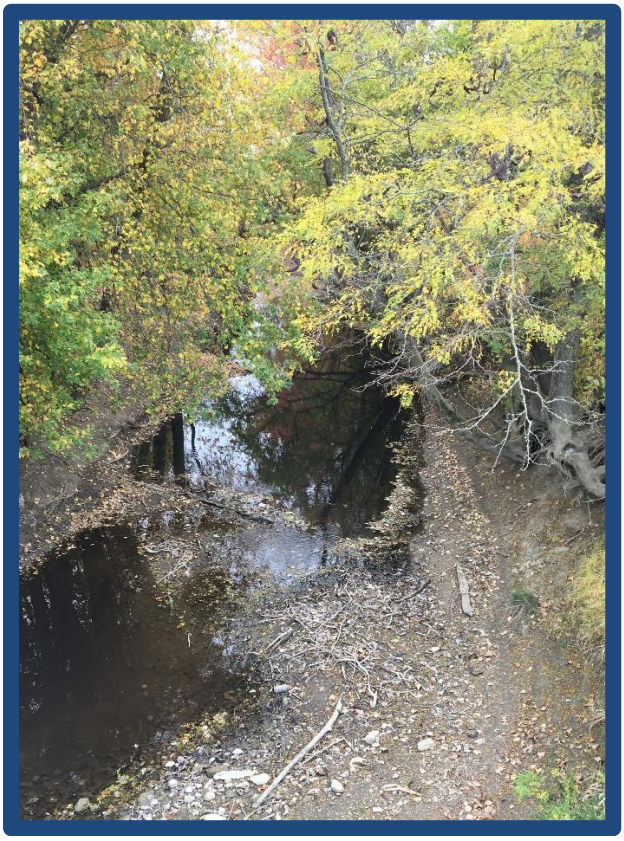
Nine-Element Nonpoint Source Implementation Strategy (NPS-IS) for Black Creek HUC-12 (04100004 03 02)



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Cover photo courtesy of Jeff Keller, Mercer Soil and Water Conservation District

Acronyms and Abbreviations

The acronyms and abbreviations below are commonly used by organizations working to restore Ohio's watersheds and are found throughout this NPS-IS document.

Numbers	
§319	Section 319 of the Clean Water Act
A	
ALU	Aquatic Life Use
B	
BMP	Best Management Practice
C	
CAFF	Confined Animal Feeding Facility
CRP	Conservation Reserve Program
CSA	Critical Sewage Area
CTIC	Conservation Tillage Information Center
D	
DAP	Domestic Action Plan
E	
EPT	*Ephemeroptera, Trichoptera* and *Plecoptera* – sensitive macroinvertebrate species
EQIP	Environmental Quality Incentives Program
F	
FLS	Federally Listed Species
G	
GLC	Great Lakes Commission
GLRI	Great Lakes Restoration Initiative
GLWQA	Great Lakes Water Quality Agreement
H	
H2Ohio	H2Ohio Initiative (Ohio state funding mechanism for water quality improvement)
HAB	Harmful Algal Bloom
HELP	Huron-Erie Lake Plains Ecoregion
HSTS	Home Sewage Treatment System
HUC	Hydrologic Unit Code
I	
IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index
IJC	International Joint Commission

M

MIwb	Modified Index of Well Being
MTA	Million Tons per Annum
MWH	Modified Warmwater Habitat

N

NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NPS-IS	Nonpoint Source-Implementation Strategy
NRCS-USDA	Natural Resources Conservation Service-United States Department of Agriculture

O

ODA	Ohio Department of Agriculture
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
OLEC	Ohio Lake Erie Commission

P

PAD-US	Protected Areas Database of the United States

Q

QHEI	Qualitative Habitat Evaluation Index

R

RM	River Mile

S

STEPL	Spreadsheet Tool for Estimating Pollutant Loads
SWCD	Soil and Water Conservation District

T

TMACOG	Toledo Metropolitan Area Council of Governments
TMDL	Total Maximum Daily Load
TSD	Technical Support Document

U

USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

W

WAP	Watershed Action Plan
WLEB	Western Lake Erie Basin
WQS	Water Quality Standards (Ohio Administrative Code 3745-1)
WRP	Wetland Reserve Program
WWH	Warmwater Habitat

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CHAPTER 1: INTRODUCTION

The **Black Creek Hydrologic Unit Code (HUC)-12 (04100004 03 02)** is located in northwestern Mercer County, Ohio and contains a watershed of 29.52 square miles (Figure 1). The **Black Creek HUC-12** contains Black Creek, an approximately 13 mile-long stream[1] that flows northward through Mercer County to drain to the St. Marys River in southern Van Wert County, Ohio. The watershed is primarily rural, and land use is dominated by cultivated crop land (~92%). The **Black Creek HUC-12** has recently been identified as a priority watershed within the Western Lake Erie Basin (WLEB) for watershed planning and nutrient reduction efforts due to the estimated loadings of total phosphorus and dissolved reactive (soluble) phosphorus that flows into the tributaries of the Maumee River and eventually, Lake Erie.

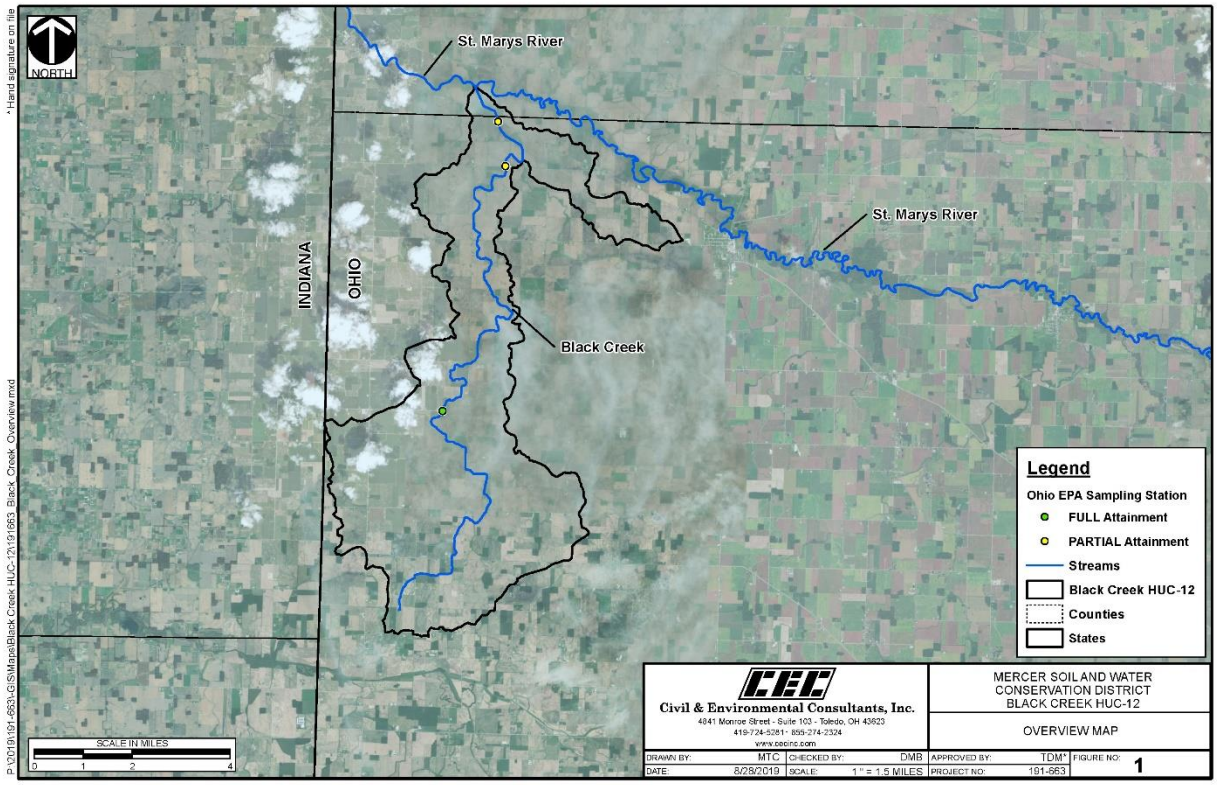

Figure 1: Black Creek HUC-12 Overview

While watershed plans could be all-inclusive inventories, the US Environmental Protection Agency (USEPA) identified nine critical elements to include in strategic planning documents for impaired waters. To ease implementation of projects addressing nonpoint source (NPS) management and habitat restoration, current federal and state NPS and habitat restoration funding opportunities require strategic watershed plans incorporate these nine key elements, concisely to HUC-12 watersheds. In addition, the development of Nine-Element Nonpoint Source Implementation Strategies (NPS-IS) is

[1] The *ODNR Gazetteer of Ohio Streams* (ODNR, 2001) lists Black Creek as 11.8 miles in length; however, current basemaps utilized by OEPA in the *2018 Ohio Integrated Report* show Black Creek extending to approximately 13 miles in length. When compared to the *OEPA River Miles Index* interactive map (online), the most upstream segment of Black Creek was considered to be a smaller tributary to Black Creek and accounts for the additional length shown on basemaps today.

critical to the efforts focused on implementing Ohio's Domestic Action Plan (DAP) to reduce total spring nutrient loadings to Lake Erie by 40% by the year 2025, with aspirations to reach a 20% reduction by 2020 (OLEC, 2018). The development of NPS-IS across the entire WLEB will address NPS pollution by accounting for both near-field (within stream/watershed) and far-field (loadings to Lake Erie) effects. The *Black Creek HUC-12 NPS-IS* is one of three plans sponsored and developed by the Mercer Soil and Water Conservation District (SWCD) under a grant from the Ohio Lake Erie Commission (OLEC).

