Nine-Element Nonpoint Source Implementation Strategic Plan (NPS-IS plan)

Pigeon Creek Watershed:
HUC-12 (05040001 01 02)
Approved: April 1, 2019

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Acknowledgements

City of Fairlawn would like to thank the many partners who helped to compile the information, maps and projects needed to create this document. This NPS-IS plan will help direct projects to expeditiously address the nonpoint source impairments in the **Pigeon Creek HUC-12** of the Tuscarawas River watershed.

Chapter 1: Introduction

The **Pigeon Creek HUC -12 Plan** (HUC-12 05040001 01 02) is located within the Tuscarawas River Watershed, draining into the Muskingum River which is the largest watershed in Ohio. The Pigeon Creek HUC -12 is one of the northernmost watersheds of the Ohio River in the Muskingum River basin. The Pigeon Creek HUC-12 drains approximately 24.68 square miles and has significant areas of dense urban and suburban development in the City of Akron, City of Fairlawn and Copley Township.

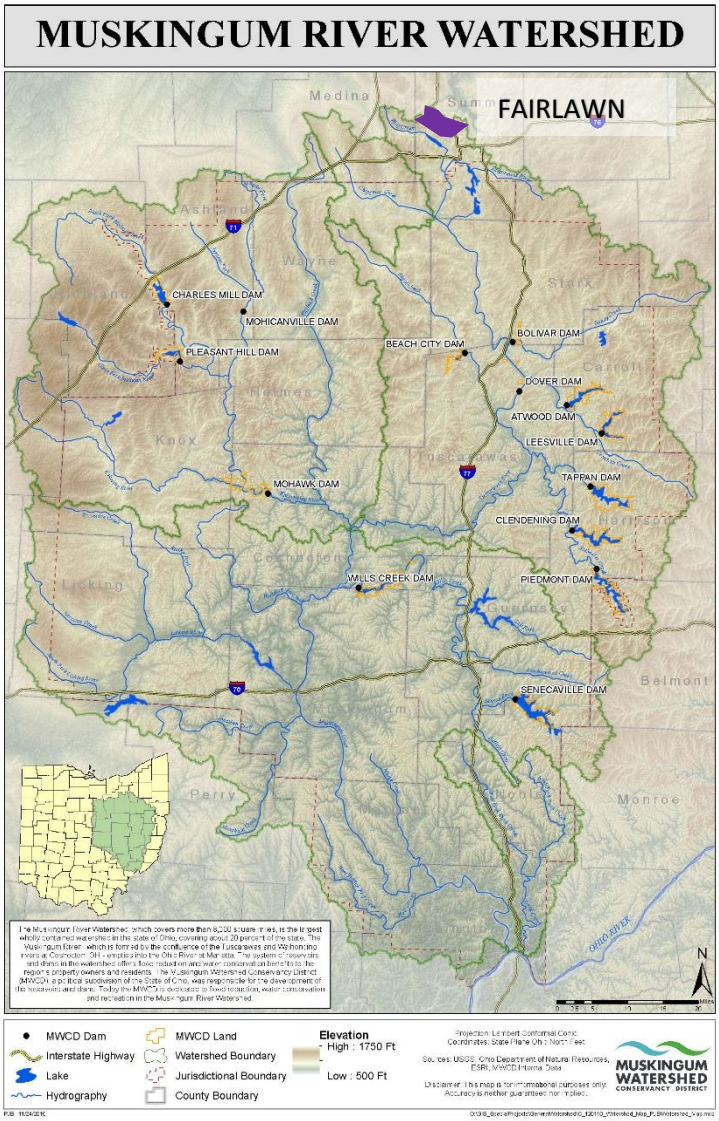

Figure 1: The Pigeon Creek HUC -12 (HUC-12 05040001 01 02) which is outlined in purple.

State and Federal nonpoint source funding is now closely tied to strategic implementation-based planning that meets U.S. EPA's nine minimum elements of a watershed plan for impaired waters. The City of Fairlawn has taken the lead in authoring this Nine-Element Nonpoint Source Implementation Strategic Plan (NPS-IS). The City is working with numerous other municipalities and stakeholders as part of the development of this NPS-IS. As an upstream contributor and a downstream receiver of floodwaters, Copley Township's administrator coordinated with the City of Fairlawn by providing information on their priority flooding areas within the HUC-12 – mainly south of Fairlawn along the main stem. These problem areas were identified within the previously developed plans. Additionally, Environmental Design Group had a meeting with the City of Akron's Water Resources Renewed staff to identify problem areas within the watershed. This information was included in this plan.

Numerous reports, studies, and watershed plans have been produced over the last 20 years, including the Tuscarawas River TMDL report in 2009 by the Ohio EPA and Upper Tuscarawas River Watershed Action Plan by Northeast Ohio Four County Regional Planning and Development Organization (NEFCO) on July 1999 (WAP). The City of Norton, Barberton and Copley Township also developed a plan to study localized flooding along Pigeon and Wolf Creek – Pigeon and Wolf Creek Watershed Preliminary Flood Study,

authored April 4, 2017 by Environmental Design Group (Flood Study). This plan shall incorporate and reference these plans and other plans.

1.1 Report Background

This NPS-IS was created as a supplement to, and in conjunction with, the Total Maximum Daily Loads for the Tuscarawas River (Ohio Environmental Protection Agency, Division of Surface Water (OEPA), July 27, 2009).

These watershed-based plans include water quality impairments and potential improvement areas; however, they do not include metric-based goals of Nonpoint Source Pollution Management. These other plans address broader impairments that need attention in order to restore the entire watershed of Upper Tuscarawas River to fishable, swimmable and drinkable waters that meet water quality standards. With the change of program focus this NPS-IS is intended to guide the region in addressing nonpoint source pollution issues for the Pigeon Creek Watershed (HUC-12 05040001 01 02). The Flood Study also detailed how the Barberton Reservoir management effects stream flow on this HUC 12 watershed. Community partners will eventually create individual HUC-12 NPS-IS plans for the other watersheds within the Upper Tuscarawas River watershed.

1.2 Watershed Profile & History

The Muskingum River Watershed, of which the Tuscarawas River drains into, covers 8,051 square miles, which is roughly 20% of the state of Ohio. It is the largest watershed in the state, spanning five counties and parts of twenty-two more. The Muskingum River Watershed has six subwatersheds including Licking, Mohican, Muskingum, Tuscarawas, Walhonding and Wills. The Muskingum River is formed by the confluence of the Tuscarawas and Walhonding Rivers, which eventually empty into the Ohio River.

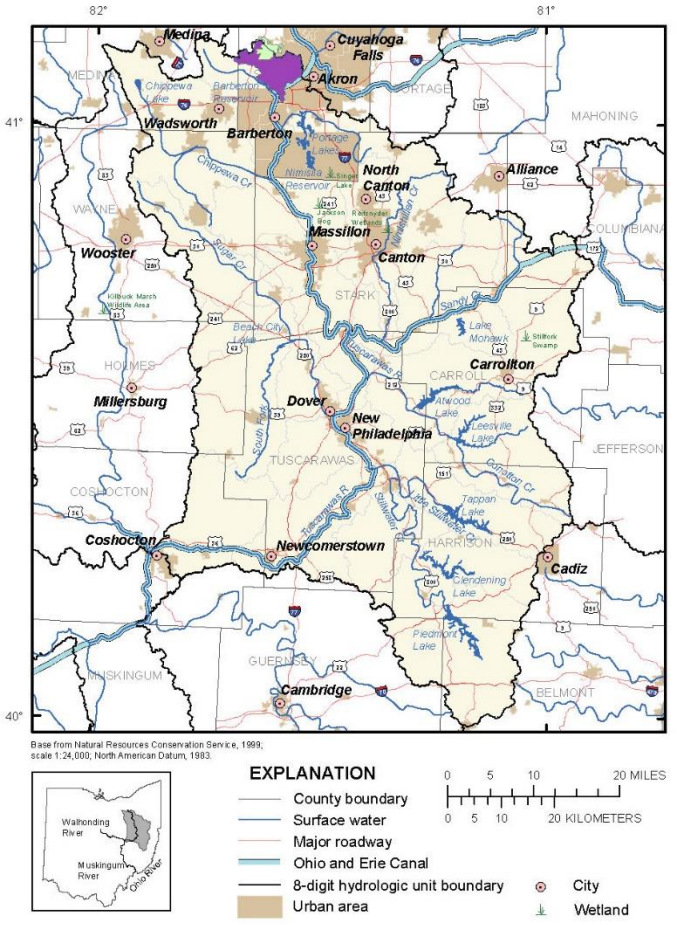

Figure 2: Context of the Pigeon Creek Watershed (purple) within the Tuscarawas River Watershed.

The Tuscarawas River Watershed begins at the southern end of Summit County and stretches south and slightly east towards Belmont County. The river is 129.9 miles long and drains 2,589 square miles, making it one of the largest river systems in the state. The watershed encompasses Tuscarawas County and parts of Summit, Stark, Wayne, Columbiana, Holmes, Carroll, Coshocton, Harrison, Guernsey, Belmont, Medina and Portage. Major municipalities within the watershed include Barberton, Wadsworth, Canton, North

Canton, Massillon, New Philadelphia, Newcomerstown and Carollton. The river passes through Portage Lakes, south of Akron and Barberton. From there, it flows southward, where it has been a catalyst for communities such as Clinton, Canal Fulton, Massillon, Dover and New Philadelphia. Just south of Barberton, the Ohio and Erie Canal was built in 1830 parallel to the Tuscarawas River. Flooding and other disrepair quickly damaged much of the canal. Today, some parts of the river remain channelized and play a vital role with the towpath trail. Additionally, the watershed is actively controlled for flooding through the Muskingum Watershed Conservancy District (MWCD). Formed in 1933, MWCD provides benefits of flood reduction, conservation and recreation with eight reservoir areas within the Tuscarawas watershed. Those include Atwood, Beach City, Bolivar, Clendening, Dover, Leesville, Piedmont and Tappan.

The Tuscarawas River Watershed spans many different landcovers, as it encompasses 2,589 miles and thirteen counties. Much of the northern portion of the watershed is urban and developed. This area includes Akron, Canton, and several smaller municipalities. The upper/middle portion of the watershed is also characterized by pastureland and row crop agriculture. This productive landscape is primarily found in Amish Country located in Holmes and Wayne Counties. Estimated landcover in the upper/middle part of the watershed is 17% urban, 36% pastureland, 20% row crop, 22% forest, and 5% surface water.

The lower/middle portion of the watershed is characterized by the Appalachian foothills. There is steeper topography and a much higher portion of forest cover. Livestock farming and pastureland is commonly mixed in with some of the flatter forest areas. Estimated landcover in the lower/middle part of the watershed is 5% urban, 30% pastureland, 16% row crop, 46% forest, and 2% surface water.

Types of land cover most prevalent in the Tuscarawas Watershed include deciduous forest, farmland, pasture hay, and developed open space. Notably, the Tuscarawas Watershed is predominantly farmland. Approximately 38% of the land is cultivated crops, 30% of the land is undeveloped and only 12% is developed/urbanized.

A series of reservoirs has also been built for flood control and recreation in the eastern portion of the watershed, which has significantly modified the natural hydrology of the watershed and presents challenges for balancing water quality attainment goals with the need for public health, safety, and recreation.

The Pigeon Creek watershed (HUC-12 05040001 01 02), with a 24.68 square mile drainage area, is the focus of this NPS-IS plan. It is located in the northernmost portion of the Tuscarawas River Watershed, with its downstream apex the conjunction with Wolf Creek, just downstream of the Barberton Reservoir. The watershed includes half of the City of Fairlawn and Copley Township. It also encompasses a large portion of the City of Akron. Two large transportation corridors, Interstate 77 & State Route 21, traverse

MEDINA COUNTY		
TOWNSHIPS	***VILLAGES***	***CITIES***
Sharron		
SUMMIT COUNTY		
TOWNSHIPS	***VILLAGES***	***CITIES***
Copley		Fairlawn
Bath		Akron
		Norton
		Barberton

Figure 3: Municipalities within the Pigeon Creek Watershed by type.

the watershed as well as the active Wheeling-Lake Erie rail line. Despite the high percentage of developed land area, the watershed also has multiple natural kettle lakes, bogs, and sand and gravel moraines.

HISTORY OF PERMITTED DISCHARGES

Twenty-one Waste Water Treatment Plants (WWTP) discharge into the Upper Tuscarawas River Watershed with none within the Pigeon Creek HUC -12 watershed. A large majority of the Pigeon Creek watershed is serviced by the City of Akron's sanitary sewer system, either through Master Meter Communities or JEDDs (See Figure 4).

The City of Fairlawn, City of Akron and Copley Township also work closely with Summit County Health Department (SCHD) to monitor the watershed for home septic systems in a state of disrepair. Working in conjunction with SCHD, homes and businesses with non-compliant septic systems are identified and the systems are typically either repaired or replaced by those owners found to be out of compliance.

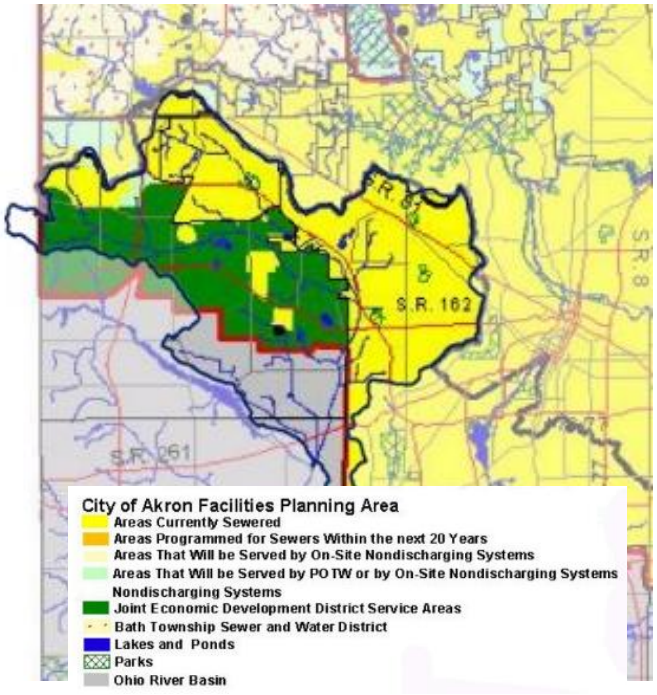

Figure 4: Map identifying sewer improvements within the Pigeon Creek Watershed from 2012 to 2015 (City of Akron, Watershed Control Program, 2015 Annual Report).

