the meeting to vote.**

**E. The President or, in his/her absence or inability to act, the Vice-president may call a special meeting for any purpose that is in line with the objectives of the organization. The Trustees will be given at least forty-eight hours notice of such a meeting. At such special meeting business and discussion is restricted to the purpose for which the meeting was called.**

**F. The President or, in his/her absence or inability to act, the Vice-president may poll the Trustees by telephone or by E-mail in the event of an emergency issue. An action may be approved by a majority affirmative vote of all the Trustees, even when the vote is obtained by electronic means. The action must be ratified at the next regular meeting of the Board of Trustees.**

**G. Any Trustee who has three unexcused absences within a calendar year will be automatically replaced. The Board of Trustees shall select, by a majority vote, a person from the membership to fill the expired term of a Trustee who resigns or who is removed from office.**

## **ARTICLE VII. COMMITTEES**

**A. There are no standing committees.**

**B. The President may create special committees from time to time for such matters as he/she may choose or at the direction of a majority of the Board of Trustees. The President shall appoint the committee chair and may serve as ex-officio member of all committees except the Nominating Committee, if such committee is formed. Committee chairs will select other members for their committee. Special committees cease to exist at the time of their final report to the Board of Trustees.**

## **ARTICLE VIII. PARLIAMENTARY AUTHORITY**

**The rules contained in the current edition of *Robert's Rules of Order Newly Revised* shall govern the organization in all cases to which they are not inconsistent with these bylaws and any special rules of order the organization may adopt, and not in violation of the authority of state or regional laws.**

## **ARTICLE IX. AMENDMENT OF BYLAWS**

**The Board of Trustees may amend any portion of these Bylaws by a two-thirds affirmative vote of those present and voting, at a regular meeting, after at least thirty days written notice to all Trustees.**

**Reviewed and corrected by Joy Myers, PRP, CPP-T on December 13, 2004**

**This DRAFT REVISION of the Bylaws of Friends of Big Walnut Creek was presented to the Board of Trustees on December 14, 2004.**

**These Bylaws were adopted by an affirmative vote of all members of the Board of Trustees present at its regular meeting on February 8, 2005, there being five out of seven of the Board members present.**

## Appendix B

### **FoBWC watershed plan evaluation tracking system**

**Purpose:**

Track implementation of action items and analyze data on actions to refine and adapt them.

**Motivation for people to use:**

Observe and learn about what other organizations are doing, demonstrate progress for funders and regulators.

**Note:**

Data should be easy to input and query the information.

**End Users:**

1. Franklins SWCD
2. Local village and municipal governments
3. City of Columbus
4. Ohio EPA
5. MORPC
6. Health Dept
7. Friends of Big Walnut
8. Health Depts.
9. Franklin County Metro Parks
10. Interested members of the public
11. Environment Career Center at New Albany High school

What kinds of questions should the tracking system answer?

1. Status of the project action items

Here are some possible items to include:

Name of responsible organization

Date

Ideas for possible next steps

Barriers

Opportunities

Percentage of action item complete

2. It should provide outputs and outcomes of the actions

Environmental and Social Outputs (linear feet, numbers of audience reached, publications distributed, etc.)

## Environmental Outcomes

Assessments and monitoring data (e.g., before and after implementation) current stream conditions using indicators for stream health may be limited to where 319 NPS grants in place (e.g., New Albany stream restoration)  
Stream erosion input measures

## Social Outcomes

### Awareness

Do you know what streams are near you?

### Knowledge Changes

What is the water quality of the streams near you?

Behavior/Practice changes related to Ag, BMPs, and urban stream practices (mowing to stream bank, installing rain gardens, limiting chemical applications, becoming involved in water quality protection)

## Building Local capacity

Targeting efforts to address watershed impairments

Are you changing your practices as an organization?

Who are sharing this information with?

Partners with local organizations... (Gahanna, New Albany Phase II responsible person)...

Funding for this activity and source (grants, contracts, and donations) acquired for this action item

## **Appendix C**

### **CLOTTS/SOUDER DITCH CHANNEL ANALYSIS**

For

The City of Gahanna

Franklin Soil and Water Conservation District

6/25/2009

### Existing Conditions

The Clotts/Souder ditch complex is a 650 acre sub-basin of the Rocky Fork Creek (HUC 05060001-140-020). The Clotts/Souder ditch complex conveys drainage westward from headwater areas in the Gahanna Woods park area, the Jefferson Golf & Country Club and an area of Jefferson Township stretching northeast to the Blacklick Elementary school. Upper reaches of the drainage are low density development with relatively high percentages of open space and a low impervious cover ratio. Newer relatively high density developments within the area such as the Stepping Stone and Farm Creek subdivisions have been developed under more recent stormwater requirements and have been designed with provisions for channel protection and stormwater retention. Older development in the catchment area has been large lot development.



Channelization has occurred through the Gahanna Woods area to facilitate drainage and piped connections have been made in the Havens Corners/Mann Road., Havens Corners/Taylor Station, and Taylor/Taylor Station Road to facilitate upstream drainage across these roadways. Gahanna Woods Park drainage is divided north and south. The southern end, consisting of piped connections along Taylor/Taylor Station roads, lead to Rocky Fork Creek through the Souder Ditch proper. The drainage area for the Clotts/Souder ditch catchment begins approximately at Brooksong Way/Taylor Station Road.