1.1 Report Background

The Ohio Environmental Protection Agency (OEPA) has historically supported watershed based planning in many forms (OEPA, 2016). In 1997, OEPA issued guidance for the development of Watershed Action Plans (WAPs), which typically covered larger watersheds (HUC-10 to HUC-8 size). The WAPs included an outline and checklist to ensure USEPA's nine elements were included within each plan. The USEPA issued new guidance in 2013 and concluded Ohio's interpretation for WAP development did not adequately address critical areas, nor did it include an approach that detailed the nine elements at the project level (OEPA, 2016). In response, OEPA developed a new template for watershed planning in the form of a NPS-IS, ensuring NPS pollution is addressed at a finer resolution and that individual projects listed within each plan include each of the nine elements. The first NPS-IS plans were approved in 2017. Over time, these plans have evolved to not only address in-stream (near-field) water quality impairment from NPS pollution, but they also address reductions in nutrient loadings to larger bodies of water (far-field), particularly in the WLEB.

Because the St. Marys River flows through both Indiana and Ohio, assessment and planning efforts are often separated at the state line. A Total Maximum Daily Load (TMDL) study was conducted in Indiana, and the TMDL report was released in 2006. Formal watershed planning within the St. Marys River began as a result of this TMDL effort and led to the formation of the St. Marys River Watershed Steering Committee, spearheaded by the Allen County (Indiana) SWCD. The *St. Marys River Watershed Management Plan* was then developed for the Indiana portion of the watershed and approved in 2009. In 2015, OEPA sampled the St. Marys River and tributaries as an initial step in TMDL modeling for the Ohio portion of the watershed. The Ohio TMDL report has not yet been released.

In 2018, all subwatersheds (HUC-12s) within the Ohio portions of the St. Marys HUC-8, the Auglaize HUC-8 (including the Ottawa River, Little Auglaize River and Little Flatrock Creek), the Blanchard HUC-8 (including Eagle Creek) and the Platter Creek HUC-12 were recommended for designation as a "Watershed in Distress" due to relatively higher concentrations of phosphorus in surface waters contributing to harmful algal bloom (HAB) occurrence in Lake Erie. These waterways were found to have flow-weighted mean concentrations of phosphorus two or more times the phosphorus loading goals set forth by the Great Lakes

Sediments and nutrients flow within tributaries to eventually reach the Maumee River and Lake Erie

Water Quality Agreement (GLWQA) and the subsequent DAP developed by the State of Ohio (ODA, 2018). In 2019, the proposal to designate these watersheds as distressed was removed from state consideration. Focus is now on developing NPS-IS for these subwatersheds in preparation for basin-wide targeted nutrient reduction efforts. The coordination of this NPS-IS for the **Black Creek HUC-12**, along with several other subwatersheds in both Mercer and Van Wert County, is the first formal planning effort within the Ohio portion of the St. Marys watershed.

Removal of NPS impairments and reduction in overall nutrient loss within the **Black Creek HUC-12** is crucial to the attainment of aquatic life use (ALU) standards within Black Creek, as well as reduction in severity, extent and occurrence of HABs within the WLEB. Within the **Black Creek HUC-12**, Black Creek is in *Full Attainment* of its Modified Warmwater Habitat (MWH) ALU at one sampling location, and is in *Partial Attainment* at two other locations due to naturally occurring hydrologic dynamics. While these natural flow conditions may not be addressed by traditional strategies that address NPS pollutants and water quality impairment, land use activities within the watershed have severely altered instream habitat along the length of Black Creek, and high nutrient loadings contribute to large-scale impairment within Lake Erie. This NPS-IS will be used to strategically identify and outline key projects that should be implemented within the **Black Creek HUC-12** to address management of NPS issues that have both near-field and far-field impacts.

1.2 Watershed Profile & History

The WLEB is composed of approximately 7,000,000 acres across the tri-state area of Ohio, Indiana and Michigan (Figure 2). The largest direct tributary to the WLEB is the Maumee River, flowing 137 miles through 18 counties in Indiana and Ohio. The WLEB watershed is broken into several subbasins at the HUC-8 level, including the St. Joseph, St. Marys, Auglaize, Blanchard, Tiffin, Ottawa-Stony, River Raisin, Cedar-Portage, Upper Maumee and Lower Maumee watersheds. The St. Marys HUC-8 (04100004) wholly contains the St. Marys River (~101 miles) from its headwaters in Auglaize County, Ohio to where its confluence with the St. Joseph River in Fort Wayne, Indiana forms the beginning of the Maumee River. The St. Marys HUC-8 contains a watershed of 794 square miles (508,618 acres) throughout Shelby, Auglaize, Mercer and Van Wert counties in Ohio and Allen, Wells and Adams counties in eastern Indiana. Larger tributaries to the St. Marys River include Kopp Creek, Twelvemile Creek, Blue Creek and Black Creek. The St. Marys HUC-8 is further divided into six smaller watersheds along its course, one of which is the *Black Creek-St. Marys River HUC-10 (04100004 03).*

The *Black Creek-St. Marys River HUC-10* has a drainage area of 143.20 square miles or 91,645 acres (Figure 3). Approximately 30 miles of the St. Marys River are contained within the *Black Creek-St. Marys River HUC-10* from river mile (RM) 71.4 where Twelvemile Creek empties into the river, to RM 41.4, at the mouth of Twentyseven Mile Creek just west of the Indiana/Ohio state border. Land use within the *Black Creek-St. Marys River HUC-10* is mainly agricultural and rural. Concentrated population centers are relatively small, ranging from ~660 in Mendon to 1,100 in Rockford (US Census Bureau, 2010a; US Census Bureau, 2010b).