1.3 Public Participation and Involvement

It is important to have diverse involvement in the development of any regionally significant plan such as this NPS-IS plan. The Cities of Fairlawn, Akron, Barberton, Norton and township of Copley had input on this plan through a compilation of recently created plans, conversations of issues and meetings. During the Flood Study, the Cities of Barberton, Norton and Copley Township provided public input on water quality and flooding issues during that 2016-17 project. Public involvement included two presentation/workshops about the watershed and project, with a final presentation to Norton City Council.

Additionally, Environmental Design Group sat down in 2018 with the City of Akron engineering bureau to discuss and document known issues within the HUC-12. Akron provides sanitary services for a large portion of this HUC-12 and as such, has extensive knowledge of water quality issues within the watershed. The city identified localized flooding areas around the highway and southern edges of the watershed.

HISTORY OF CITY OF FAIRLAWN AND OTHER PARTNERS' PROTECTION

Located in the flat headwaters of the Tuscarawas River, over the past 20 years, the Cities of Fairlawn, Norton, Barberton, Akron, Copley and Bath Townships with Summit County have worked to protect Pigeon Creek by creating setback ordinances and preserving property in critical areas along the river.

Fairlawn's largest park, Fort Island Griffiths Park, protects large segments of bogs, wetlands and stream channel in Schocalog Run. Most recently Fairlawn has installed a flood controlling floodplain oxbow along Smith Ditch and created a holistic Smith Ditch stormwater master plan for regional water quality improvements. Additionally, Norton, Barberton and Copley worked together in 2017 to create a watershed study to reduce flooding within the region. This flooding in the industrial areas of Barberton continually affects water quality downstream. Additionally, the City of Akron protects large sections of tributaries within their J. Edward Good Park Golf Course.

Figure 5: University of Akron's Panzner Wetland Wildlife Reserve, which is a wetland mitigation site.

PIGEON CREEK HUC-12 NPS-IS Plan

NPS-IS = Nine-Element Nonpoint Source Implementation Strategic Plan

What is it? A watershed-based plan that identifies water quality issues for potential funding & grants.

Why are we doing it? The State of Ohio is not in compliance with federal programs for watershed planning. Every watershed in Ohio will create a NPS-IS plan.

Who's doing it? As stewards of the watershed, the City of Fairlawn is leading the charge to create the Pigeon Creek HUC-12 NPS-IS Plan. Environmental Design Group is assisting the City on this important project.

Where are we looking? For this NPS-IS plan, the geographic boundary is the Pigeon Creek Watershed (see map – blue outline).

When is it due? The report draft is due in December to Ohio EPA. Final plans are to be submitted to the US EPA around April.

What can you do? The city is currently asking for stakeholder feedback for this living document. Upon the completion of the plan, the city will submit it to Ohio EPA and the US EPA for approval. In the future, additional projects and problems can be included into the plan and resubmitted to the Ohio EPA.

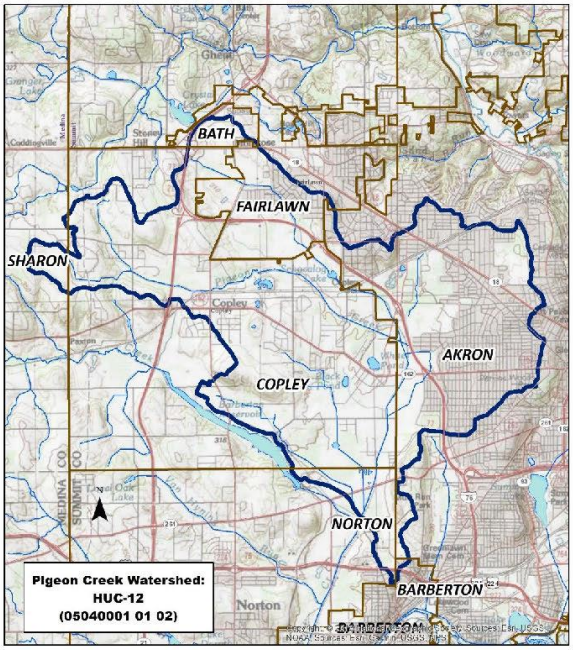

Figure 6: Fact sheet provided for public/stakeholder involvement meetings/conversations.

Chapter 2: Pigeon Creek Watershed Characterization and Assessment Summary

2.1 Summary Watershed Characterization for Pigeon Creek HUC-12

2.1.1 Physical and Natural Features

The Tuscarawas River Headwaters to below Wolf Creek HUC-10 watershed (0504000 10 10) consists of 6 subwatersheds. This NPS-IS focuses on #04, Pigeon Creek. Pigeon Creek is the northernmost watershed. The confluence of Pigeon Creek with the Wolf Creek HUC-12 (05040001 01 04) serves as the downstream terminal node for the Pigeon Creek watershed.

NRCS HUC-12	TMDL SUBWATERSHED	Acreage	Square Miles	Miles of Stream
Pigeon Creek (05040001 01 02)	Tuscarawas River Headwaters to below Wolf Creek (05040001 010) – Pigeon Creek 040	15,792	24.68	38.4

Glaciation from over 10,000 years ago has greatly impacted the physical and natural features of the Tuscarawas River Watershed. The watershed is defined by two different physiographical regions: The Glaciated Appalachian Plateau to the north, and Unglaciated Appalachian Plateau to south. The southern, unglaciated part of the watershed takes up about 2/3 of the total areas of the HUC-10 and has greater topographic relief with rolling hills and forest cover. The Pigeon Creek HUC-12 watershed is located wholly within the glaciated portion. Specifically, the watershed is within the Erie Gorges and Summit Interlobate areas.

"The Erie Gorges ecoregion is a uniquely steep, dissected area along the Chagrin, Cuyahoga, and Grand rivers. Local relief can exceed 500 feet, rock exposures occur, and fluvial erosion rates are high. Originally, mixed mesophytic forests were common on well-drained sites; today, woodland, recreational areas, scattered farms, and housing are dominant." – Ecoregions of Indiana and Ohio

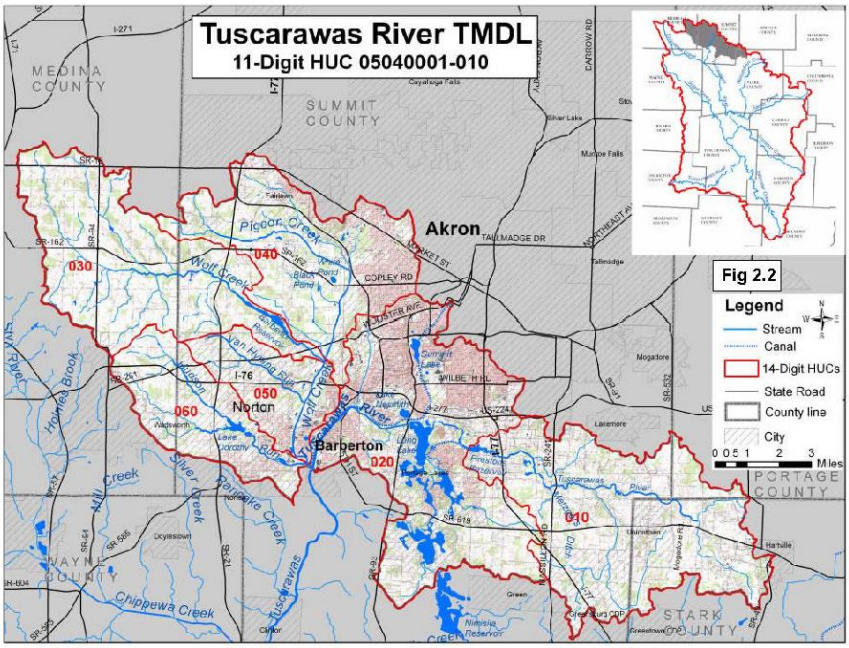

Figure 7: Tuscarawas River Headwaters Watershed and sub-watersheds including the Pigeon Creek Watershed (040). Table includes acreage and stream mile breakdown.

"The Summit Interlobate Area is set apart from adjacent ecoregions by its numerous lakes, wetlands, sphagnum bogs, sluggish streams, kames, and kettles. The substrate is often sandy outwash and till. Mixed oak forests originally dominated well drained areas; today, woodland, peatland, agriculture, gravel quarries, and urban-suburban development occurs." (*Ecoregions of Indiana and Ohio*.)

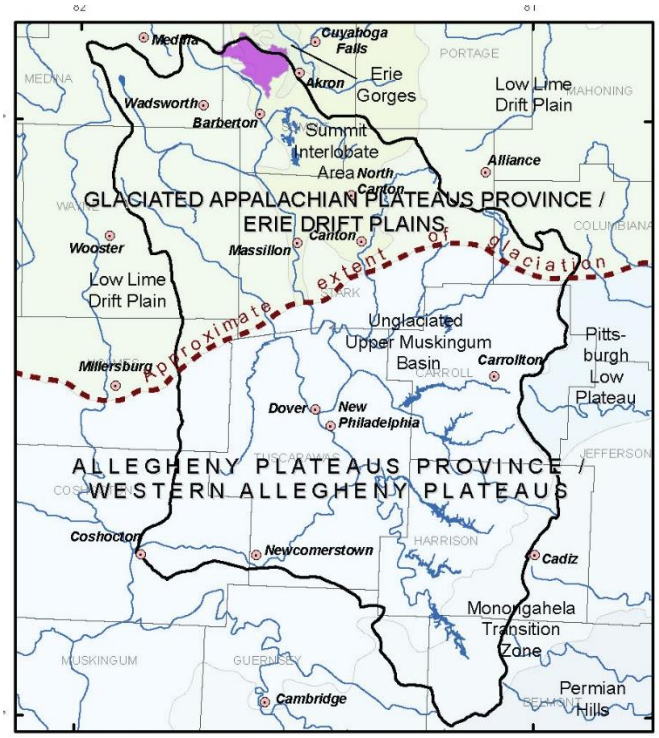

Figure 8: Glacier geology of the area which identifies the deposits from past glacial-interglacial cycles. Pigeon Creek in purple.

Much of Pigeon Creek HUC-12 has poorly to well drained till or lacustrine deposits with generally low suitability for basement building foundations or septic leach fields (USDA Web Soil Survey).

There are multiple county ditches located within the Pigeon Creek HUC-12 watershed. These principal drainageways were established as County Ditches in the early 1930s. "Utilizing financial assistance through the federal WPA program, stream and ditches were cleared of debris, widened, deepened and channelized. Consisting of 21.8 miles of ditch and stream and encompassing Wolf Creek, Pigeon Creek and tributary ditches Schocalog, Viers, Copley, Frederick, Weinpert, Rousch, Black Pond, Bessemer, Infirmary, Hands and Frank these channels became the core infrastructure for draining the land within the basin." (Wolf Creek Rehabilitation Study, MS Consultants, August 28, 2015, Summit County Engineer). Individual property owners are responsible for maintenance of the channels that pass through their land. Cleaning and realigning of these drainageways can be performed through the Ditch Petition process in Sections 6131 and 6137 of the Ohio Revised Code.

Within the lower Pigeon Creek, near its confluence with Wolf Creek, there are several submerged low head dams. These were identified and hydraulically modeled in the Flood Study. Additionally, many road culverts and road bridges within this same area act as flood water restrictions.

Specific landmarks and features in the Pigeon Creek HUC-12 watershed include:

- Three Golf Courses – Rosemont Country Club, J. Edwards Good Park Golf Course and Portage Country Club
- Eight Lakes and Ponds over 2.5 acres – Yellow Pond, White Pond, Black Pond, Schocalog Lake, and four unnamed waterbodies
- There is one sand and gravel processing facility along Sawmill Road in Copley and one active surface mine along McCoy Road (ODNR)
- A portion of the now demolished Rolling Acres Mall
- A portion of Greenlawn Memorial Park Cemetery

- Multiple City parks – Fairlawn's Fort Island Griffiths Park, Bicentennial Park; Copley's Community Park; Akron's Erie Island Park, Will Christy Park, Forest Lodge Park, Schneider Park, Hardesty Park, Copley Road Soccer Complex, Frank Boulevard Park; University of Akron's Panzner Wetland Wildlife Reserve
- The Fairlawn Corporate Park which intertwines natural areas with commercial office park
- Multiple historic coal and surface mining operations (ODNR)

In the TMDL report, the Tuscarawas River (headwaters to below Wolf Creek) impairments to recreation and/or aquatic life includes stream modification, septic tanks, siltation, habitat, nutrients, suburbanization, and channelization. WWTP discharges are also listed as a water quality impairment in the larger HUC-11 watershed; however, there are no major WWTP (greater than 1MGD design flow) discharging to the Pigeon Creek HUC-12.

SUBURBANIZATION

The Pigeon Creek HUC-12 is 40% residential area with an average residential parcel size of 0.4 acres (Figure 4). Many of the parcels previously served by home septic treatment systems have been added to the City of Akron's WWTP service, significantly reducing water quality impacts from bacteria. However, pollution from urban runoff, channelization and stream modification from development is prevalent and continues to impair stream habitat and water quality within this urbanized watershed.