Two channelized branches carry drainage through Gahanna Woods Park and emerge in the Farm Creek subdivision. This subdivision is a 231 acre sewer shed. It is single family residential on 0.25 acre lots. All runoff is conveyed to the curb and gutter system that discharges to the Clotts/Souder ditch.



Cross hatched areas = Cc muck, Stippled areas = potential treatment areas

Stormwater controls for the Farm Creek subdivision are a 48" pipe and broad crested weir structure at Havens Corner Road. This structure discharges into the 108" conveyance under Havens Corner Road and provides channel protection and critical storm protection for Rocky Fork Creek. It affords no upstream channel protection or treatment except during extreme storm events.



## **Problem**

Bank erosion has become more prevalent to several ditchside residents within the Farm Creek subdivision, and the threat of property loss has prompted a more in-depth solution oriented analysis. While bank armoring and hard engineering practices can protect individual properties, the long term sustainability of these practices and the individual cost and overall benefits are limited.

Development and urbanization results in rapid drainage and the loss of infiltration and groundwater recharge. Groundwater maintains the base flow in streams which maintains the channel form and mediates in-stream habitat and seasonal water fluctuations. Urbanized streams typically have reduced in-stream quality because of the lack of base flow. Urbanizing results in flashy high energy storm events that scour bank areas beyond the normal bank full widths, and the lack of water during seasonal low periods diminishes habitat quality and natural channel maintenance.

## **Existing Natural Resources**

Gahanna Woods Park is, and has always been a merge point for area drainage. This is apparent by the soil types, the local contours, and historic land use. Condit Muck (Cc) is predominant in large depressional wet areas of the park. This soil type is associated with ice age glacial depressions and historically use for truck crop farming (i.e. perishable vegetables) and mined for peat. Surrounding this soil type is Pewamo (Pw) soil. Also a depressional soil, Pewamo soil is considered a hydric soil indicating that saturated reducing conditions occur for extended periods.

The Clotts/Souder ditch through Gahanna Woods Park is a straight, deeply incised channel. The bottom elevation of the ditch results in the rapid conveyance of historical overbank events beyond the natural resource base of Gahanna Woods. Both branches cut through areas that historically were seasonally inundated or saturated and carried broad overland flows but are now drained more rapidly by the ditch. The effect downstream is increased short duration storm volumes carried by the channels and less maintained base flow from the diminished infiltration upstream and natural detention.

Channel excavation can be seen in the 1938 aerial through all areas of Pewamo soils, a low strength soil subject to erosion and down cutting. Down cutting of the channel is evident by comparing the 1938 aerial section near present day Ashley Court, an identified problem area. Historic channelization was straight through this narrowed area of Pewamo soils connecting to a downstream section of Alexandria soils (west of convergence, light tree line northwest to farm road and heavy tree line), a typical soil found along drainage ways. Recent aerials of the same area indicate channel meander development and bank erosion downstream from Farm Creek Drive. Added to this immediate area is the point discharge from a 12", two 18", and one 24" storm main from the Farm Creek subdivision, increasing the short duration storm event volumes. Upstream of present day Farm Creek Drive, the historic aerial shows the linear excavation of the channel branches. The channel is deeply incised by evidence of the bright spoil and bank areas and straightened to Taylor Station Rd. to encourage drainage in the area.



1938 Historic Aerial

Clotts/Souder Ditch and Gahanna Woods at Havens Corner Rd. and Taylor Station Rd.

### **Solutions**

Storage of runoff is a key component of any potential reduction of channel erosional forces. Limited solutions exist in urban settings due to the existing buildout and cost of available land. Some options for reducing stormwater input in the Clotts/Souder ditch include:

1. Re-establishing flood elevations and hydroperiod within hydric soils in Gahanna Woods.
2. Creation of additional pool storage in areas of existing sheet flows and historic overbank areas.
3. The use of existing storm water infrastructure for temporary storage of stormwater.

### **Discussion**

Areas identified in the Gahanna Woods Park could be restored to historic hydroperiod levels by creating restrictions in the outfall elevation of the existing ditch.

Restoration of hydroperiod, vernal pool creation, riparian enhancement, and enhancing channel morphology in Gahanna Woods would result in wet detention treatment for the 419 acre upstream portion of the Clotts/Souder ditch catchment. Based on ODNR's load reduction

worksheet, wet detention for approximately 100 acres of residential and 319 acres of open space would potentially result the following pollutant reductions.