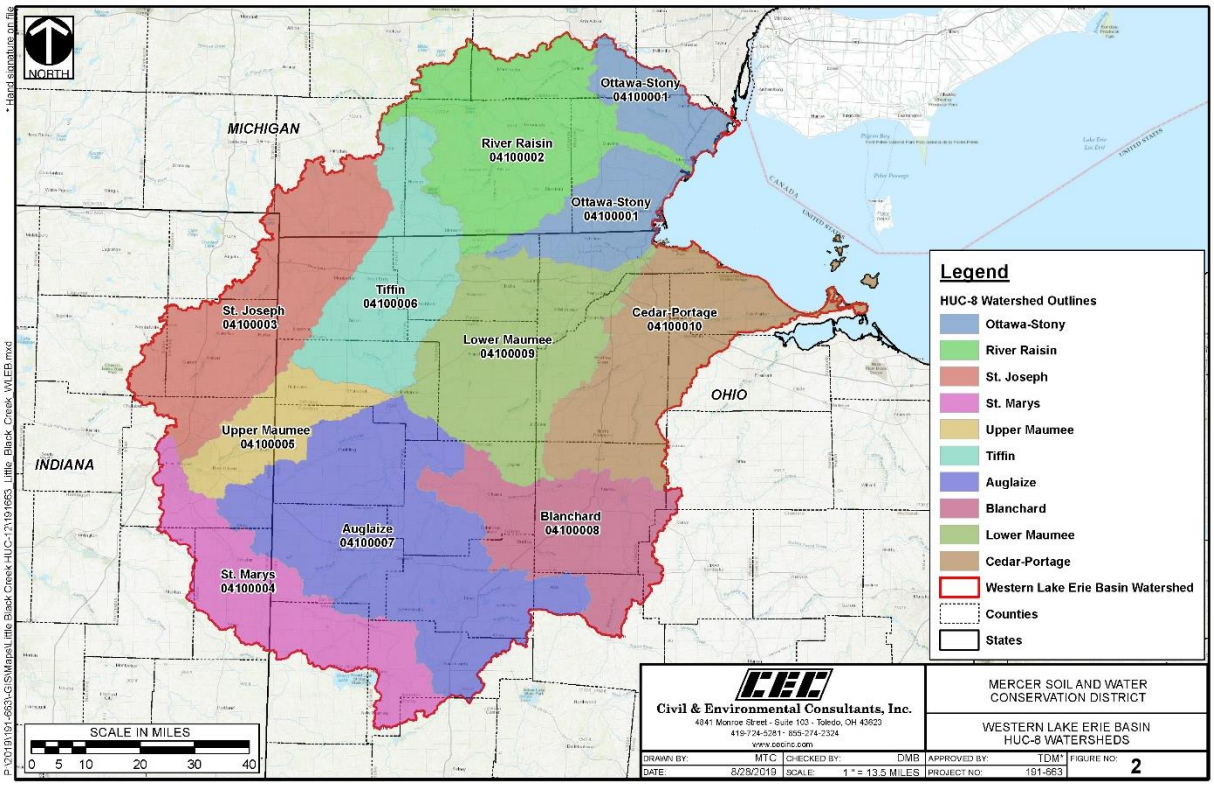

Figure 2: Western Lake Erie Basin Watershed

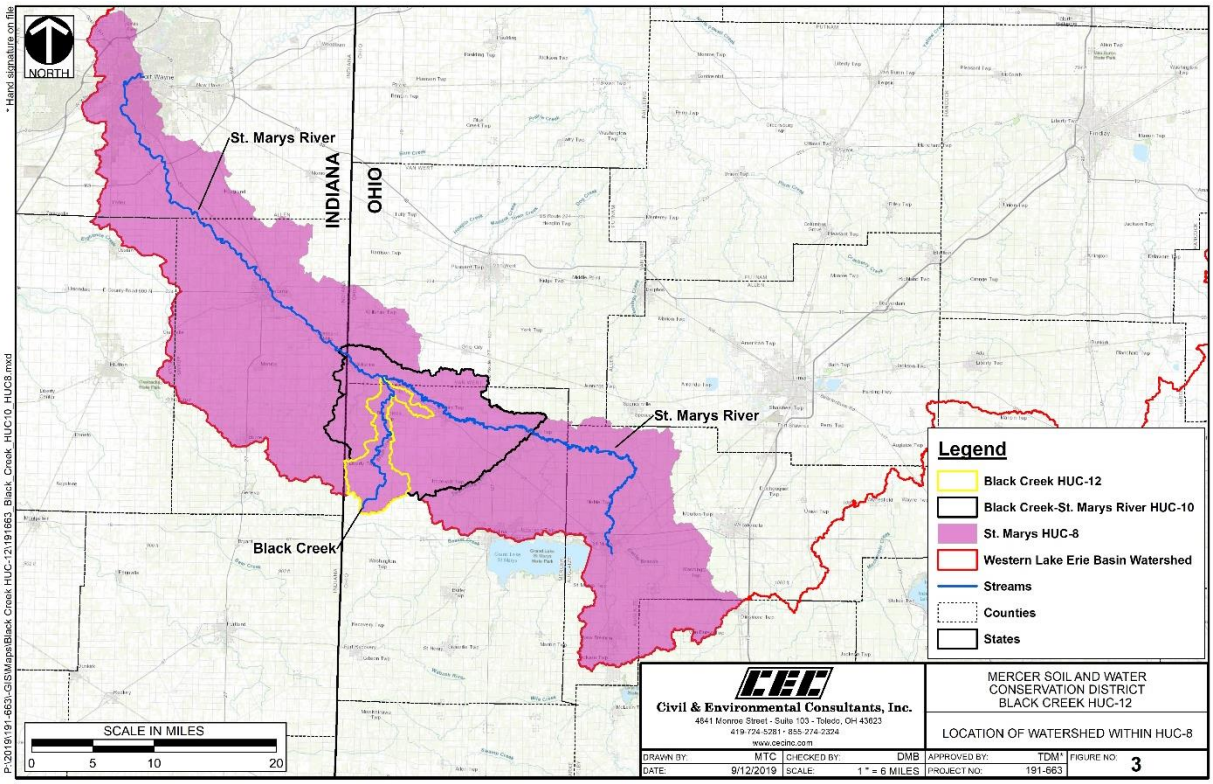

Figure 3: Location of the Black Creek HUC-12

The *Black Creek-St. Marys River HUC-10* contains five HUC-12 watersheds, one of which is the **Black Creek HUC-12.** The **Black Creek HUC-12** wholly contains Black Creek, a 13 mile-long stream that enters the St. Marys River at approximately RM 46.6. The Black Creek watershed is similar in land use setting and characteristics as the overall larger HUC-10 watershed, supporting mostly agricultural land use.

1.3 Public Participation and Involvement

Watershed planning is best accomplished by collaboration and input from a diverse group of entities, including governmental agencies, private businesses, academia, non-profit groups, neighborhood organizations, agricultural landowners, producers and service providers, as well as the public at large. Mercer SWCD is dedicated to providing local leadership in the conservation and wise use of soil, water and related resources through a balanced cooperative program that protects, restores and improves those resources.

Mercer SWCD frequently partners with other county agencies, particularly with Mercer County's Community and Economic Development Agency – Agricultural Solutions (Ag Solutions). Ag Solution's mission is to identify and eliminate, through the use of technology and environmentally sound farming practices, agricultural factors that are negatively impacting the environmental health of all Mercer County Watersheds, while also enhancing the vibrant, prosperous farming economy that is an integral part of the local community. Both Mercer SWCD and Ag Solutions have been active leaders in watershed planning, project development and solution implementation. Their recent planning and implementation efforts have focused in the Grand Lake St. Marys region, and through development of this NPS-IS for the **Black Creek HUC-12,** both organizations recognize the need to expand their efforts into the WLEB portion of the county.

Chapters 1, 2 and 3 of this NPS-IS were primarily prepared using the *Biological and Water Quality Study of the St. Marys River and Tributaries, 2015, Technical Report EAS/2018-11-01* (OEPA, 2018b) and the *2018 Ohio Integrated Report* (OEPA, 2018a*).* Project information for Chapter 4 was compiled by collaborative meetings with organizational stakeholders, community partners and local landowners.

Mercer SWCD held a public meeting regarding NPS-IS development and current state and federal agricultural programs on June 27, 2019 in Rockford to engage area landowners and organizational stakeholders in the planning process. In addition, Mercer SWCD solicited individual input from potential cooperating landowners and stakeholder organizations working within the **Black Creek HUC-12**, such as the Mercer County Engineers Office and Mercer County Health Department, as well as those that work regionally throughout the WLEB, including Mercer Landmark, the Ohio Farm Bureau, The Nature Conservancy, The West Central Land Conservancy, Black Swamp Conservancy, Maumee Valley Conservancy District and the Ohio Department of Natural Resources (ODNR).

CHAPTER 2: HUC-12 WATERSHED CHARACTERIZATION AND ASSESSMENT SUMMARY

2.1 Summary of HUC-12 Watershed Characterization

2.1.1 Physical and Natural Features

The **Black Creek HUC-12** is a subwatershed within the greater *Black Creek-St. Marys River HUC-10*. The *Black Creek-St. Marys River HUC-10* is comprised of five HUC-12 watersheds; this document focuses on the #02 hydrologic unit—the **Black Creek HUC-12**. The largest waterbody within this subwatershed is Black Creek, an approximately 13 mile-long stream[2] that flows northward to meet the St. Marys River in southern Van Wert County, Ohio. The **Black Creek HUC-12** wholly contains Black Creek, from its headwaters that begin in southern Liberty Township in Mercer County, flowing north to approximately RM 46.64 of the St. Marys River, where Black Creek empties. In total, Black Creek drains 54.65 square miles (34,976 acres), which also includes the watershed of Little Black Creek (USGS, 2019). The drainage area contained specifically within the **Black Creek HUC-12** is 29.52 square miles (18,892.8 acres). Black Creek has an average fall of 4.1 ft/mile (ODNR, 2001).

The largest tributary to Black Creek is Little Black Creek, an 11.9 mile-long stream[3] that enters Black Creek at RM 1.92. Little Black Creek is wholly contained within the Little Black Creek HUC-12, and its drainage contributes an additional 24.95 square miles to the entire watershed of Black Creek. Including the length of Black Creek, almost 50 miles of streams and ditches are within the boundaries of the **Black Creek HUC-12**. Of the ~50 miles of waterways within the **Black Creek HUC-12**, very little are maintained under Mercer County's Ditch Maintenance program. Maintained ditches within the **Black Creek HUC-12** are mostly located in the portion of the watershed north and east of Little Black Creek's confluence with Black Creek.