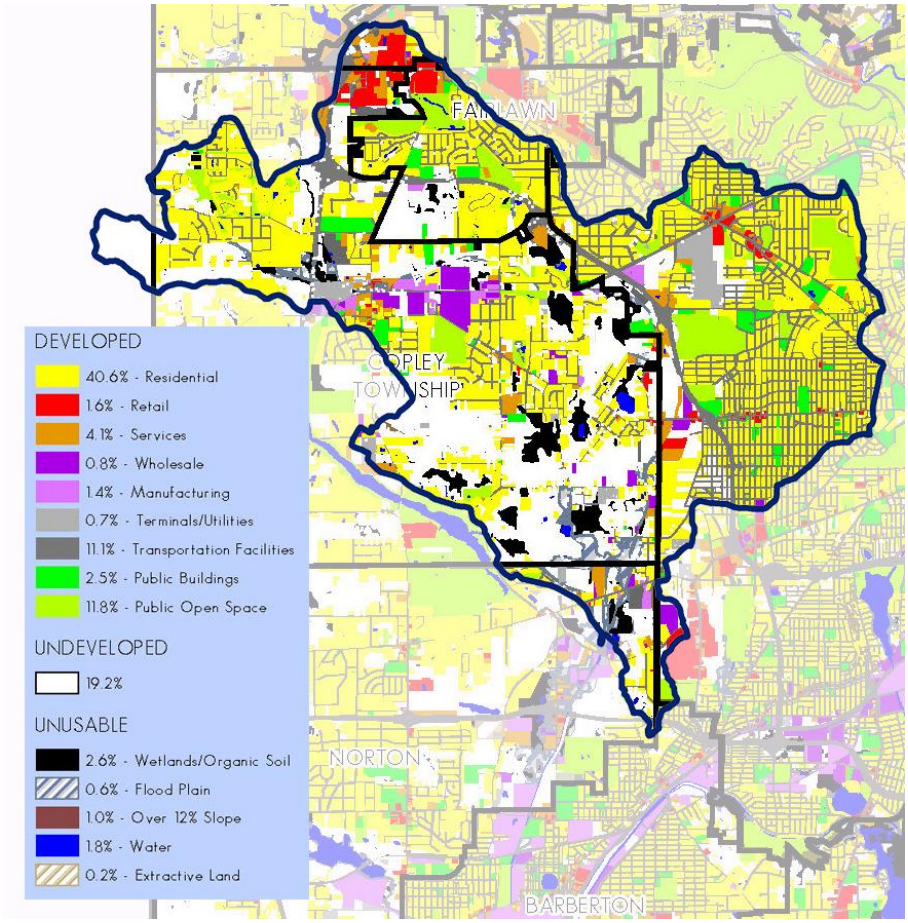

Figure 9: General Land use within Pigeon Creek Watershed (dark blue outline) AMATS 2005.

NPDES PERMITS

As mentioned previously, there are no major WWTP (greater than 1MGD flow) discharging to the Pigeon Creek HUC-12 but there are minor NPDES permit holders, listed in the table below along with the receiving stream. The National Environmental Service Center estimates approximately 2,680 septic systems in the HUC-12, with an average of 2 people per system and a failure rate of 2.18% or about 75 systems.

Ohio EPA Permit #	Facility Name	Permit Type Description	Facility Type Description	Stream
3PG00118*HD	Frasure Park Estates WWTP No 46	Individual Permit - Public	County - Under 0.1 MGD	Vara's Ditch
3PR00184*DD	Cavanaugh Bldg Corp	Individual Permit - Public	Semi-Public - Under 0.05 MGD	Unnamed trib to Pigeon Creek
3PT00127*CD	Spring Garden Waldorf School	Individual Permit - Public	Schools and Hospitals	Unnamed trib to Pigeon Creek
3PW00008*GD	Foxtail Glen	Individual Permit - Public	Subdivisions and Apartment Complexes	Ditch to Pigeon Creek
3IR00102*CD	Karman Rubber Co	Individual Permit - Industrial	Rubber Fabrication	Pigeon Creek via unnamed tribs
3PT00126*CD	Arrowhead Elementary School	Individual Permit - Public	Schools and Hospitals	Pigeon Creek via unnamed tribs
3PR00381*CD	Copley Towne Center	Individual Permit - Public	Semi-Public - Under 0.05 MGD	Unnamed trib to Pigeon Creek
3PT00038*GD	Copley Fairlawn Middle School	Individual Permit - Public	Schools and Hospitals	Unnamed trib to Pigeon Creek
3GS00012*BG	First Benefits	General Permit	Small Sanitary Discharge	
3PR00309*CD	Covenant of Grace Church	Individual Permit - Public	Semi-Public - Under 0.05 MGD	Pigeon Creek via storm sewer
3IE00007*HD	PVS Chemical Solutions	Individual Permit - Industrial	Inorganic Chemical Plant	Pigeon Creek
3GN00021*DG	Akron Dispersions Inc	General Permit	Non-Contact Cooling Water	Pigeon Creek
3PT00047*CD	Copley Fairlawn High School	Individual Permit - Public	Schools and Hospitals	Pigeon Creek via unnamed trib

RARE, THREATENED, AND ENDANGERED SPECIES

The Ohio Department of Natural Resources (ODNR) Division of Wildlife catalogs known rare, threatened, and endangered species through its Natural Heritage Database Program. A request was made to ODNR for a list of known species identified in the Pigeon Creek HUC-12. According to ODNR's Natural Heritage Database, the only record directly identified in the Pigeon Creek watershed is a 1989 observation of low umbrella-sedge (*Cyperus diandrus*), a State-listed Potentially Threatened species. However, below is a table of known species identified in Summit County (which over 90% of the Pigeon Creek HUC-12 is located in) that have the potential to be present in the HUC-12. The Natural Heritage Database relies on information supplied by many individuals and organizations, and a lack of records for any particular area is not a statement that rare species or unique features are absent from that area.

Status: X = Extirpated, E = Endangered, T = Threatened, PT = Potentially Threatened, SC = Species of Concern

State Status	Federal Status	Species	Common Name	Most Recent County Record
		Fauna		
E		*Etheostoma exile*	Iowa Darter	2012
E		*Opsopoeodus emiliae*	Pugnose Minnow	1997
E		*Speyeria idalia*	Regal Fritillary	1980
E	E	*Myotis sodalis*	Indiana Myotis Bat	2004
E		*Ursus americanus*	Black Bear	2000
T		*Erimyzon sucetta*	Lake Chubsucker	2012
T		*Clemmys guttata*	Spotted Turtle	2008
SC		*Hemidactylium scutatum*	Four-toed Salamander	2012
SC		*Esox masquinongy*	Muskellunge	1997
SC		*Euphyes bimacula*	Two-spotted Skipper	1898
SC		*Orconectes (Crokerinus) propinquus*	Great Lakes Crayfish	1992
SC		*Condylura cristata*	Star-nosed Mole	2011
SC		*Eptesicus fuscus*	Big Brown Bat	2012
SC		*Lasionycteris noctivagans*	Silver-haired Bat	2012
SC		*Lasiurus borealis*	Red Bat	2012
SC		*Lasiurus cinereus*	Hoary Bat	2012
SC		*Myotis leibii*	Eastern Small-footed Myotis	2012
SC		*Myotis lucifugus*	Little Brown Bat	2012
SC	T	*Myotis septentrionalis*	Northern Long-eared Bat	2012
SC		*Perimyotis subflavus*	Tri-colored Bat	2012
SC		*Peromyscus maniculatus*	Deer Mouse	2005
SC		*Sorex fumeus*	Smoky Shrew	1983
SC		*Synaptomys cooperi*	Southern Bog Lemming	1917
SC		*Taxidea taxus*	Badger	2007

Flora				
E	T	*Aconitum noveboracense*	Northern Monkshood	2007
T		*Adlumia fungosa*	Mountain-fringe	2014
PT		*Arabis pycnocarpa var. adpressipilis*	Southern Hairy Rock Cress	1998
T		*Betula pumila*	Swamp Birch	2011
T		*Buxbaumia aphylla*	Bug-on-a-stick	2009
PT		*Calla palustris*	Wild Calla	2008
T		*Calopogon tuberosus*	Grass-pink	1976
X		*Cardamine pratensis var. palustris*	American Cuckoo-flower	1991
PT		*Carex alata*	Broad-winged Sedge	2008
PT		*Carex albolutescens*	Pale Straw Sedge	1979
E		*Carex arctata*	Drooping Wood Sedge	1999
PT		*Carex argyrantha*	Silvery Sedge	1986
PT		*Carex atherodes*	Wheat Sedge	2003
PT		*Carex atlantica ssp. capillacea*	Howe's Sedge	2011
PT		*Carex aurea*	Golden-fruited Sedge	2009
PT		*Carex bebbii*	Bebb's Sedge	2011
E		*Carex brunnescens*	Brownish Sedge	2002
T		*Carex bushii*	Bush's Sedge	2009
PT		*Carex cephaloidea*	Thin-leaved Sedge	1998
T		*Carex diandra*	Lesser Panicled Sedge	1991
E		*Carex disperma*	Two-seeded Sedge	2000
PT		*Carex flava*	Yellow Sedge	2001
PT		*Carex lasiocarpa*	Slender Sedge	2004
T		*Carex mesochorea*	Midland Sedge	2008
T		*Carex oligosperma*	Few-seeded Sedge	2008
PT		*Carex pallescens*	Pale Sedge	2011
T		*Carex projecta*	Necklace Sedge	1997
PT		*Carex straminea*	Straw Sedge	2002
T		*Carex viridula*	Little Green Sedge	1979
PT		*Chamaedaphne calyculata*	Leather-leaf	2011
T		*Chimaphila umbellata*	Pipsissewa	1982
E		*Cinna latifolia*	Northern Wood-reed	2004
SC		*Cistothorus platensis*	Sedge Wren	2014
E		*Clintonia umbellulata*	Speckled Wood-lily	2004
PT		*Corallorhiza maculata*	Spotted Coral-root	2009
E		*Corallorhiza trifida*	Early Coral-root	2002
E		*Cornus canadensis*	Bunchberry	1958
PT		*Cornus rugosa*	Round-leaved Dogwood	2004
T		*Corydalis sempervirens*	Rock-harlequin	1984
PT		*Cyperus diandrus*	Low Umbrella-sedge	1999
T		*Cypripedium reginae*	Showy Lady's-slipper	1955

PT		*Deschampsia flexuosa*	Crinkled Hair Grass	2009
T		*Dichanthelium meridionale*	Southern Hairy Panic Grass	2010
E		*Dryopteris filix-mas*	Male Fern	2000
T		*Eleocharis flavescens*	Green Spike-rush	1999
T		*Eleocharis quinqueflora*	Few-flowered Spike-rush	2004
T		*Eleocharis tenuis*	Slender Spike-rush	2009
T		*Elymus trachycaulus*	Bearded Wheat Grass	2009
T		*Epilobium strictum*	Simple Willow-herb	2007
PT		*Equisetum sylvaticum*	Woodland Horsetail	2009
E		*Equisetum variegatum*	Variegated Scouring-rush	1986
T		*Eriophorum virginicum*	Tawny Cotton-grass	1998
PT		*Eriophorum viridicarinatum*	Green Cotton-grass	1990
E		*Fallopia cilinodis*	Mountain Bindweed	1979
PT		*Gentianopsis crinita*	Fringed Gentian	2005
PT		*Gentianopsis procera*	Small Fringed Gentian	1990
PT		*Geum rivale*	Water Avens	1998
T		*Glyceria acutiflora*	Sharp-glumed Manna Grass	2009
PT		*Helianthemum bicknellii*	Plains Frostweed	1998
T		*Helianthemum canadense*	Canada Frostweed	2004
T		*Hypericum boreale*	Northern St. John's-wort	1998
E		*Hypericum canadense*	Canada St. John's-wort	1989
PT		*Juncus balticus*	Baltic Rush	1991
E		*Juniperus communis*	Ground Juniper	2010
PT		*Larix laricina*	Tamarack	2011
PT		*Lechea intermedia*	Round-fruited Pinweed	1997
T		*Lechea pulchella*	Leggett's Pinweed	2009
PT		*Lechea villosa*	Hairy Pinweed	2007
PT		*Liatris squarrosa*	Scaly Blazing-star	2004
E		*Lilium philadelphicum*	Wood Lily	1971
PT		*Lupinus perennis*	Wild Lupine	1997
PT		*Luzula bulbosa*	Southern Wood rush	1997
E		*Melampyrum lineare*	Cow-wheat	1956
T		*Menyanthes trifoliata*	Buckbean	2011
E		*Myrica pensylvanica*	Bayberry	2001
X		*Myriophyllum verticillatum*	Green Water-milfoil	1990
E		*Nuphar variegata*	Bullhead-lily	2009
E		*Panicum tuckermanii*	Tuckerman's Panic Grass	1999
PT		*Persicaria robustior*	Coarse Smartweed	2006
PT		*Phegopteris connectilis*	Long Beech Fern	1998
PT		*Phragmites australis ssp. americanus*	American Reed Grass	2006
PT		*Poa saltuensis ssp. languida*	Weak Spear Grass	2002
T		*Pogonia ophioglossoides*	Rose Pogonia	2009

E		*Potamogeton gramineus*	Grass-like Pondweed	2004
PT		*Potamogeton natans*	Floating Pondweed	2004
E		*Potamogeton pulcher*	Spotted Pondweed	2000
T		*Potamogeton zosteriformis*	Flat-stemmed Pondweed	1990
T		*Potentilla palustris*	Marsh Five-finger	2011
PT		*Rhexia virginica*	Virginia Meadow-beauty	1999
PT		*Rhynchospora alba*	White Beak-rush	2006
PT		*Sagittaria rigida*	Deer's-tongue Arrowhead	2008
T		*Salix candida*	Hoary Willow	2008
PT		*Salix myricoides*	Blue-leaved Willow	2008
T		*Salix pedicellaris*	Bog Willow	1990
T		*Salix petiolaris*	Slender Willow	2009
PT		*Salix serissima*	Autumn Willow	2011
T		*Sarracenia purpurea*	Pitcher-plant	2008
E		*Schoenoplectus subterminalis*	Swaying-rush	2004
PT		*Shepherdia canadensis*	Canada Buffalo-berry	2010
T		*Silene caroliniana ssp. pensylvanica*	Carolina Catchfly	1998
E		*Sistrurus catenatus*	Eastern Massasauga	2012
T		*Solidago squarrosa*	Leafy Goldenrod	1985
T		*Sparganium androcladum*	Keeled Bur-reed	2003
E		*Sphagnum riparium*	Shore-growing Peat Moss	1985
PT		*Spiranthes lucida*	Shining Ladies'—tresses	1998
PT		*Spiranthes magnicamporum*	Great Plains Ladies'-tresses	2005
T		*Symphyotrichum dumosum*	Bushy Aster	2010
PT		*Triantha glutinosa*	False Asphodel	2011
T		*Triglochin maritimum*	Seaside Arrow-grass	1985
PT		*Triglochin palustris*	Marsh Arrow—grass	2006
T		*Utricularia intermedia*	Flat-leaved Bladderwort	1990
T		*Utricularia minor*	Lesser Bladderwort	2004
T		*Vaccinium oxycoccos*	Small Cranberry	2002
T		*Viburnum opulus var. americanum*	Highbush-cranberry	1998
PT		*Wolffiella gladiata*	Wolffiella	2008
T		*Zizania aquatica*	Wild Rice	2004

Status: X = Extirpated, E = Endangered, T = Threatened, PT = Potentially Threatened, SC = Species of Concern

2.1.2 Land Use and Protection

LAND COVER

Analysis of the Pigeon Creek HUC-12 using the USGS National Land Cover Database (NLCD) shows over 68% of the watershed is developed, with 28% as developed open space, 27% as low intensity developed, 10% as medium intensity developed, and 3% as high intensity developed. About 7% of the watershed is hay/pasture or cultivated crops. Forests, meadows, and other "natural" land cover comprise only 24% of the watershed.