	<b>Load before BMP (lbs/yr)</b>		<b>Load after BMP (lbs/yr)</b>		<b>Load Reduction (lbs/yr)</b>
<b>BOD</b>	2,530		936		1,594
<b>COD</b>	28,745		14,373		14,373
<b>TSS</b>	50,513		11,365		39,148
<b>LEAD</b>	29		10		19
<b>COPPER</b>	8		U		U
<b>ZINC</b>	116		75		41
<b>TDS</b>	274,774		U		U
<b>TN</b>	922		738		184
<b>TKN</b>	736		U		U
<b>DP</b>	52		U		U
<b>TP</b>	206		115		91
<b>CADMIUM</b>	0		U		U

Redesign of the outfalls and stormwater pipe storage would provide treatment similar to dry detention. Using ODNR’s load reduction spreadsheet, providing dry detention for 231 acres of sewer residential development would result in the following pollutant reductions:

	<b>Load before BMP (lbs/yr)</b>		<b>Load after BMP (lbs/yr)</b>		<b>Load Reduction (lbs/yr)</b>
<b>BOD</b>	5,093		3,718		1,375
<b>COD</b>	32,411		25,929		6,482
<b>TSS</b>	71,533		30,402		41,131
<b>LEAD</b>	54		27		27
<b>COPPER</b>	11		U		U
<b>ZINC</b>	208		167		42
<b>TDS</b>	100,934		U		U
<b>TN</b>	1,389		972		417
<b>TKN</b>	741		U		U
<b>DP</b>	60		U		U
<b>TP</b>	188		139		49
<b>CADMIUM</b>	0		U		U

Implementation of these practices in the Clotts/Souder ditch catchment could result in the following totals for pollutant removal and reduce stormwater loading within critical areas of the existing channel.

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Total Load Reduction (lbs/yr)
<b>BOD</b>	7623		4654		2969
<b>COD</b>	61156		40302		20854
<b>TSS</b>	122046		41767		80279
<b>LEAD</b>	83		37		46
<b>COPPER</b>	19		U		U
<b>ZINC</b>	324		242		82
<b>TDS</b>	375708		U		U
<b>TN</b>	2311		1710		601
<b>TKN</b>	1477		U		U
<b>DP</b>	112		U		U
<b>TP</b>	394		254		140
<b>CADMIUM</b>	0		U		U

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## **Appendix D**

### Petition Ditches in Rocky Fork Creek Watershed

Rocky Fork has nine petitioned ditches.

Bauer Ditch

Bevelheimer Ditch #1

Boehm & Schleppi Ditch

Edwards Jt. Co. Ditch

Herb Ditch #1

Herb Ditch #1

Moore Jt. Co. Ditch

Sycamore Run (petitioned as Kramer & Bachman Ditch in the 1940s)

Taylor Ditch

Most of these have been incorporated within municipal boundaries and are no longer maintained as petition ditches.

## Appendix E

### Rocky Fork Creek—HUC 05060001-140 -120

#### Inventory of Watershed Action Items

Waterbody	Cause #1	Cause #2	Action Item	Target	Unit	Total Costs
Entire Watershed			Establish Volunteer Water Quality Monitoring Program	3/site/season	Measurements	\$5000
Entire Watershed	Pathogens		Identify Illicit Discharges		# detected	n/a
Entire Watershed	Pathogens	Bacteria	Connect HSTS to Sewer	38	HSTS	n/a
Entire Watershed	Pathogens	Bacteria	Identify Farms where livestock have access to stream	n/a	List	Staff time
Entire Watershed	Pathogens	Bacteria	Work with 1 farmer to fence out cattle from stream	?	Linear ft.	\$3 * ?
Entire Watershed	Pathogens	Bacteria	Take Windrush WWTP offline	- 4.78 *10 <sup>9</sup> FC	cfu/season	n/a
Rose Run	Sediment	Water volume	Flow study of the headwaters of Rose Run			\$10,000
Rose Run	Sediment	habitat	Reconnect stream to flood plain	2800	Linear ft.	\$70,000
Rose Run	Sediment	habitat	Reconnect stream to flood plain	2200	Linear ft.	\$55,000
Rose Run	Habitat	Sediment	Remove 100 yr old low head dam	60	QHEI	\$723,622
Rose Run	Sediment	Habitat	Streamside homeowner education	1500	brochures	\$3,000
Rose Run	Sediment	Nutrients	Implement conservation Tillage in headwaters	120	Tons/year	n/a
Upper Mainstem	Nutrients	Sediment	Riparian Restoration: Trees	10	acres	\$5000
Upper Mainstem	Nutrients	pathogens	Connect 38 HSTS homes to sewer	353	lbs/year	n/a
Upper Mainstem	Nutrients	Sediment	Conservation Tillage on 1442 acres	456	lbs./year	n/a
Upper Mainstem	Habitat Loss	Sediment	Riparian Restoration: buffers	3.6	Acres	\$716
Upper Mainstem	Habitat Loss	Sediment	Establish Metro park in Headwaters	1200	acres	N/A
L. Main Stem	Nutrients		Take Windrush WWTP offline	347	lbs/year	n/a
L. Main Stem	Nutrients	Sediment	Reconnect Clotts/Souder ditch to floodplain	5.81	acres	\$350,000
L. Main Stem	Nutrients	Sediment	Create Vernal Pools	0.53	acres	\$50,000
L. Main Stem	Nutrients	Sediment	Redesign outfalls and retrofit pipes for neighborhood along Clotts/Souder Ditch	49	lbs/year	n/a
Total estimated costs						\$1,272,338