The physiography of the **Black Creek HUC-12** is defined by features from glacial activity of Wisconsinan time. As the Erie ice lobe advanced and retreated, the Ft. Wayne and Wabash Moraines were deposited, truncating the northern and southern boundaries, respectively, of many tributaries to the St. Marys River along the middle stretch of the river (OEPA, 2018b). Soils within the **Black Creek HUC-12** are mainly fine-grained and are predominantly the Pewamo Silty Clay Loam (Figure 4). These soils are derived mainly from lacustrine deposits and lake-planed moraine, consist of clayey silts and sand and are typically poorly drained (OEPA, 2018b).

Stream gradients are low in the HELP Ecoregion

[2] The ODNR Gazetteer of Ohio Streams lists Black Creek as 11.8 miles in length; however, current basemaps utilized by OEPA in the 2018 Ohio Integrated Report show Black Creek extending to approximately 13 miles in length. When compared to the OEPA River Miles Index interactive map (online), the most upstream segment of Black Creek was considered to be a smaller tributary to Black Creek and accounts for the additional length shown on basemaps today.

[3] As determined by the OEPA River Miles Index.

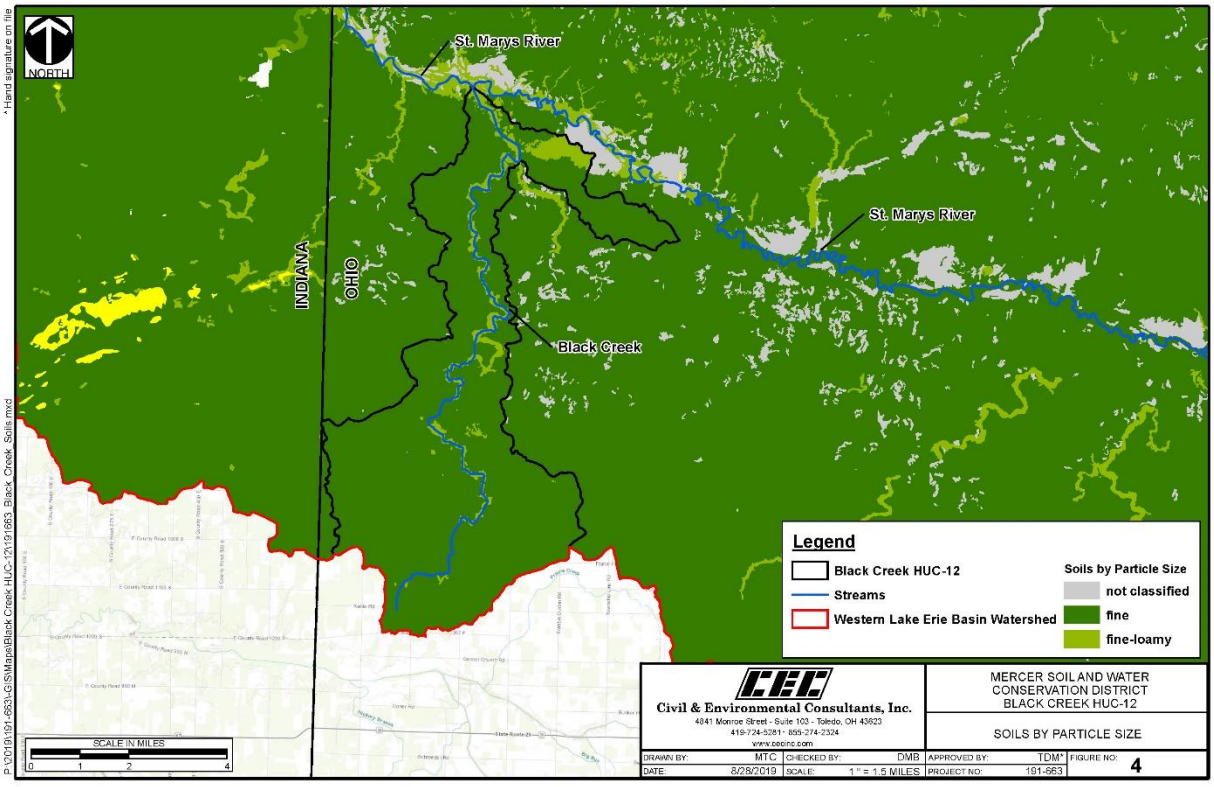

Figure 4: Soils Classified by Particle Size

The **Black Creek HUC-12** is wholly contained within the Huron-Erie Lake Plains (HELP) ecoregion. The ecoregion is characterized by a broad and nearly level lake plain, with extensive lacustrine and still-water deposits (OEPA, 2018b). Stream gradients within the HELP ecoregion are typically low, and adjacent lands are typically poorly drained. Settlement in this poorly drained area prompted the necessity for a vast system of drainage networks. Nearly 70% of streams within the HELP ecoregion have been channelized or hydrologically modified to varying degrees for drainage conveyance (OEPA, 2018b). Elm-ash swamp and beech forests were typical in the HELP ecoregion prior to settlement (USEPA, 2013). Wetland areas are now sparse throughout the **Black Creek HUC-12** (Figure 5). Today, the ecoregion is characterized by extensive corn, soybean, vegetable and livestock production.

Row crop production is prevalent in Mercer County

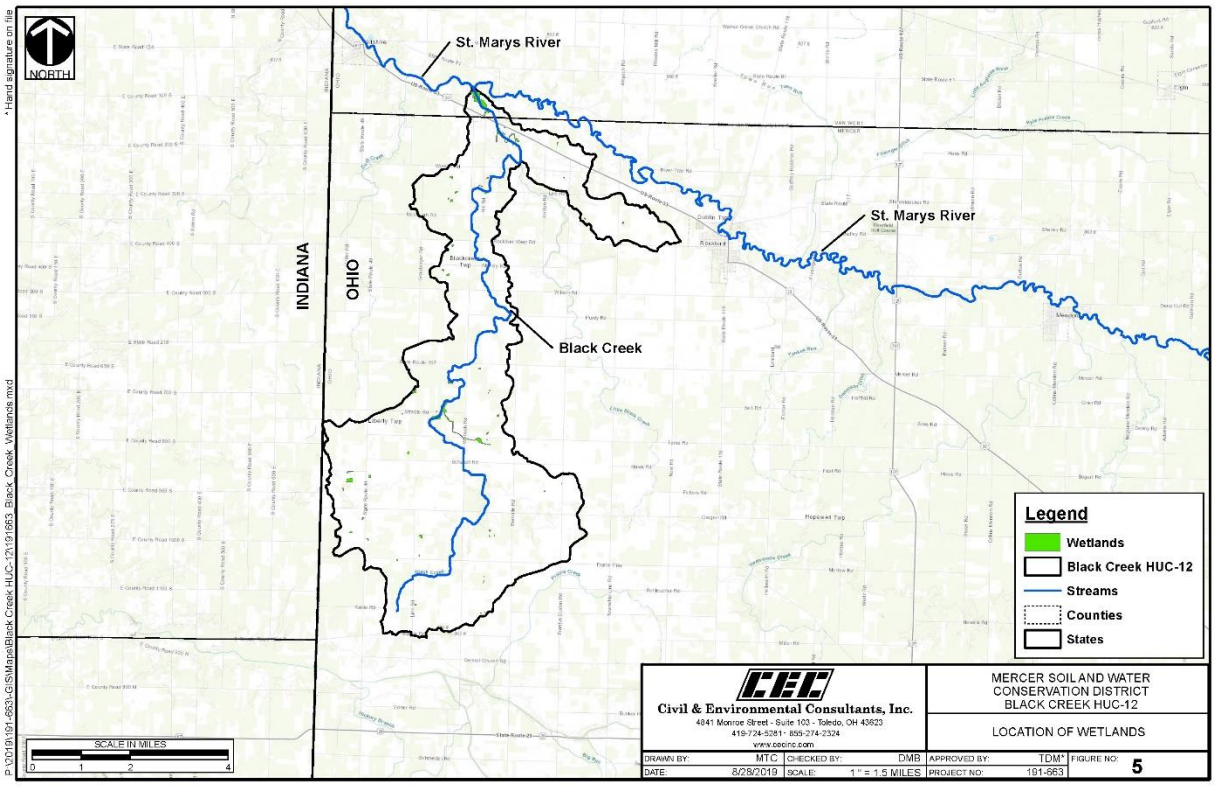

Figure 5: Wetlands within the Black Creek HUC-12

Currently, there are no National Pollutant Discharge Elimination System (NPDES) permitted facilities located within the **Black Creek HUC-12**. There is one Ohio Department of Agriculture (ODA)-permitted Confined Animal Feeding Facility (CAFF) located within the watershed with mixed numbers of hogs and cattle. Other smaller, animal farms within the watershed include cattle, hogs, horses and turkeys. An estimate of the number of animals existing in the **Black Creek HUC-12** can be found in Table 1.