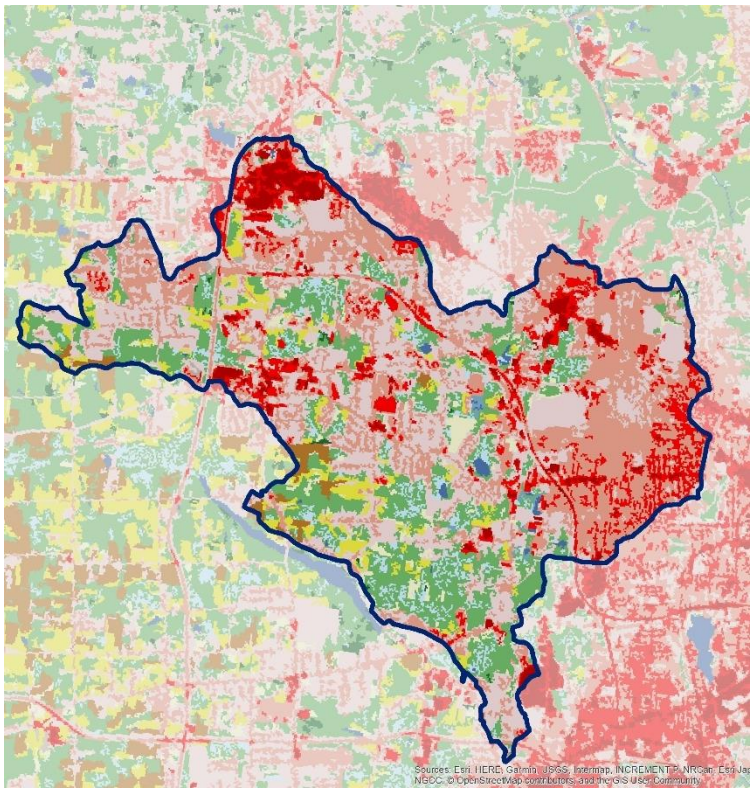

Figure 10: Land cover classification for Pigeon Creek HUC-12 (United States Geological Survey National Land Cover Database)

The Ohio EPA 2016 Integrated Assessment Report estimates Pigeon Creek's historic wetland presence at 24.21% of the HUC-12 and a current wetland presence of 3.46%, which is an over 85% loss of wetlands within the HUC-12. Approximately 68 wetlands were inventoried in the watershed as of 2016 through the National Wetland Inventory (NWI). An ORAM conducted in the HUC-12 as part of the Integrated Assessment had a score of 60, indicating a high-quality Category II and the HUC-12 was assigned an area-weighted Level 1 score of 45.93, indicating the average quality of NWI wetlands in the HUC-12 are Category II. Some of the highest-quality wetlands in the watershed can likely be found at the University of Akron's Panzner Wetland Wildlife Reserve, a 104-acre former muck farm that has been restored to one of the top wetland mitigation sites in Ohio. Wetlands on the site are ranked at Category II and III status, and nesting ospreys and many diverse native wetland obligate plants, including fen species, are present. This link shows an aerial photo of the site with inventories of plant species that have been found at the site: http://www.personal.kent.edu/~spanzner/pwwr/map.html.

LAND USE

The Pigeon Creek HUC-12 is a heavily urbanized/suburbanized watershed that touches over 20,839 different parcels. Summit and Medina County Auditors provides another analysis of how the watershed is used through taxation land use codes. According to that data, 49% of the watershed is taxed as residential, 18.6% of the watershed is taxed as commercial, 12% of the watershed is taxed as agricultural, and 10% of the watershed is tax-exempt. Industrial land use comprises only 1.28% of the watershed, while 0.38% is utilized by the Wheeling & Lake Erie Railroad. Roads and highways make up 8.45% of the watershed. There are more than 18,943 parcels designated as residential properties in the Pigeon Creek HUC-12, with 14,575 designated as single family with houses. Multi-family/condominium residential uses were identified on 1,490 parcels with 857 of those parcels (164.5 acres) classified as condominium residential units.

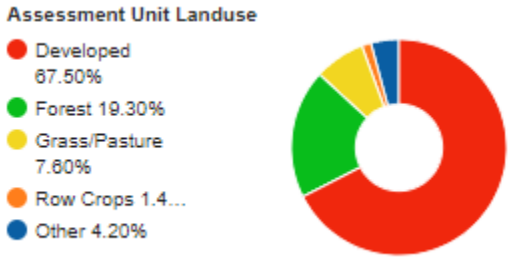

Figure 11: Land Use of Pigeon Creek HUC-12 (Ohio EPA 2018 Integrated Assessment Unit)

LAND PROTECTION

There are multiple protected areas within the Pigeon Creek HUC-12. This includes multiple acres of municipal park land and the Panzner Wetland Wildlife Reserve, a 104-acre wetland mitigation and research site. In addition, Copley Township, Bath Township, the City of Barberton, and the City of Norton have adopted riparian setbacks. Riparian and wetland setbacks function similarly to front, side, and rear yard setback zoning but are placed along stream corridors rather than parcel lines. They protect the services of riparian areas by providing reasonable controls governing structures and uses in riparian setbacks. Approximately 26.6 miles (69%) of stream are protected in the Pigeon Creek HUC-12 through riparian setback regulations. The City of Norton has placed additional setback protections on Category II and III wetlands that are not contiguous with the riparian corridor in its municipal ordinance.

STORMWATER

Over 98% of the Pigeon Creek HUC-12 is within the regulated Municipal Separate Storm Sewer System (MS4); only a small portion of the watershed in Medina County is not part of the MS4. Stormwater can be one of the most significant and difficult nonpoint source pollutants to address within a watershed. Stormwater is problematic because any substance such as chemicals, nutrients, sediment, and other debris is carried into the storm sewer system and discharged untreated into surrounding waterbodies. This has subsequent effects on drinking water, recreational activities, and industries that rely on clean water. The main sources of stormwater runoff come from urban, suburban, and agricultural activities; with each source effecting water quality in a variety of ways. Bath Township, Fairlawn, Copley Township, Norton, and Barberton are all regulated as Phase II communities under the MS4 program with the Ohio EPA. The City of Akron is regulated under the MS4 program as a Phase I community. Each regulated MS4 is required to develop and implement a stormwater management program to reduce the contamination of stormwater runoff and prohibit illicit discharges.

2.2 Summary of Biological Trends

The Ohio EPA's 2018 Integrated Water Quality Report lists the Pigeon Creek HUC-12 as impaired for its Modified Warmwater Habitat aquatic life use due to channelization (MWH-C), based on historical data. The MWH use applies to streams and rivers which have been subjected to extensive, maintained and essentially permanent hydromodifications such that the biocriteria for the Warmwater Habitat (WWH) use are not attainable and where the activities have been sanctioned and permitted by state or federal law. Most of the stream reaches in the Pigeon Creek HUC-12 have been channelized as a result of extensive petition ditching that started in the 1930s. As a result, the ditched stream reaches fall under the Ohio Petitioned Ditch statutes and are permitted to be maintained in their channelized state. Pigeon Creek HUC-12, therefore, will likely never attain Warmwater Habitat (WWH) use, and its representative aquatic assemblages are generally composed of species which are tolerant to low dissolved oxygen, silt, nutrient enrichment, and poor-quality habitat.

The Pigeon Creek HUC-12 was assessed from 2003 to 2004 under the HUC-14 designation 05040001-101-040 and the HUC-11 designation 05040001-010 for the development of the Tuscarawas River TMDL (2009). The Pigeon Creek HUC-14 (same land area as its HUC-12 land area) had TMDLs prepared for nutrients, habitat, sediment, and bacteria as a result of this early monitoring. The 2009 TMDL report also notes that Pigeon Creek and Schocalog Run met the water quality standards for recreational use, but a 2017 assessment for recreational use was performed by Ohio EPA in the Pigeon Creek HUC-12 which designated the watershed as impaired for Primary Contact Recreation. No waters in the Pigeon Creek HUC-12 are currently used for public drinking water supply. The TMDL report was used extensively in the development of the Pigeon Creek HUC-12 NPS-IS plan.

2018 Integrated Water Quality Monitoring and Assessment Report

Section L4. Section 303(d) List of Prioritized Impaired Waters							
Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points
05040001 01 02	Pigeon Creek	24.70	5h	4A	4Ah	0	2

Figure 12: Pigeon Creek HUC-12 Prioritized Impaired Waters of Ohio (OEPA 2018 Integrated Water Quality Monitoring and Assessment Report).

The below table lists the metrics for what is considered attainment of the WWH, EWH, and MWH aquatic life use designations using the Index of Biotic Integrity (IBI), Modified Index of well-being (MIwb), and Invertebrate Community Index (ICI) metrics. IBI and ICI monitoring were performed in the Pigeon Creek HUC-12 for TMDL development; MIwb was not used as the drainage areas were less than 20mi^2.

Ecoregion	Biological Index	Assessment Method[2,3]	Biological Criteria for the Applicable Aquatic Life Use Designations[1]		
			WWH	EWH	MWH[4]
Erie-Ontario	IBI	Headwater	40	50	24
		Wading	38	50	24
		Boat	40	48	24/30

Lake Plains (EOLP)	MIwb	Wading	7.9	9.4	6.2
		Boat	8.7	9.6	5.8/6.6
	ICI	All[5]	34	46	22

[1] Coldwater habitats (CWH), limited warmwater habitat (LWH), resource waters (LRW) and seasonal salmonid habitat (SSH) do not have associated biological criteria

[2] The assessment method used at a site is determined by its drainage area (DA) according to the following: Headwater: DA ≤ 20mi²; wading: DA > 20mi² and ≤ 500mi²; boat: DA > 500mi²

[3] MIwb not applicable to drainage areas less than 20mi²

[4] Biocriteria depend on type of MWH. MWH-C (due to channelization) is listed first and MWH-I (due to impoundment) is listed second

[5] Limited to sites with appropriate conditions for artificial substrate placement

Figure 13: Biological criteria applicable to rivers and streams throughout Ohio for three aquatic life use designations, based on ecoregion and assessment method.

Monitoring was performed at three locations in the Pigeon Creek HUC-12 from 2003-2004; two locations along Pigeon Creek and one location along Schocalog Run. None of the monitoring points were in full attainment of the Modified Warmwater Habitat aquatic life use. The below figure shows the 2003 sampling locations and attainment status of each monitoring point.

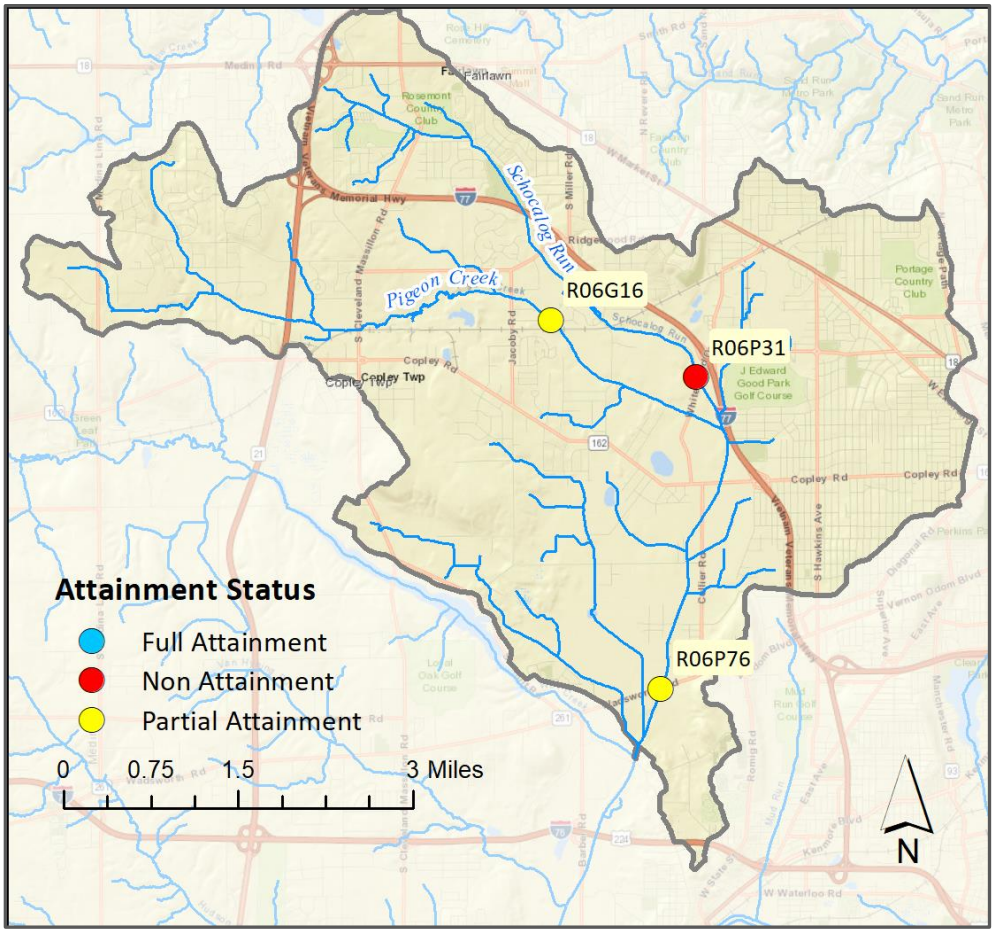

Figure 14: Monitoring points and ALU attainment status in the Pigeon Creek HUC-12 (2014 Ohio EPA Integrated Water Quality Report), labeled by Station ID number.