Table 1: Estimated Animal Counts in the Black Creek HUC-12

Livestock Type	Number of Farms	Animal Units[1]
Beef	2	970
Swine	3	4,240
Turkey	4	1,300
Horses	N/D	N/D

(Source: Mercer SWCD)

NOTES
1 Estimates include permitted operations
N/D No data available

The population within the **Black Creek HUC-12** is sparse, estimated at 630, with 250 housing units (TMACOG, 2018). Residential developments are clustered along Frahm Pike and State Route 49, as well as the unincorporated area of Chattanooga. In 2018, the Toledo Metropolitan Area Council of Governments (TMACOG) concluded a study of locations and densities of home sewage treatment

systems (HSTS) throughout the WLEB. Within Mercer County, Chattanooga was identified as a Critical Sewage Area (CSA), in which larger-scale efforts should be initiated to address failing HSTS and/or potentially establish sewer service. The Mercer County Comprehensive Plan noted the need for addressing failing HSTS throughout the county, as well as the need to continue expansion of the County's sewer subdistricts in populated residential areas (WSU, 2013).

Specific landmarks and features within this watershed include (Figure 6):

- Winkler Airport
- the unincorporated area of Chattanooga (southern portion)
- an undeveloped Construction and Demolition Landfill
- clustered residential homes around Frahm Pike
- St. Paul's United Church of Christ Cemetery

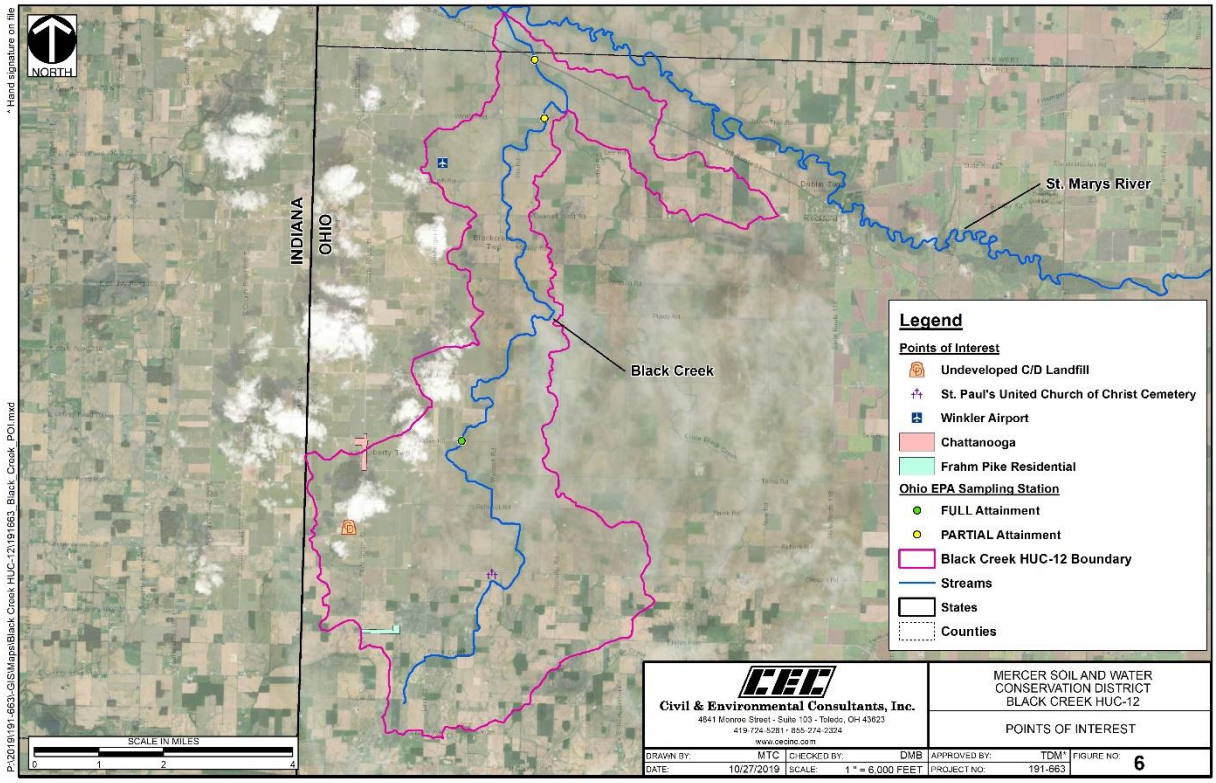

Figure 6: Points of Interest in the Black Creek HUC-12

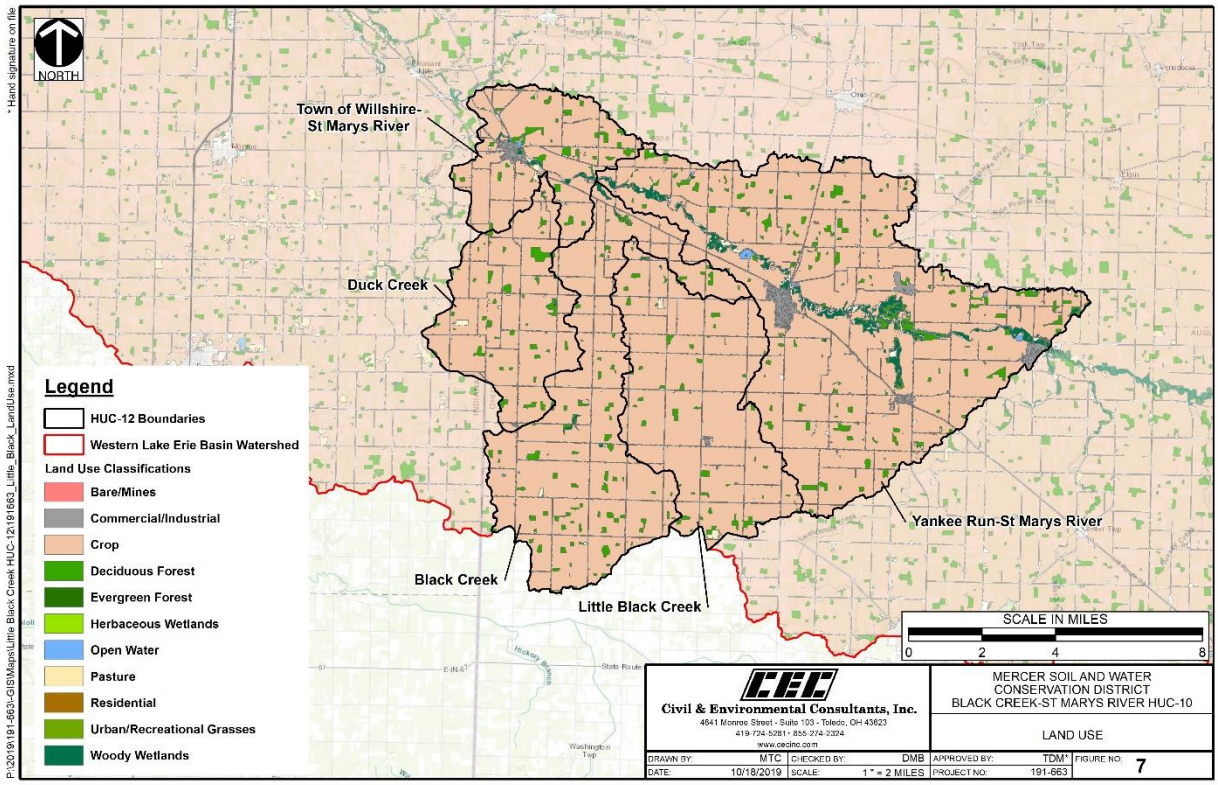

Figure 7: Land Use in the Black Creek-St. Marys River HUC-10

2.1.2 Land Use and Protection

Land use within the **Black Creek HUC-12** is fairly homogenous (Figure 7). The dominant land use activity within the **Black Creek HUC-12** is cultivated crop production (91%), with commercial/industrial/ transportation areas covering the next largest portion of the watershed (4%) (Table 2).

Table 2: Land Use Classifications in the Black Creek HUC-12

Land Use	Black Creek HUC-12 (04100004 03 02)		
	Area (mi^2)	Area (acres)	% Watershed Area
Bare/Mines	<0.01	0.72	<0.01%
Commercial/Industrial/Transportation	1.25	796.85	4.22%
Crop	26.97	17,262.41	91.37%
Deciduous Forest	1.09	696.97	3.69%
Emergent Herbaceous Wetlands	0.01	4.20	0.02%
Herbaceous	0.01	9.36	0.05%
Mixed Forest	<0.01	1.27	0.01%
Open Water	0.01	7.41	0.04%
Pasture	0.04	22.75	0.12%
Woody Wetlands	0.14	90.50	0.48%
Total	**29.52**	**18,892.44**	**100.00%**

(Source: Homer, 2015)

While no parks are listed for this watershed in the United States Geological Survey's (USGS) Protected Areas Database of the United States (PAD-US), a small portion of land near the confluence of Black Creek and the St. Mary's River is shown to be protected by enrollment in the Wetland Reserve Program (WRP). Two threatened or endangered species are listed for Mercer County by the US Fish and Wildlife Service (USFWS) (Table 3). Black Creek is listed as a Group 1 stream in Appendix A of the *Ohio Mussel Survey Protocol*, indicating that it is a small to mid-sized stream, but no Federally Listed Species (FLS) of mussels are expected to be found (ODNR, 2018).

Table 3: Threatened and Endangered Species in Mercer County

Species	Status	Habitat Characteristics
Indiana bat *(Myotis sodalis)*	Endangered	Hibernates in caves and mines and forages in small stream corridors with well-developed riparian woods, as well as upland forests
Northern long-eared bat *(Myotis septentrionalis)*	Threatened	Hibernates in caves and mines and swarms in surrounding wooded areas in autumn; roosts and forages in upland forests during late spring and summer

(Source: USFWS, 2018)

Most land within the **Black Creek HUC-12** is privately owned; therefore, knowledge of conservation practices may be limited. Some conservation practices, such as the use of conservation tillage, can be estimated from crop tillage transects from prior years. These tillage tracts include areas in the WLEB watershed within Mercer County. Over time, the use of conservation tillage has increased. During a five-year period spanning from 2006-2010, conservation tillage was observed on an average of 60% of fields annually during Conservation Technology Information Center (CTIC) surveys conducted in the month of June. Data from June surveys in 2016-2018 indicate conservation tillage has increased to an average use on 66% of fields (personal communication, Mercer SWCD, August 14, 2019).

Summary data provided by OEPA regarding the use of the Environmental Quality Incentives Program (EQIP) within the **Black Creek HUC-12** indicated five certifications of practices occurred after March 30, 2017 (R. Wilson, personal communication, June 13, 2019). A breakdown of this activity is in Table 4. Since 2008, Mercer SWCD has assisted local landowners in the **Black Creek HUC-12** in the installation of 3,818 linear feet of grassed waterways, covering 3.5 acres and draining surface water from 400.9 row crop acres. Future nutrient reduction projects implemented through this NPS-IS and available state and federal programming will be compiled to track progress made towards nutrient reduction and conservation goals across the **Black Creek HUC-12** and the greater WLEB watershed.

Table 4: Environmental Quality Incentives Program – Recent Activity in the Black Creek HUC-12

Practice Type	Acreage	Year	Status
Conservation Cover	2.0	2017	Completed
Grassed Waterway	0.9	2018	Active
Grade Stabilization Structure	2.0	2018	Active
Mulching	0.9	2018	Active
Filter Strip	2.4	2017	Active

(Source: R. Wilson, personal communication, June 21, 2019)

2.2 Summary of HUC-12 Biological Trends

The OEPA sampled the **Black Creek HUC-12** in 2015, as documented in the *Biological and Water Quality Study of the St. Marys River and Tributaries, 2015, Technical Report EAS/2018-11-01* (OEPA, 2018b). This report serves as the Technical Support Document (TSD) for the TMDL study for the St. Marys River, which is still under agency preparation. All sample sites of this assessment unit were verified to be MWH segments.

A summary of the sample locations and their biological status in the **Black Creek HUC-12** is provided in Table 5. For reference, water quality standards (WQS) for the HELP Ecoregion are presented in Table 6.

Table 5: Biological Indices Scores for Sites in Black Creek HUC-12

Black Creek HUC-12 (04100004 03 02)							
River Mile	**Drainage Area (mi^2)**	**IBI**	**MIwb[a]**	**ICI[b]**	**QHEI**	**Attainment Status**	**Location**
Black Creek (MWH)							
10.70^{H}	13.2	38	N/A	F	50.5	Full	Strable Rd.
2.50^{W}	25.0	43	9.6	16*	45.8	Partial	Winkler Rd.
0.90^{W}	54.0	34	9.2	18*	40.8	Partial	SE of Willshire @ St. Rte. 33

(Source: OEPA, 2018b)

NOTES

IBI *Index of Biotic Integrity*

a *The Modified Index of Well Being (MIwb) is not applicable to headwater sites (drainage ≤20 mi^2).*

ICI *Invertebrate Community Index*

b *Narrative evaluation used in lieu of ICI (G=Good; MG=Marginally Good; H Fair =High Fair; F=Fair; L Fair=Low Fair; P=Poor; VP=Very Poor).*

QHEI *Qualitative Habitat Evaluation Index*

* *Significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units). Underlined scores are in the poor to very poor range.*

H *Headwater sample*

W *Wading sample*

N/A *Not applicable*

Table 6: Water Quality Standards for the Huron-Erie Lake Plains Ecoregion

HELP Ecoregion	MWH Standards[a]			WWH WQS Standards		
	Wading	Headwater	Boat	Wading	Headwater	Boat
IBI	22	20	20/22	32	28	34
MIwb	5.6	N/A	5.7/5.7	7.3	N/A	8.6
ICI	22	22	22	34	34	34
QHEI[b]	43.5	43.5	43.5	60	60	60

(Source: OEPA, 2013b)

NOTES

WQS Water quality standards

a MWH standards are dependent on type of MWH. MWH-C (due to channelization) is listed first; MWH-I (due to impoundment) is listed second. All MWH streams in this NPS-IS are MWH-C, unless otherwise noted.

b QHEI is not criteria included in Ohio WQS; however, it has been shown to be highly correlated with the health of aquatic communities. In general, sites scoring 60 or above support healthy aquatic assemblages indicative of WWH. For modified warmwater habitats, Ohio EPA suggests a score of 43.5 for the support of tolerant aquatic assemblages (Ohio EPA, 2013b).

N/A MIwb not applicable to headwaters sampling locations with drainage areas ≤ 20 mi^2.

Fishes (Modified Index of Well-Being (MIwb] & Index of Biotic Integrity [IBI])

Fish communities performed well in Black Creek, exceeding attainment values for both MWH and warmwater habitat (WWH)-designated streams. Both headwaters and wading sites produced high IBI scores, despite habitat limitations that affected macroinvertebrate communities (IBI $\bar{x}$=38, n=3). Fish communities at RM 0.90 were not affected by exceedances in the dissolved oxygen regime, despite the signature of organic enrichment (OEPA, 2018b).

Macroinvertebrates (Invertebrate Community Index [ICI])

In 2015, ICI scores hovered in the fair to poor range within Black Creek. Macroinvertebrate impairment in Black Creek can be attributed to very poor substrate and riffle metric scores (OEPA, 2018b). At the time of the 2015 study, macroinvertebrate communities were limited below normal conditions due to lack of sufficient rainfall and a lower than average water table. This led to a nearly interstitial flow condition, particularly at RM 2.5, and substantially decreased macroinvertebrate diversity. The low gradient and proximity to the confluence with the St. Marys River created a pooled effect at RM 0.90, thus limiting the macroinvertebrate communities (OEPA, 2018b). The negative impacts on the naturally-occurring hydrologic regime in Black Creek is listed as the primary cause of impairment at both sites, sourced from natural conditions (rainfall).

Little sinuosity or riparian cover along Black Creek

Habitat (via Qualitative Habitat Evaluation Index [QHEI])

Ohio EPA sampling crews documented various water quality and habitat attributes during the QHEI assessment in the summer of 2015 (Table 7). QHEI was measured at a total of 25 sampling locations that were located in the HELP Ecoregion throughout the St. Marys watershed. Three of these locations were in Black Creek. In general, habitat in the HELP tributaries was severely degraded. Of the 25 sites sampled during the study, only four yielded QHEI scores that met or exceeded target values for WWH benchmarks. None of these four were within Black Creek; however, two of the three locations in Black Creek exceeded MWH benchmarks for QHEI, which is the designated ALU for the stream (QHEI> 43.5). The average QHEI score within Black Creek was 45.7 (n=3).