In 2017, Ohio EPA conducted water quality sampling throughout the Tuscarawas watershed, including the Pigeon Creek HUC-12. These data have not been published yet as of this plan's submittal and cannot be used to determine ALU, attainment or non-attainment, but they do allow for an observation of current water quality trends in the Pigeon Creek HUC-12.

A summary of the monitoring locations and their biological status in the Pigeon Creek HUC-12 are provided in the following table. Indexes with stressed communities or below baseline scores are highlighted.

Station ID	Sample Station Name	River Mile	ALU Type	Fish Sample Year	IBI Score	IBI Narr.	Bug Sample Year	ICI Score	ICI Narr.	Bug Narr.	QHEI	Attainment
R06G16	PIGEON CREEK NEAR COPELY @ KIBLER RD.	4.70	MWH	2003	28	Fair	2004	N/A	N/A	Low Fair	39.0	Partial
R06P76	PIGEON CREEK N OF BARBERTON @ AKRON-WADSWORTH RD.	0.60	MWH	2003	20	Poor	2004	26	Fair	N/A	39.5	Partial
R06P31	SCHOCALOG RUN NEAR COPLEY JUNCTION @ WHITE POND RD.	0.50	MWH	2003	22	Poor	2004	N/A	N/A	Poor	35.0	Non
R06G16	PIGEON CREEK NEAR COPELY @ KIBLER RD.	4.80	N/A	2017	24	N/A	2017	N/A	N/A	N/A	58.0	N/A
R06P76	PIGEON CREEK N OF BARBERTON @ AKRON-WADSWORTH RD.	0.64	N/A	2017	30	N/A	2017	28	N/A	N/A	45.0	N/A
R06P31	SCHOCALOG RUN NEAR COPLEY JUNCTION @ WHITE POND RD.	0.50	N/A	2017	26	N/A	2017	N/A	N/A	N/A	35.8	N/A

2.2.1 Fish (Modified Index of Well-Being (MIwb) & Index of Biotic Integrity (IBI))

2003 fish sampling data in the Pigeon Creek HUC-12 was collected using the Index of Biotic Integrity (IBI) since the sampling locations were less than 20mi^2 drainage areas. The IBI score in the furthest upstream Pigeon Creek sampling location (RM 4.7) was 28, within the Fair narrative range and in attainment of

MWH use. The "Fair" range describes absence or low abundance of expected fish species for typical WWH assemblages, and declining species richness and an increase in tolerant species in the assemblage (Ohio EPA, 1981). 2017 sampling data indicates a slight decline in fish assemblage integrity at the RM 4.7 location with an IBI score of 24 (previously 28), indicating further stressors to the fish community despite the presence of significantly higher quality stream habitat. These stressors may be from nutrient or bacterial inputs to the stream and stress the need for nutrient management and runoff reduction.

IBI scores improved in the downstream Pigeon Creek sampling location at RM 0.64, with an IBI score of 30 (previously 20). A score of 30 is in the "Fair" range of narrative quality and indicates that this location may be capable of attainment of its MWH use with stream habitat improvements.

2003 sampling at the Schocalog Run location shows an IBI score of 22 and a narrative rating of "Poor," indicating extremely stressed fish communities with low abundance and diversity. Subsequent sampling in 2017 shows an improvement in IBI score from 22 to 26, which brings it into attainment for MWH.

2.2.2 Macroinvertebrates (Invertebrate Community Index (ICI))

Macroinvertebrate samples collected to assess a Modified Warmwater Habitat (MWH) stream must at least score a 22 on the ICI to be considered in attainment of this use designation. Of the three sample sites in the Pigeon Creek HUC-12, only the Pigeon Creek north of Barberton at Akron-Wadsworth Road location (RM 0.6) had ICI monitoring data. The site scored a 26, which is within the attainment range for MWH. The Pigeon Creek sampling location at RM 4.7 and the Schocalog Run sampling location did not have ICI data; however, macroinvertebrate samples which are collected only with qualitative procedures or for which a valid ICI score is not available are assigned a narrative evaluation based on the qualitative sample. The narrative evaluations align with the numeric ranges on the ICI as seen in the following figure.

Narrative	Invertebrate Community Index (ICI) Range				
	Huron/Erie Lake Plains HELP (1)	Interior Plateau IP (2)	Erie/Ontario Lake Plains EOLP (3)	Western Allegheny Plateau WAP (4)	Eastern Corn Belt Plains ECBP (5)
Exceptional	46 - 60				
Very good	42 - 44				
Good	34 - 40	30 - 40	34 - 40	36 - 40	36 - 40
Marginally Good	30 - 32	26 - 28	30 - 32	32 - 34	32 - 34
Fair	22 - 28	22 - 24	22 - 28	22 - 30	22 - 30
Low Fair	14 - 20				
Poor	8 - 12				
Very Poor	0 - 6				

The narratives can be used to rate the macroinvertebrate community condition in relation to the designated ALUs codified in the Ohio Water Quality Standards:

- Exceptional (meets Exceptional Warmwater Habitat (EWH) expectations)
- Very Good (just below EWH expectations)
- Good (meets Warmwater Habitat (WWH) or Coldwater Habitat (CWH) expectations)

- Marginally Good (just below WWH or CWH but still meets expectations)
- Fair (does not meet WWH or CWH but does meet Modified Warmwater Habitat (MWH) expectations)
- Low Fair (does not meet MWH expectations)
- Poor (meets Limited Resource Water (LRW) expectations)
- Very Poor (does not meet LRW expectations)

The Pigeon Creek sampling location at RM 4.7 and the Schocalog Run sampling location rated an invertebrate narrative of Low Fair and Poor, respectively, indicating low numbers or complete absence of sensitive or intermediate taxa and a community composed primarily of tolerant taxa with low diversity. These scores are likely due to channelization, removal of riparian cover, and nutrient/sediment inputs from land disturbance and suburbanization in the watershed. The 2017 monitoring data do not include ICI scores or narrative descriptions for any of the locations except for the Pigeon Creek at RM 0.64 location, which shows a moderate improvement in macroinvertebrate assemblages with a score of 28 (previously 26), which correlates with the increase in stream habitat quality and fish assemblage quality and indicates this location may be progressing towards attainment of MWH use if nutrient and sediment loading can be reduced or in-stream habitat can be improved.

2.2.3 Habitat (via Qualitative Habitat Evaluation Index (QHEI))

Physical habitat is evaluated using the QHEI developed by Ohio EPA for streams and rivers in Ohio (Ohio EPA 1989b), and the scoring ranges vary by drainage area as illustrated in the following figure.

Table 2. General narrative ranges assigned to QHEI scores. Ranges vary slightly in headwater (≤ 20 sq mi) vs. larger waters.

Narrative Rating		QHEI Range	
		Headwaters	Larger Streams
Excellent		≥ 70	≥ 75
Good		55- to 69	60 to 74
Fair		43 to 54	45 to 59
Poor		30 to 42	30 to 44
Very Poor		< 30	< 30

The Pigeon Creek HUC-12 sampling points all fall into the "Headwater" range as their respective drainage areas are less than 20mi^2. All three 2003 sampling points score in the "Poor" narrative rating, indicating low quality stream habitat which reinforces the fish and macroinvertebrate sampling data. 2017 data shows an improvement in stream habitat in the upstream sampling location at Kibler Road (RM 4.8) with a "Good" QHEI score of 58 (previously 39), but further decline in the fish community. The downstream Pigeon Creek sampling location at RM 0.64 shows improvement in the QHEI to a "Fair" score of 45 (previously 39) and a moderate improvement in the fish and macroinvertebrate community. Low IBI scores are most strongly correlated in Headwater ranges for the EOLP ecoregion to the following QHEI subcomponents: heavy/moderate silt covering, silt/muck substrate, sparse/nearly absent stream cover, low/no sinuosity, fair/poor stream development, recent/recovering channel modifications, and unstable riffles (Rankin, 1989). Based on the relatively high QHEI and declining fish scores, some of these subcomponents may still be low in the RM 4.8 location while other metrics in the QHEI may be

significantly improving, or declining fish populations may be due to other, non-habitat inputs to the stream system at or upstream of this location.

Schocalog Run continues to exhibit "Poor" stream habitat with only a slight improvement in QHEI to 35.8 (previously 35), but the corresponding improvement in fish community to attainment of MWH use for the IBI may help bring the reach into partial attainment of MWH use, and further stream habitat improvement through sediment load reduction or habitat restoration in Schocalog Run may achieve the goal of total attainment of MWH use.

2.3 Summary of NPS Pollution Causes and Associated Sources

Causes of impairments to Pigeon Creek are listed in the Ohio EPA 2018 Integrated Water Quality Assessment Report as organic enrichment/low dissolved oxygen, direct habitat alterations, siltation, flow alteration, and natural limits caused by the presence of wetlands. Sources of impairments are listed as major and minor municipal point sources, channelization from development, flow regulation/modification, land development/suburbanization, nonpoint source urban runoff/storm sewers, and natural sources (wetlands). These are common causes and sources in Northeast Ohio and throughout Ohio. Much of the channelization in the Pigeon Creek HUC-12 is related to modification for legacy flood control, agricultural ditches and suburban land development.

Nutrient enrichment is a listed cause of impairment in the Pigeon Creek HUC-12. In-stream nutrient concentrations were found to have an impact on the health of the biological communities. For the purpose of the 2009 TMDL, total phosphorus was used as an indicator for the degree of nutrient enrichment. Habitat improvements can significantly mitigate the harmful effects of nutrients on the biological community; therefore, the 2009 TMDL stressed the importance of habitat and other factors in addition to in-stream nutrient concentrations as having an impact on the health of biologic communities.

Use designation	Watershed size	Total phosphorus (mg/l)
WWH	Headwaters (drainage area < 20 mi^2)	0.08
	Wadeable (20 mi^2 < drainage area < 200 mi^2)	0.10
	Small River (200 mi^2 < drainage area < 1000 mi^2)	0.17
MWH	Headwaters (drainage area < 20 mi^2)	0.34
	Wadeable (20 mi^2 < drainage area < 200 mi^2)	0.28
	Small River (200 mi^2 < drainage area < 1000 mi^2)	0.25

[1] Based on state-wide targets found in the Association Between Nutrients, Habitat, and the Aquatic Biota of Ohio Rivers and Streams (Ohio EPA, 1999)

Figure 15: Total phosphorus targets for warm water habitats (WWH) and modified warm water habitats (MWH)[1]).

Organic enrichment and dissolved oxygen (DO) depletions are identified as causes of impairment in the Pigeon Creek HUC-12. Measuring DO serves as a surrogate for a variety of oxygen consuming substances commonly found in wastewater, runoff, combined sewer overflows, animal waste, etc. In the Pigeon Creek

HUC-12, the sources of low DO are likely from wastewater and runoff related to suburbanization. The 2009 TMDL uses fecal coliform as an indicator organism for pathogenic loading, using the primary contact recreation (PCR) geometric mean standard of five or more samples within a 30-day period not to exceed 1000 counts per 100 ml and not exceeding 2000 counts per 100 ml in more than 10 percent of the samples taken during any 30-day period.

Site	RM	Observed Condition[1] (fecal coliform cfu/100 ml)		Impaired?	Area analyzed[2] (see Chapter 4)
05040001-010-010: Tuscarawas River headwaters to Diversion Dam (HUC 14)					
Tuscarawas R. @ Mogadore Ave	126.8	Geometric mean	1529	YES	Site (7.67 mi^2)
		90th percentile	2900		
05040001-010-030: Wolf Creek headwaters to above Pigeon Cr. (HUC 14)					
UT to Wolf Ck RM 10.97 @ SR 162	0.52	Geometric mean	1226	YES	Site (4.83 mi^2)
		90th percentile	3320		
05040001-010-040: Pigeon Creek (HUC 14)					
Pigeon Creek (Summit Co.) @ SR 261	0.64	Geometric mean	2277	YES	Site (<20 mi^2)
		90th percentile	14720		
05040001-010-050: Wolf Creek below Pigeon Cr. to Tuscarawas R. (HUC 14)					
Wolf Creek (Summit Co.) @ Summit Rd.	3.91	Geometric mean	1948	YES	14-HUC
		90th percentile	4400		
Van Hyning Run @ Clark Mill Rd.	0.61	Geometric mean	1612	YES	
		90th percentile	2120		
Wolf Ck at Snyder Ave dst CSX RR	0.2	Geometric mean	1456	YES	
		90th percentile	4990		

[1] Geometric mean criterion for fecal coliform bacteria is 1000 cfu/100 ml and 90th percentile criterion for fecal coliform is 2000 cfu/100 ml.
[2] "Site" indicates that the watershed analysis included the drainage area ending at that sample location; "LDC" indicates that a load duration curve was generated at that point; and "14-HUC" indicates that the entire 14 digit HUC was modeled.