Table 7: QHEI Matrix with WWH and MWH Attribute Totals for Sites in the Black Creek HUC-12

Black Creek HUC-12 (04100004 03 02)																																
Key QHEI Components			WWH Attributes											MWH Attributes																		
														High Influence						Moderate Influence												
River Mile	QHEI Score	Gradient (ft/mi)	Not Channelized or Recovered	Boulder/Cobble/Gravel Substrate	Silt Free Substrates	Good/Excellent Development	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low/Normal Embeddedness	Max Depth >40 cm	Low/Normal Embeddedness	WWH Attributes	Channelized/No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/No Cover	Max Depth <40 cm	High Influence Modified Attributes	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrate (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1 or 2 Cover Types	Intermediate/Poor Pools	No Fast Current	High/Moderate Embeddedness	High/Moderate Riffle Embeddedness	No Riffle	Moderate Influence MWM Attributes
Black Creek (MWH)																																
10.7	50.5	6.90											**0**				•	•	**2**	•	•			•	•			•	•		•	**7**
2.5	45.8	3.92					•	•		•	•		**4**				•		**1**	•	•			•			•	•	•		•	**7**
0.9	40.8	3.10									•		**1**	•	•		•		**3**	•	•			•	•		•	•	•		•	**8**

(Source: OEPA, 2018b)

NOTES
QHEI Qualitative Habitat Evaluation Index
WWH Warmwater Habitat
MWH Modified Warmwater Habitat

Strong correlations exist between habitat attributes and a stream's ability to support healthy aquatic assemblages (OEPA, 1999). The presence of certain attributes are shown to have a larger negative impact on fish and macroinvertebrate communities. Streams designated as MWH should exhibit no more than six total MWH habitat attributes; additionally, no more than two of those six should be of high-influence (OEPA, 2013b). No sampling locations within the **Black Creek HUC-12** met this target,

with total MWH attributes ranging from eight to eleven among the sites. The sampling location at RM 2.5 exhibited the best habitat along Black Creek, with four high-quality habitat attributes observed; however, the total QHEI score just barely exceeded expectations (QHEI= 45.8; goal=43.5).

2.3 Summary of HUC-12 Pollution Causes and Associated Sources

As listed in the 2018 *Biological and Water Quality Study of the St. Marys River and Tributaries*, Ohio EPA has determined that the biological impairments in the **Black Creek HUC-12** are mainly from naturally occurring alterations to the flow regime, caused by decreased precipitation (Table 8). While these natural causes/sources of impairment may not be derived from traditional activities associated with NPS pollution, the presence and persistence of HABs within Lake Erie has shown the need for reduced NPS pollution, particularly in regards to phosphorus, throughout the entire WLEB watershed.

Table 8: Causes and Sources of Impairments for Sampling Locations in the Black Creek HUC-12

Black Creek HUC-12 (04100004 03 02)				
River Mile	**Primary Cause(s)**	**Primary Source(s)**	**Attainment Status**	**Location**
Black Creek (MWH)				
10.70[H]	--	--	Full	Strable Rd.
2.50[W]	Natural (flow or habitat)	Natural sources	Partial	Winkler Rd.
0.90[W]	Natural (flow or habitat)	Natural sources	Partial	SE of Willshire @ St. Rte. 33

(Source: OEPA, 2018b)

NOTES
W Wading sample
H Headwater sample

The OEPA has estimated spring phosphorus loadings from individual subwatersheds throughout the greater WLEB watershed. These estimates also include a breakdown of estimated loads from contributing sources of NPS pollutants, such as agricultural lands/activities, developed/urban lands, failing HSTS and natural sources (Table 9). Efforts to reduce nutrients from each of these contributing sources will focus on reaching the 40% reduction goal outlined by Annex 4 of the GLWQA and the Ohio DAP.

Table 9: Estimated Spring Nutrient Loadings from Contributing NPS Sources in the Black Creek HUC-12

	Agricultural Load (lbs)	Developed/Urban Load (lbs)	Natural Load (lbs)	HSTS Load (lbs)	NPS Total (lbs)
Current Estimates*	16,000	490	<100	160	17,000
Target Estimates*	9,600	300	<100	100	10,000

(Source: R. Wilson, personal communication, June 21, 2019)

NOTES
**Estimated using two significant figures*

2.4 Additional Information for Determining Critical Areas and Developing Implementation Strategies

Assessment data from the 2015 TMDL sampling event and data referenced in the 2018 *Biological and Water Quality Study of the St. Marys River and Tributaries, 2015, Technical Report EAS/2018-11-01* and the *2018 Integrated Report* were used in the development of this NPS-IS (OEPA, 2018a; OEPA, 2018b). Any additional documents and/or studies created by outside organizations that were used as supplemental information to develop this NPS-IS are referenced in Chapter 5 (Works Cited), as appropriate.

CHAPTER 3: CRITICAL AREA CONDITIONS & RESTORATION STRATEGIES

3.1 Overview of Critical Areas

Overall, three sampling sites are located in the **Black Creek HUC-12**. The macroinvertebrate communities at two of these three sites are not reaching the MWH attainment level, resulting in *Partial Attainment* at these two sampling locations. However, this impairment is not attributed to a traditional NPS cause or source. Instead, impairment at these locations is due to decreased rainfall during the summer of the biological study (2015), which in turn affected the natural hydrologic regime in Black Creek at sites located in the lower three miles. While improvements to habitat along this reach would be beneficial to aquatic communities and may potentially boost QHEI scores, no project is likely to address a naturally occurring cause of impairment such as rainfall.

Critical areas have been identified to address far-field effects of nutrients in Lake Erie, the end receiving waterbody of drainage from the **Black Creek HUC-12** (Figure 8)**.** As outlined by OEPA, nutrient reduction targets have been set for contributing sources of phosphorus. At this time, nutrient reduction strategies and projects have been identified for two critical areas contributing to far-field impairment (Table 10). Additional critical areas may be developed in subsequent versions of this NPS-IS.

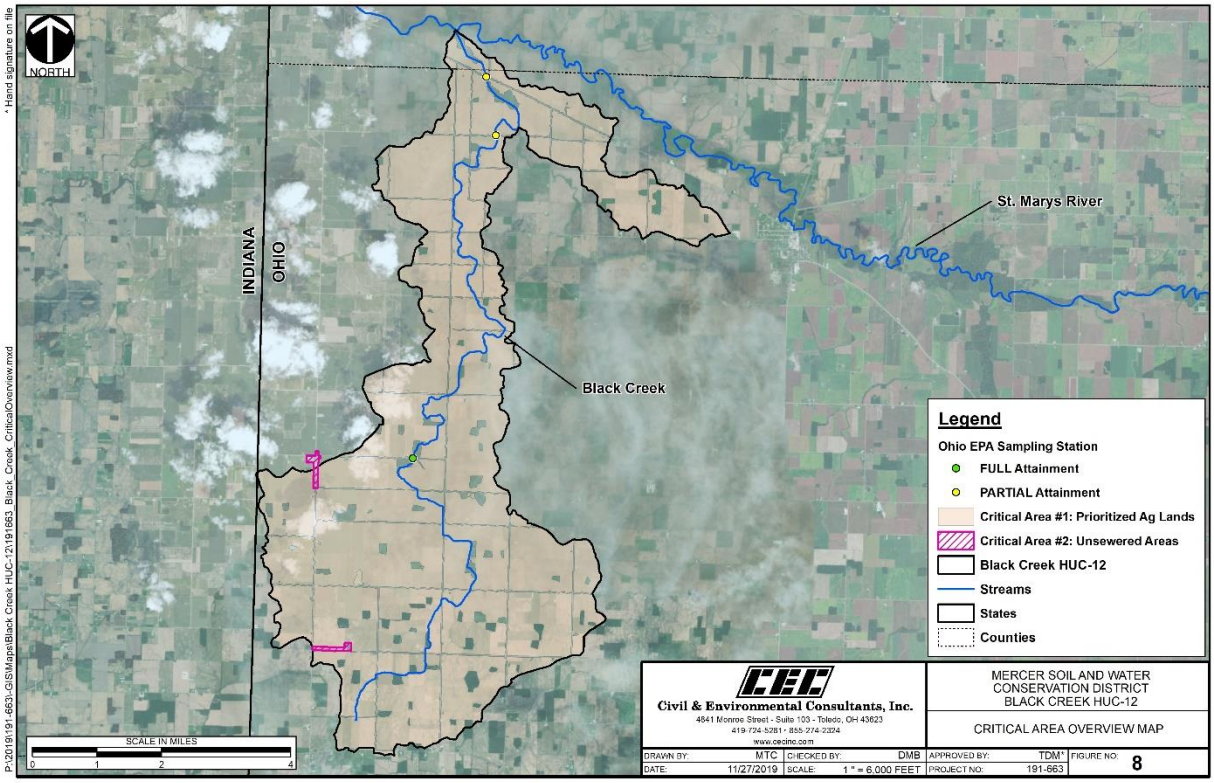

Figure 8: Black Creek HUC-12 Critical Area Overview

Table 10: Black Creek HUC-12 Critical Area Descriptions

Critical Area Number	Critical Area Description	Impairments Addressed
1	Nutrient Reduction in Prioritized Agricultural Lands	Far-field (Lake Erie)
2	Nutrient Reduction in Unsewered Areas	Far-field (Lake Erie)

3.2 Critical Area #1: Conditions, Goals & Objectives for Nutrient Reduction in Prioritized Agricultural Lands

3.2.1 Detailed Characterization

Ohio's Nutrient Mass Balance Study (OEPA, 2018c) estimated 88% of the nutrient loadings to Lake Erie via the Maumee River were primarily from nonpoint sources, related to land use activities, with only small contributions from failing HSTS and NPDES permitted facilities. This estimate is consistent with several other studies. Given the dominance of agricultural land use throughout the greater WLEB watershed, the use of best management practices (BMPs) are recommended for agricultural operations to minimize nutrient loss to local waterways and drainage ditches through surface and tile flow. While BMPs are encouraged on all agricultural lands, certain lands are more prone to nutrient loss than others and are prioritized for BMP implementation. *Critical Area #1* contains prioritized agricultural lands throughout the entire **Black Creek HUC-12** (Figure 9).