Figure 16: Recreational use impairment and 2009 TMDL approach for Pigeon Creek HUC-12 (highlighted).

Habitat alteration, particularly due to channelization, was noted as a significant cause of impairment in the TMDL assessment area that included the Pigeon Creek HUC-12. Channelization (straightening or relocating streams), urbanization (increasing impervious surfaces leading to stream erosion) and removing riparian vegetation have led to significant habitat impacts in the Pigeon Creek HUC-12. Poor habitat quality is an environmental condition, rather than a pollutant load, and the 2009 TMDL uses QHEI as its metric for habitat quality assessment.

	Overall QHEI Score	All Modified Attributes	
		High Influence Modified Attributes	All Other Modified Attributes
Range of Possibilities	12 to 100 points	- Channelized or No Recovery - Silt/Muck Substrate - Low Sinuosity - Sparse/No Cover - Max Pool Depth < 40 cm (wadeable streams only)	- Recovering Channel - Sand Substrate (boat sites) - Hardpan Substrate Origin - Fair/Poor Development - Only 1-2 Cover Types - No Fast Current - High/Moderate Embeddedness - Ext/Mod Riffle Embeddedness - No Riffle
Target	Overall score >= 60	Total number < 2	Total number < 5[1]
TMDL Points if Target Satisfied	+ 1	+ 1	+ 1

[1] Total number of modified attributes includes those counted towards the high influence modified attributes.

Figure 17: QHEI targets for the habitat TMDL[1]).

The TMDL also used QHEI as a metric for sediment loading, through the use of some of the QHEI's component sub-metrics: substrate, channel morphology, and bank erosion and riparian zone.

Sediment TMDL =	**Substrate**	**+**	**Channel Morphology**	**+**	**Riparian Zone/Bank Erosion**	
For WWH >=	13	+	14	+	5	>= 32

Figure 18: QHEI targets for the sediment TMDL.

Based on biological and chemical monitoring conducted in the HUC-12 between 2003 and 2004, both Pigeon Creek and its main tributary Schocalog Run are listed as either non or partially attaining their designated life use. Schocalog Run is designated WWH along its entire reach in the 2009 TMDL and is listed as non-attaining its WWH aquatic life use. The 2014 Integrated Water Quality Report shows a change in use for Schocalog Run from WWH to MWH, but it is unclear when this change took place. Below is a table of sampling locations in the HUC-12 taken between 2003-2004 for the development of the Tuscarawas TMDL and associated impairment causes/sources.

	ATTAINMENT STATUS			IMPAIRMENT CAUSE	IMPAIRMENT SOURCE	ADDRESSED IN TMDL?
RM	**ALU**	**RU**	**QHEI**			
Pigeon Creek (17-543) – WWH (MWH from Jacoby Rd. (RM 5.2) to the mouth) - EOLP						
4.7	PART	FULL	39	Habitat alteration, siltation, organic enrichment, pathogen	Suburbanization, channelization, septic discharges	YES
0.6	PART	NON	39.5	Habitat alteration, siltation, organic enrichment, pathogen	Suburbanization, channelization, septic discharges	YES
Schocalog Run (17-544) WWH – EOLP						
0.5	NON	FULL	35	Habitat alteration, siltation, organic enrichment, pathogen	Suburbanization, channelization, septic discharges	YES

Figure 19: Pigeon Creek HUC-12 Water Quality Monitoring Sampling Stations (2009, TMDL).

2.4 Additional Information for Determining Critical Areas and Developing Implementation Strategies

2.4.1 Wolf Creek Rehabilitation Study

In 2015 the Summit County Engineer commissioned a study of the Wolf Creek drainage basin, which included Pigeon Creek and other tributaries upstream of Wolf Creek, to provide public officials, concerned property owners and resident information on the issue of failing drainage ditches in the study area. Approximately 22 miles of stream in the study area were converted into county ditches which involved clearing them of debris, widening, deepening, and channelizing them. Most of this work occurred in the early 1930s. Many of the ditches originally meant for agricultural stormwater control now do not provide the necessary volume and turbidity regulators to remove sediment and reduce stream velocities. These channelized streams also lack instream habitat, increase eutrophication and promote invasive species growth.

The study includes maps and photos of the drainageway problems and a cost estimate to restore the channels to their 1930s post-modification condition as an attempt to mitigate the significant flooding and property damage that had recently occurred in and downstream of the study area. The Summit County Engineer also recommends additional improvements such as adding retention areas, creating wetlands, providing stream and riparian zone enhancements and the possibility of purchasing properties where flooding cannot be mitigated by any other means. The study shows extensive aerial images of the channelized sections of Pigeon Creek and Schocalog Run, noting zones of significant erosion and sediment, debris jams, and culverts and outfalls.

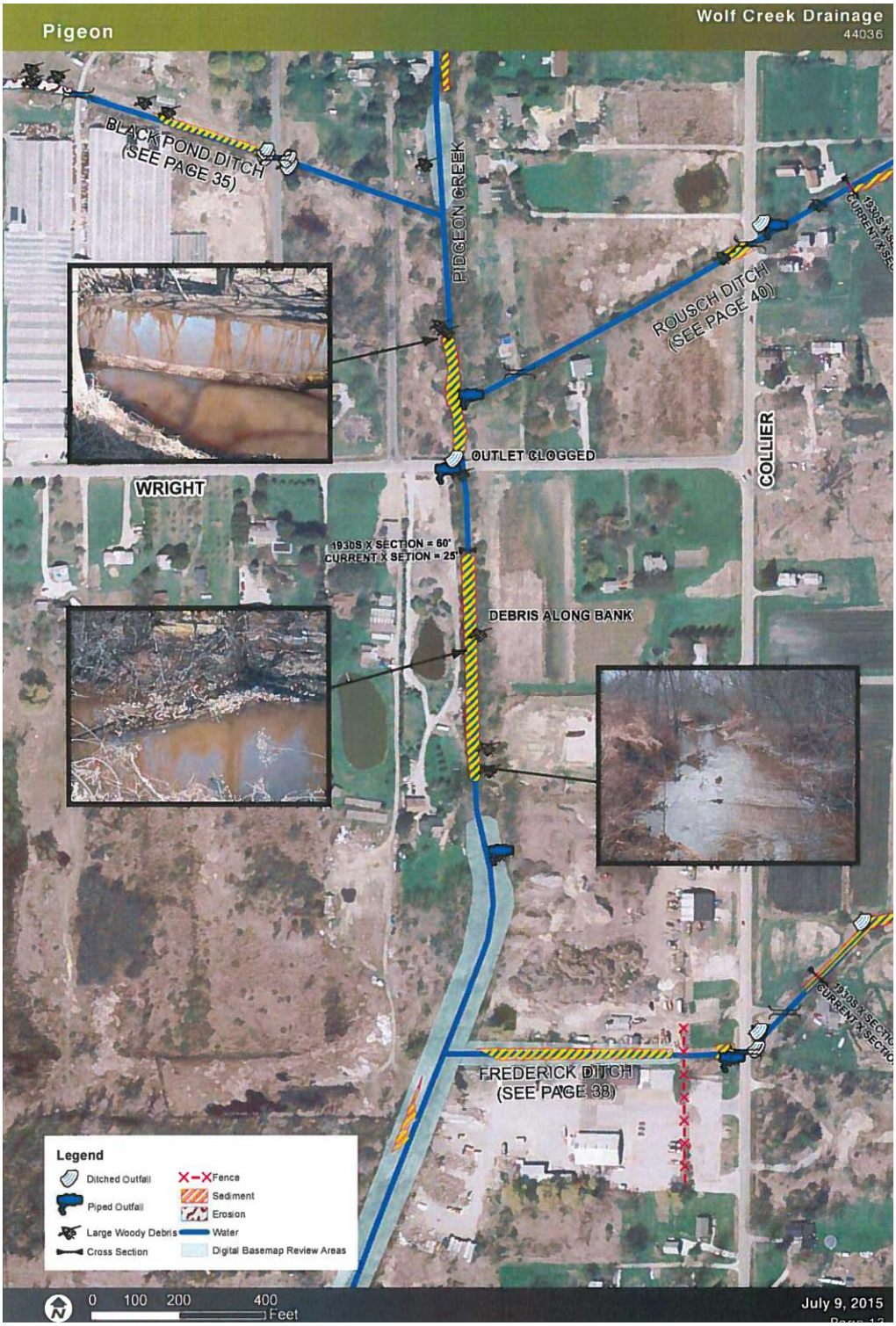

Figure 20: Example image from Wolf Creek Rehabilitation Study, showing channelized corridor with noted areas of sediment, erosion, and in-stream debris.

Chapter 3: Conditions & Restoration Strategies

3.1 Overview of Critical Areas

All of Pigeon Creek and most of its tributaries, including Schocalog Run, are/can be maintained as drainage ditches by Summit County. All Pigeon Creek stream reaches assessed in the 2009 TMDL report failed to meet all three of the habitat TMDL targets (scores of 0/3), and all QHEI assessment scores were less than 40, indicating "Poor" stream habitat. Low IBI and macroinvertebrate scores are directly correlated to poor stream substrate conditions, lack of sinuosity, and lack of natural riparian corridor. Lack of instream cover is often associated with channel modifications; in which cover is often regarded as a risk or impediment to flow and removed (Rankin, 1989). These sites also failed to meet the sediment TMDL by large margins. Recent channelization with no channel recovery, and various poor substrate attributes are observed throughout the watershed and documented in the Wolf Creek Rehabilitation Study. Because of this and given the large degree by which the Pigeon Creek sites fail to meet the habitat and sediment TMDLs, it is clear that habitat and sediment are continuing to degrade water quality in the Pigeon Creek HUC-12 and preventing streams in the watershed from fully attaining their MWH designated use (TMDL, 2009).

Implementation objectives for this overarching goal for all the Pigeon Creek HUC-12 watershed include:

- Nutrient load and sediment reduction – riparian setbacks, remove/replace failing septic systems, riparian buffer restoration
- Stream and wetland assimilation – wetland treatment trains, wetland conservation planning, streambank stabilization and stream/riparian restoration

These practices, once installed, should incrementally assist the Pigeon Creek watershed towards restoring attainment.

The first iteration of the Pigeon Creek HUC-12 NPS-IS will address Critical Area 1, Schocalog Run and Pigeon Creek to its confluence with Schocalog Run, as priority projects. Subsequent critical areas with descriptions, characterizations, and projects are being refined and developed for further updates to the NPS-IS.

3.2 Critical Area 1: Conditions, Goals & Objectives

3.2.1 Detailed Characterization

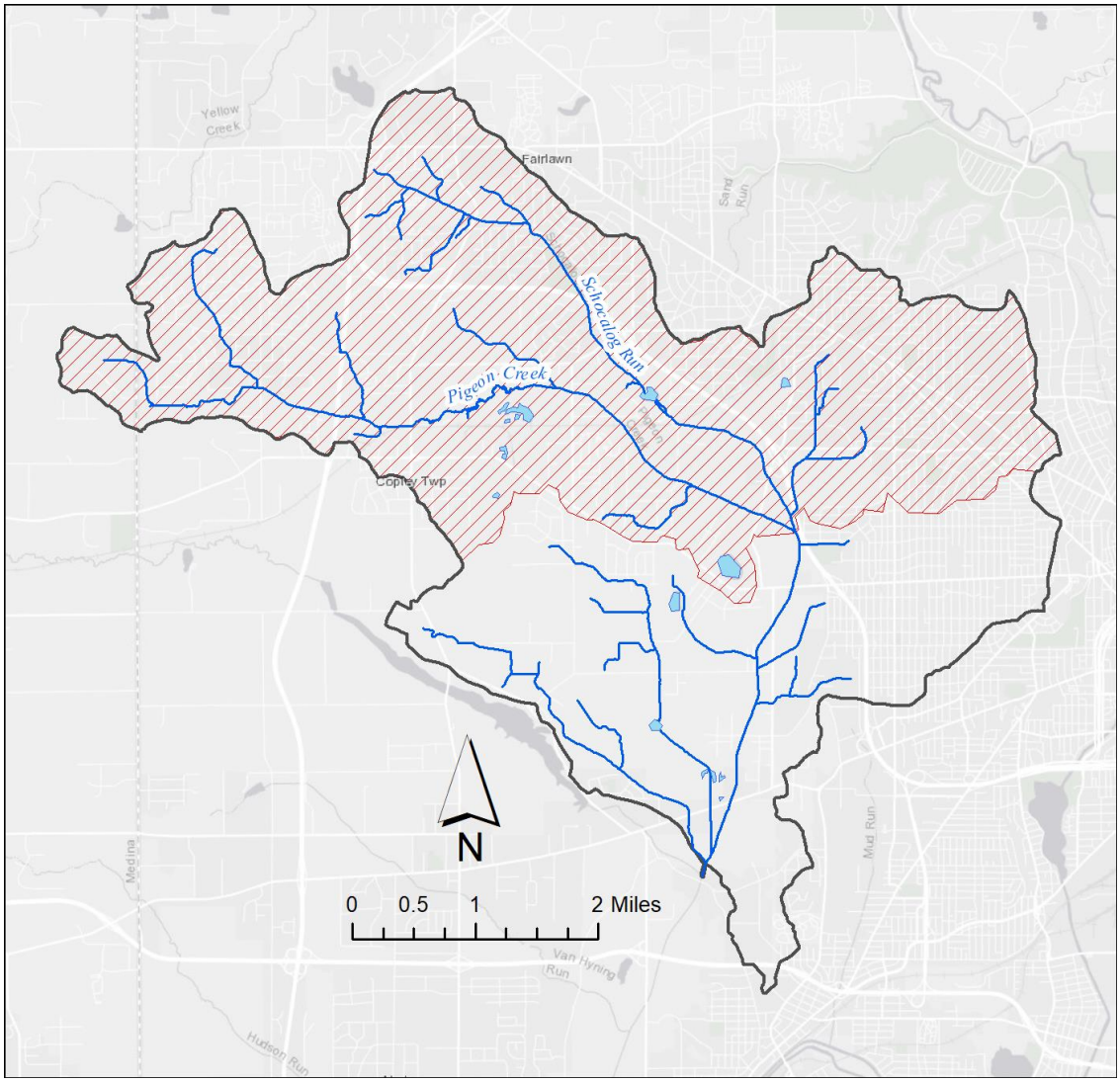

Figure 21: Critical Area 1: Schocalog Run and Pigeon Creek to its confluence with Schocalog Run.

This critical area comprises the headwaters of Pigeon Creek to its confluence with Schocalog Run and the Schocalog Run catchment. Schocalog Run is a 5-mile-long major tributary to Pigeon Creek with its confluence at RM 2.97. This critical area is characterized by urban/suburban development, channelization, poor water quality, flooding, lack of instream habitat, excess nutrient loading/concentrations and poor riparian zone. Schocalog Run was listed at non-attainment for aquatic life use and Pigeon Creek in this stretch was listed as partially attaining its aquatic use in the 2009 TMDL Report.

Per the 2011 National Land Cover Dataset (NLCD), Critical Area 1 has 75% of its land area classified as developed land use in various levels of intensity, and only 16.5% classified as forested cover. Interstate

Highway 77 crosses the critical area, and it contains the highest concentration of medium to high intensity development and contiguous impervious areas in the Pigeon Creek HUC-12. An impervious cover analysis using GIS data obtained from the Summit County GIS department estimates over 2,005 acres of impervious cover in Critical Area 1, which represents approximately 20% of the critical area's land cover.

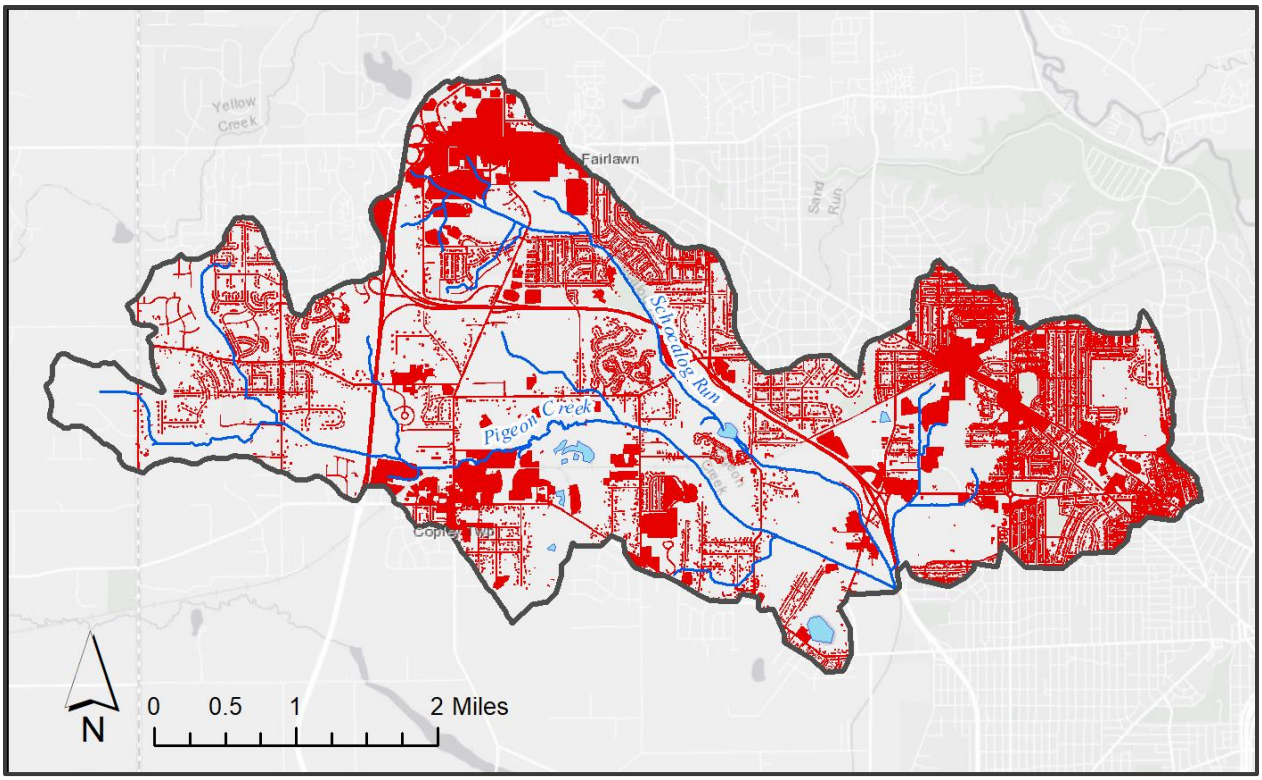

Figure 22: Estimated impervious coverage in Critical Area 1.

Aquatic communities have been demonstrated to show water quality and habitat impairments when their drainage area exceeds 10% impervious cover (Schueler, 2003). Critical Area 1 exceeds this 10% threshold and is within the Impacted range of stream quality, where function begins to decrease but can still be restored. Increasing impervious cover (i.e., hard surfaces such as roads, parking lots, and rooftops) harms water quality. The rate of erosion increases, streams become unstable, and the resulting channel is less able to assimilate nutrients and other pollution. Higher runoff volume increases the amount of pollutants (nutrients, metals, sediment, salts, pesticides, etc.). As water runs over hot pavement and rooftops or sits in detention basins, it becomes heated. When this heated water enters a stream, the higher temperatures reduce dissolved oxygen concentrations that aquatic life need to survive. Increased stormwater runoff leads to higher peak flows, flow variability, and frequency of high flows, causing streambank erosion, channel incision, stream channel

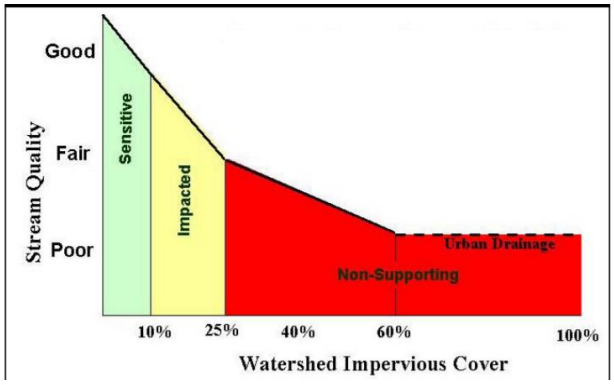

Figure 23: Impervious Cover Model of stream health from Center for Watershed Protection (Schueler, 2003).

widening, and lower habitat diversity. The high level of urban/suburban land use in the critical area combined with legacy channelization for flood control and historical agricultural use has resulted in degraded water quality and partial or non-attainment of its assessed MWH life use.

Figure 24: Aerial Image of Fairlawn Park, showing oxbow wetland and adjoining exposed and channelized stream corridor.

There are several parks in Critical Area 1: Fort Island Griffiths Park, Frank Boulevard Park, Forest Lodge Park, Schneider Park, Will Christy Park, Fairlawn Park, Westlake Manor Park, and Hardesty Park. Of these parks, Fort Island Griffiths Park has some portions preserved in a natural state; the rest are mainly used for active recreation (ballfields, etc.) and are maintained and landscaped. Fairlawn Park, owned by the City of Fairlawn, has a community garden, soccer fields, and a tributary to Pigeon Creek that includes a floodplain wetland built to improve water quality. Significant sections of stream in Critical Area 1 are channelized, lacking riparian cover, and erosion and siltation is a major cause of impairment. Projects that address stream impairments on public property with willing communities such as the City of Fairlawn should be prioritized in this critical area.

The 2017 Wolf Creek Rehabilitation Study notes several areas in Critical Area 1 where sediment and/or siltation are evident, as well as areas of streambank erosion. Major sediment and/or siltation areas identified in the study are:

Schocalog Run

- Just upstream of the confluence with Pigeon Creek
- Downstream of the intersection of Schocalog Run with the railway line south of Frank Road
- Downstream of Schocalog Road

Pigeon Creek

- Upstream of White Pond Drive
- Downstream of the railway line south of Kibler Road

Major areas of streambank erosion identified in the study are:

Schocalog Run

- Along Park West Boulevard by the Park West bus stop
- Downstream of White Pond Drive

Pigeon Creek

- Upstream of White Pond Drive
- Downstream of the railway line south of Kibler Road

The study only assessed Pigeon Creek up to Jacoby Road and Schocalog Run up to Schocalog Pond, and it is likely that upstream reaches in the critical area exhibit similar erosion and sedimentation issues.

Using the rationale described in the Handbook for Developing Watershed Plans to Restore and Protect Our Waters (U.S. Environmental Protection Agency, 2008) (Section 10.3.4): "In general, management practices are implemented immediately adjacent to the waterbody or upland to address the sources of pollutant loads." — *Critical Area 1* includes Schocalog Run and Pigeon Creek to its confluence with Schocalog Run (9,915.6 acres as estimated in StreamStats).

3.2.2 Detailed Biological Conditions

QHEI monitoring in Schocalog Run at RM 0.5 in 2003 shows non-attainment of MWH use with a "Poor" narrative score of 35. Subsequent monitoring in 2017 continues to exhibit "Poor" stream habitat with only a slight improvement in QHEI to 35.8 (previously 35), but the corresponding improvement in fish community to attainment of MWH use for the IBI may help bring the reach into partial attainment of MWH use, and further stream habitat improvement through sediment load reduction or habitat restoration in Schocalog Run may achieve the goal of total attainment of MWH use. The Schocalog Run 2003 sampling location scored an invertebrate narrative of "Poor," indicating low numbers or complete absence of sensitive or intermediate taxa and a community composed primarily of tolerant taxa with low diversity. 2003 sampling at the Schocalog Run RM 0.5 location shows an IBI score of 22 and a narrative rating of "Poor," indicating extremely stressed fish communities with low abundance and diversity. Subsequent sampling in 2017 shows an improvement in IBI score from 22 to 26, which brings it into attainment for MWH and may be further improved with sediment reduction and habitat restoration along the stream reach.

QHEI monitoring in Pigeon Creek at RM 4.7 (near Copely at Kibler Road) in 2003 shows partial attainment of MWH use with a "Poor" score of 39 and a corresponding IBI score of 28 (Fair narrative range) and "Low Fair" macroinvertebrate narrative range. 2017 data, however, shows an improvement in stream habitat in the sampling location with a "Good" QHEI score of 58, but further decline in the fish community to an IBI score of 24, which is the lowest threshold of attainment for MWH. No macroinvertebrate data is available for this location from the 2017 sampling. Low IBI scores are most strongly correlated in Headwater ranges for the EOLP ecoregion to the following QHEI subcomponents: heavy/moderate silt covering, silt/muck substrate, sparse/nearly absent stream cover, low/no sinuosity, fair/poor stream development, recent/recovering channel modifications, and unstable riffles (Rankin, 1989). Based on the relatively high QHEI and declining fish scores, some of these subcomponents may still be low in the RM 4.8 location while other metrics in the QHEI may be significantly improving, or declining fish populations may be due to other, non-habitat inputs to the stream system. Sedimentation, erosion, and channelization are still evident throughout this reach per the 2017 Wolf Creek Rehabilitation Study, but an increase in in-stream woody debris (also noted in the study) from lack of petition ditch maintenance may be contributing to improved QHEI scores.

3.2.3 Detailed Causes and Associated Sources

The primary causes of impairment in this critical area are direct habitat alterations and other flow regime alterations, and siltation. Nonpoint sources of impairment are land development/suburbanization, channelization, urban runoff, and municipal stormwater discharges. Impacts to this critical area are primarily from flow and habitat alteration through direct channelization, removal of riparian habitat, and runoff linked to suburban development. For example, the Schocalog Run monitoring location at RM 0.5 noted an IBI score of 22 with a narrative rating of Poor, an ICI narrative score of Poor, and a QHEI score of 35 with a narrative rating of Poor. The figure to the right is an aerial image of Schocalog Run from the Wolf Creek Rehabilitation Study, with the approximate Ohio EPA monitoring location shown in red. The stream in this segment is entirely channelized with sparse riparian cover and adjacent medium to high-intensity development.

Figure 25: Aerial photo from Wolf Creek Rehabilitation Study, showing channelized and impacted stream downstream of Ohio EPA sampling point.

Pigeon Creek and Schocalog Run are petitioned ditches within the critical area and are mainly impacted by sedimentation/siltation with the source as channelization and suburbanization. Siltation/sedimentation describes the deposition of fine soil particles on the bottom of stream and river channels. Deposition typically follows high-flow events that erode and pick up soil particles from the land, and soil particles also transport other pollutants. As the flow decreases, the soil particles fall to the stream bottom, reducing the diversity of stream habitat available to aquatic organisms. Lack of riparian cover and adjacent wetlands and floodplain eliminates the natural pollutant filtering and flow attenuation that these natural areas provide. Projects that address these habitat-related attributes will have a positive effect in the QHEI scoring, which should then improve the IBI and ICI scores. Projects that reduce sediment and nutrient loading/concentrations will also improve the overall water quality in the Tuscarawas River Watershed, protect attainment further downstream in the Tuscarawas, and address nutrient and sediment loading to the Ohio River, the Mississippi River, and the Gulf of Mexico.

3.2.4 Outline Goals and Objectives for the Critical Area

As explained above, Critical Area 1 is primarily impaired based upon sedimentation/siltation due to channelization, flow regime alterations, and surrounding urban/suburban land development. Almost all of Critical Area 1 has been ditched, channelized or culverted. Overlap in the linkage between the causes and sources of impairment provides additional justification for targeting a subset of high-magnitude causes. A single source may be contributing to multiple causes of impairment, so control strategies aimed at that source could help to remedy multiple problems. Management measures and projects that address suburbanization and channelization will also address the silt and sediment cause of impairment and improve habitat. As projects are developed, goals may be adapted and modified to reflect additional sites.

GOALS

The overall nonpoint source restoration goals for the NPS-IS plan is to improve IBI, MIwb, ICI, QHEI scores so that partial or non-attainment status can achieve full attainment of the designated aquatic life use. Specific goals referencing the non-attaining assessment points are outlined here:

Goal 1. Achieve and maintain IBI score of 24 at 0.5 RM sampling site on Schocalog Run
- ACHIEVED: Site currently has a score of 26*

Goal 2. Achieve and maintain ICI score of 14 or narrative range of Fair at 0.5 RM sampling site on Schocalog Run
- NOT ACHIEVED: Site currently has a narrative of Poor**

Goal 3. Achieve and maintain QHEI score of 55 (Good) at 0.5 RM sampling site on Schocalog Run
- NOT ACHIEVED: Site currently has a score of 35.8 (Poor)*

Goal 4. Improve IBI score from 24 to 28 or better at 4.7 RM sampling site on Pigeon Creek
- NOT ACHIEVED: Site currently has a score of 24***

Goal 5. Achieve and maintain ICI score of 14 or narrative range of Fair at 4.7 RM sampling site on Pigeon Creek
- NOT ACHIEVED: Site currently has a narrative of Low Fair**

Goal 6. Achieve and maintain QHEI score of 55 (Good) at 4.7 RM sampling site on Pigeon Creek
- ACHIEVED: Site currently has a score of 58*

**score based on 2017 monitoring data obtained by Ohio EPA. These data are approved by Ohio EPA but have not been published as of this NPS-IS's submittal.*
***score based on approved, published data obtained by Ohio EPA in 2003-2004 for the 2009 TMDL report.*
****score based on 2017 monitoring data obtained by Ohio EPA. Score meets minimum MWH threshold but represents a decline in quality from 2003-2004 data.*

OBJECTIVES

In order to achieve the overall nonpoint source restoration goal of restoring full attainment to the Pigeon Creek HUC-12, the following objectives that address channelization and siltation/sedimentation sources need to be achieved within Critical Area 1. These objectives are the prioritized management measures/practices in Critical Area 1 and will be the primary objectives as projects are sought out and/or developed to improve the NPS impacts in this Critical Area.

Objective 1. Improve instream habitat by restoring stream using natural channel design features and principles including new technologies.

- Prioritize preservation and restoration of wooded riparian buffers to improve QHEI scores. Preserve or replant 1,500 linear feet of riparian buffer with a minimum of 25' buffer on each side.
- Restore stream channel morphology within petitioned ditches in the critical area. Petitioned ditches mean the flow and volume of the utility cannot be diminished. Restoration will have to include inventive, non-traditional methods in order to satisfy both needs. Restore morphology of 1,500 linear feet of petitioned ditches.

Objective 2. Improve water quality within Pigeon Creek HUC-12 by reducing sediment entering from the critical area.

- Stabilize 1,500 or more linear feet of eroding ditch banks within the Critical Area 1.
- Create or restore 40 acres or more of wetlands within Critical Area 1.

Objective 3. Protect land in the critical area riparian corridor through riparian setbacks, conservation easements, and land acquisition.

- Adoption of riparian setback regulations by three (3) political entities: City of Akron, City of Fairlawn, and Sharon Township.

Objective 4. Mitigate urban runoff from untreated impervious surface in the critical area through impervious surface reduction and infiltrative green infrastructure practices.

- Mitigate 400 acres of impervious surface in Critical Area 1.

As these objectives are implemented, water quality monitoring (both project-related and regularly scheduled monitoring) will be conducted to determine progress toward meeting the identified goals (i.e., water quality standards). These objectives will be reevaluated and modified if determined to be necessary.

When reevaluating, the City will reference the Ohio EPA Nonpoint Source Management Plan Update (Ohio EPA, 2013), which has a complete listing of all eligible NPS management strategies to consider including:

- Urban Sediment and Nutrient Reduction Strategies;
- Altered Stream and Habitat Restoration Strategies;
- Nonpoint Source Reduction Strategies; and
- High Quality Waters Protection Strategies.

Chapter 4: Projects and Implementation Strategy

4.1 Overview Tables and Project Sheets for Critical Areas

Below are the projects and evaluation needs believed to be necessary to remove the impairments from Pigeon Creek HUC-12 as a result of the identified causes and associated sources of non-point source pollution. Because the attainment status is based on biological conditions, it will be necessary to periodically re-evaluate the status of the critical area to determine if the implemented projects are sufficient to achieve restoration. Time is an important factor to consider when measuring project success and overall status. Biological systems in some cases can show response fairly quickly (months); others may take longer (years) to show recovery. There may also be reasons other than nonpoint source pollution for the impairment. Those issues will need to be addressed under different initiatives, authorities or programs which may or may not be accomplished by the same implementers addressing the nonpoint source pollution issues.

For the Pigeon Creek HUC-12 watershed there is one Project and Implementation Strategy Overview Table for all critical areas. Each Critical Area has overlying primary causes and associated sources of nonpoint source impairments. If another nonpoint source impairment is identified for one of the existing or new critical areas, it will be explained and added to this or a new table. If a new impairment is determined which has a different critical area, a new table will be created for that new critical area. The projects described in the *Overview Table* have been prioritized using the following two step prioritization method:

Priority 1	Projects that specifically address known causes and sources to the impaired waterways.
Priority 2	Projects where there is land-owner willingness to engage in restoration or preservation projects that are designed to address the cause(s) and source(s) of impairment or where there is an expectation that such potential projects will improve or sustain water quality.

4.2 Critical Areas: Overview Table and Project Sheet(s) for Pigeon Creek HUC-12

The information included in the *Overview Table* is a condensed overview of identified projects for nonpoint source restoration of the Pigeon Creek HUC-12 Critical Areas. Project Summary Sheets are included for short term projects or any project that is considering seeking funding in the near future. Only those projects with complete Project Summary Sheets will be considered for state and federal NPS program funding.

4.2.1 Critical Areas: Project and Implementation Strategy Overview Table

Project Overview Table for Pigeon Creek HUC (05040001 01 02) All Critical Areas							
Critical Area	**Objective**	**Proj. #**	**Project Title (EPA Criteria g)**	**Lead Organization (criteria d)**	**Time Frame (EPA Criteria f)**	**Estimated Cost (EPA Criteria d)**	**Potential/Actual Funding Source (EPA Criteria d)**
Urban Sediment and Nutrient Reduction Strategies*							
1	CA1-All	2	Riparian Setback Regulations	City of Fairlawn, Akron, Sharon Township	3-7 YEARS	0	n/a
Altered Stream and Habitat Restoration Strategies*							
1	CA1 – 1, 2	1	Smith Ditch Floodplain Restoration	City of Fairlawn	1-3 YEARS	$500,000	319, WRRSP
Agricultural Nonpoint Source Reduction Strategies*							
High Quality Waters Protection Strategies*							
Other NPS Causes and Associated Sources of Impairment							

*(Ohio EPA 2013)

4.2.2 Critical Areas: Project Summary Sheets

CRITICAL AREA 1: PROJECT 1 – SMITH DITCH FLOODPLAIN RESTORATION		
9- ELEMENT CRITERIA	**INFORMATION NEEDED**	**EXPLANATION**
n/a	Title	Smith Ditch Floodplain Restoration
D	Proj. Lead Org. & Partners	City of Fairlawn
C	HUC-12 & Critical Area	Pigeon Creek (HUC 05040001 01 02) Critical Area 1 (Schocalog Run and Pigeon Creek to its confluence with Schocalog Run)
C	Location of Project	Fairlawn Corporate Park Ditch north of Ridgewood Road. (41.112547, -81.634925)
n/a	Which strategy is being addressed by this project?	Altered Stream and Habitat Restoration Strategy Nonpoint Source Reduction Strategy
F	Time Frame	Short (1-3 Years)
G	Short Description	Construct approximately 2-acre-feet (1.5 acres) of water quality treatment wetland(s) with in-stream features to create a 2-stage channel in Smith Ditch. Once constructed, the project will enhance the quality of in-stream and riparian habitat and reduce sediment loads into Critical Area 1.
G	Project Narrative	The project area is a tributary (Smith Ditch) to Pigeon Creek (confluence with Pigeon Creek at approximately RM 5.35) on property owned by the City of Fairlawn (PPN 0904136). It is upstream of the partially-attaining RM 4.7 sampling location on Pigeon Creek that has seen decline in IBI scores between 2004 and 2017. The project area consists of approximately 430 LF of channelized tributary stream (down the center-line) flowing to the City's Fairlawn Park, within a recently acquired property which contains municipal soccer fields and the Community Garden. The stream though this section is recovering from historical channelization and lacks good native riparian cover. The project proposes to create floodplain and restore in-stream habitat and sinuosity to this segment of Smith Ditch and enhance the streamside habitat with invasive species removal and planting native trees and shrubs. The property, including the project site, will remain under protection and be maintained by the City of Fairlawn. This project will improve in-stream and riparian habitat along Smith Ditch within Critical Area 1. This will be achieved by: restoring natural vegetated riparian buffer and restoring sinuosity and reconnecting the floodplain of 430 LF of channelized stream using natural channel design techniques to improve in-stream habitat and reduce downstream sediment transport, erosion and under cutting of the bank. Furthermore, the project will create a 1.5-acre water quality treatment wetland which will reduce runoff and nutrients entering Pigeon Creek from surrounding existing suburban development. These upstream improvements will also improve downstream habitat and help move Pigeon Creek closer to attainment at the RM 4.7 monitoring location.

D	Estimated Total cost	$500,000
D	Possible Funding Source	Ohio EPA 319, WRRSP
A	Identified Causes and Sources	Cause: Sedimentation/Siltation Sources: channelization, suburban runoff
B & H	Part 1: How much improvement is needed to remove the NPS impairment associated with this Critical Area?	With the goal being to raise the IBI score from threshold 24 to its 2003 score of 28 or better, and to raise the ICI narrative from "Low Fair" to "Fair" at the RM 4.7 Pigeon Creek monitoring point, reasonable objectives are: • Objective 1. Improve instream habitat by restoring stream using natural channel design features and principles including new technologies. • Objective 2. Improve water quality within Pigeon Creek HUC-12 by reducing sediment entering from the critical area.
	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	• 430 LF of 1,500 LF (29%) of riparian buffer of Objective 1 • 430 LF of 1,500 LF (29%) of petition ditch restoration of Objective 1 • 430 LF of 1,500 LF (29%) of streambank stabilization of Objective 2 • 1.5 acres of 40 acres (3.75%) of Objective 2 Goals: There is recognition that there is lag time associated with nonpoint source-related projects and measured stream response. With respect to the goals in Critical Area 1, the main drivers are IBI and ICI scores. Current data shows the RM 4.7 location has an IBI of 24, which is at the threshold for MWH use but is a decline from a 2003-2004 score of 28, and a macroinvertebrate narrative of Low Fair, which is below the Fair threshold for MWH use. It is expected that this project will cause an incremental increase in the IBI and macroinvertebrate scoring to 25 (25% of progress towards the goal) and similar incremental gains for the macroinvertebrate scoring.
	Part 3: Load reduced?	Estimated Reductions: Nitrogen: 34.4 lbs/year Phosphorous: 12.7 lbs/year Sediment: 15.7 tons/year
I	How will the effectiveness of this project in addressing the NPS impairment be measured?	The City of Fairlawn will continue to monitor this segment of Smith Ditch for water quality. Staff from the OEPA-DSW Ecological Assessment Unit will perform both pre and post project monitoring. In addition, the RM 4.7 sampling site will also be monitored (as part of the State's ongoing surface water monitoring program cycle) to determine progress (through IBI, ICI/macroinvertebrate narratives, and QHEI) from partial attainment to full attainment.

E	Information and Education	This project will be promoted with project signage, press releases, newsletter articles, and recreational users of the public areas of Fairlawn Corporate Park as an important demonstration project to Suburban land owners who own property along Smith Ditch. Additionally, the City of Fairlawn will incorporate this project into their existing educational programs with local schools at the Fort Island Griffiths Park and Nature Center.

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Appendix A: Acronyms and Abbreviations

The acronyms and abbreviations below are commonly used by organizations working to restore Ohio's watersheds; many of which are included in this NPS-IS plan.

A

AOC	Area of Concern

B

BMP	Best Management Practice
BOD	Biochemical Oxygen Demand

C

CSO	Combined Sewer Overflow

D

DELT	Deformities, Eroded Fins, Lesions, and Tumors
DNR	Department of Natural Resources

E

EOLP	Erie-Ontario Lake Plain Ecoregion
EWH	Exceptional Warmwater Habitat
EDG	Environmental Design Group

G

GIS	Geographical Information System

H

HELP	Huron-Erie Lake Plain Ecoregion
Hg	Mercury
HUC	Hydrologic Unit Code

I

IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index

L

LRW	Limited Resource Water

M

Mg/l	Milligrams per Liter
MGD	Million Gallons per Day
MIwb	Modified Index of Well Being
MWH	Modified Warm water Habitat

N

NPDES	National Pollutant Discharge Elimination System

O

ODA	Ohio Department of Agriculture
ODNR	Ohio Department of Natural Resources
ODH	Ohio Department of Health
OEPA	Ohio Environmental Protection Agency

P

PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls

Q

QHEI	Qualitative Habitat Evaluation Index

R

RAP	Remedial Action Plan

S

SSO	Sanitary Sewer Overflow
SWCD	Soil and Water Conservation District

T

TMDL	Total Maximum Daily Load Limits
TSD	Technical Support Document

U

µg/kg	Micrograms per Kilogram
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USPC	United States Policy Committee

V

VAP	Voluntary Action Program

W

WAP	Watershed Action Plan
WBP	Watershed Based Plan
WC	Watershed Characterization
WQ	Water Quality
WQS	Water Quality Standards (Ohio Administrative Code 3745-1)
WRAS	Watershed Restoration Action Strategy
WWH	Warm water Habitat
WWTP	Wastewater Treatment Plant