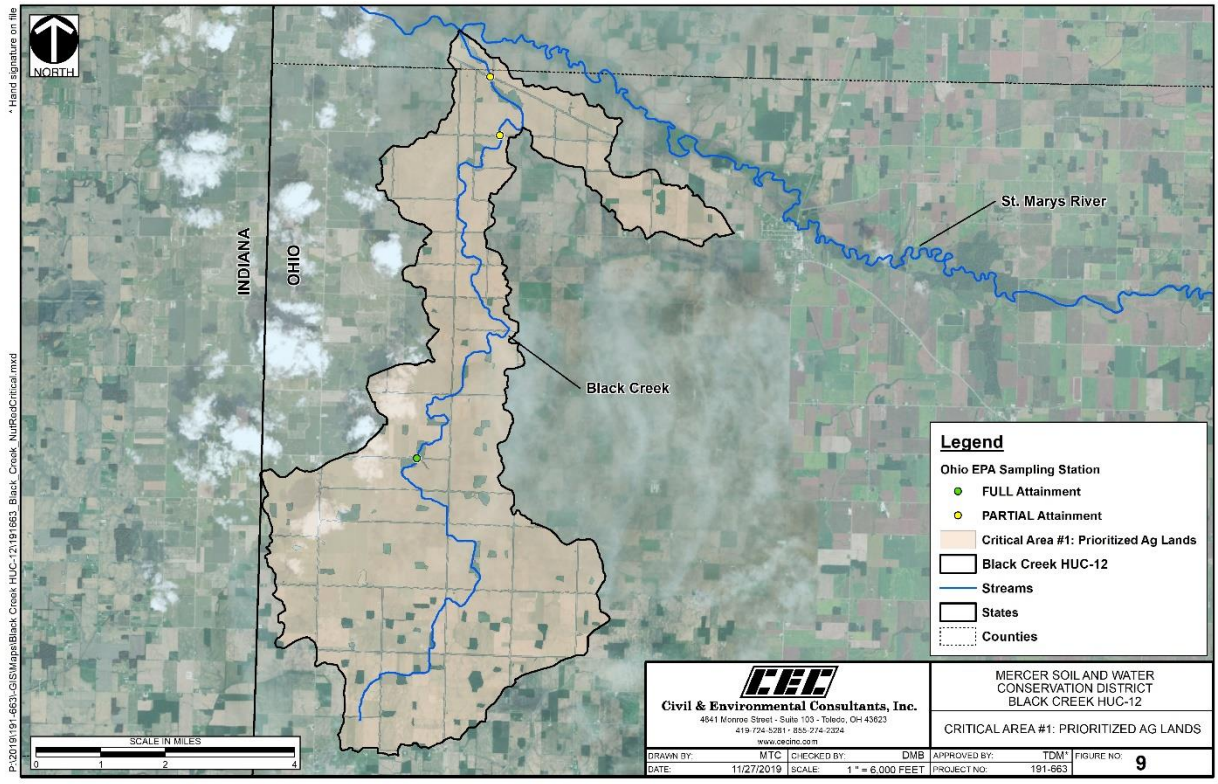

Figure 9: Black Creek HUC-12 Critical Area #1

Of the 17,263 crop acres in the **Black Creek HUC-12**, prioritized lands are operations that meet one or more of the following criteria:

- Lands directly adjacent to streams or drainage waterways
- Lands without a current (<3 years) nutrient management plan
- Lands with high soil phosphorus levels (>40 ppm Mehlich)
- Lands with recurrent gully erosion

3.2.2 Detailed Biological Conditions

Fish community data for the three sampling locations within **Black Creek HUC-12** are summarized below (Table 11). Analysis of the abundance, diversity and pollution tolerance of existing fish species found by OEPA at each sampling location, in relation to the corresponding QHEI score, aids in the identification of causes and sources of impairment. The fish communities at each of the three sampling locations scored well above the MWH WQS for IBI (goal for headwater sites = 20, wading sites = 22). Habitat characteristics at RM 10.70 and RM 2.50 also exceeded target MWH expectations (QHEI = 43.5), while RM 0.90 scored within a few points of the target value. MIWb scores at both wading sites (RM 2.50 and RM 0.90) are well above the minimum attainment value for the HELP Ecoregion (MIwb = 5.6). While the fish communities at all three sites are in attainment, pollution tolerant species are still abundant within Black Creek, as evidenced by the presence of species such as bluntnose minnows and green sunfish in notable amounts.

Table 11: Critical Area #1 – Fish Community and Habitat Data

Black Creek HUC-12 (04100004 03 02)							
RM	**Drainage Area (mi^2)**	**Total Species**	**QHEI**	**IBI**	**MIwb[a]**	**Predominant Species (Percent of Catch)**	**Narrative Evaluation**
Black Creek (MWH)							
10.70[H]	13.2	20	50.5	38	N/A	Johnny darter (26%), central stoneroller (21%), bluntnose minnow (20%)	Marginally Good
2.50[W]	25.0	34	45.8	43	9.6	Bluntnose minnow (12%), blackside darter (10%), Johnny darter (9%)[1]	Good - Exceptional
0.90[W]	54.0	29	40.8	34	9.2	Gizzard shad (23%), green sunfish (14%), Johnny darter (12%)[1]	Marginally Good - Very Good

(Source: OEPA, 2018b)

NOTES
QHEI Qualitative Habitat Evaluation Index
IBI Index of Biotic Integrity
a The Modified Index of Well Being (MIwb) is not applicable to headwater sites (drainage ≤20 mi^2).
H Headwater sample
W Wading sample
N/A Not applicable
1 Percentages based upon results from the first sampling pass in 2015.

Characteristics of the aquatic macroinvertebrate community for the Black Creek sampling locations in *Critical Area #1* are summarized below (Table 12). Again, analysis of the abundance, diversity, and pollution tolerance of existing aquatic macroinvertebrates (bugs) found by OEPA at these sampling locations, related to QHEI scores, can aid in the identification of causes and sources of impairment. The macroinvertebrate communities at RM 10.70 received a qualitative score of Fair, which generally equates to a numerical score between 14 and 28, with a mean of 21, falling within the nonsignificant departure range for MWH attainment (ICI goal = 22). Macroinvertebrate communities at this site were limited by poor substrate and lack of riffles. Macroinvertebrate communities at RM 2.50 were negatively affected by insufficient rainfall, resulting in a lowered water table and nearly interstitial flow condition (OEPA, 2018b). Communities at RM 0.90 were heavily influenced by a combination of the reduced rainfall with low gradient and proximity to the confluence with the St. Marys River, causing a ponded condition. While three *Ephemeroptera* (mayfly), *Plecoptera* (stonefly) and *Trichoptera* (caddisfly) (EPT) species were collected, no sensitive species were collected (OEPA, 2018b). Notably, both RM 2.50 and RM 0.90 received riffle scores of zero during the QHEI assessment, which is a large, habitat-related factor in the limited communities at each location.

Table 12: Critical Area #1 – Macroinvertebrate Community Data

Black Creek HUC-12 (04100004 03 02)		
RM	**ICI Score-Narrative**	**Predominant Species (Tolerance Categories)**
Black Creek (MWH)		
10.70[H]	NA – Fair 3 sensitive taxa	Turbellaria (F), Beetles (F, MT, T)
2.50[W]	16* - NA 1 sensitive taxa	Caddisflies (F), Midges (F, MT, T)
0.90[W]	18* - NA 0 sensitive taxa	Isopods (MT), Damselflies (F), Midges (F, MT, T)

(Source: Ohio EPA, 2018b)

NOTES

** Significant departure from ecoregion biocriteria; poor and very poor results are underlined.*

ns Nonsignificant departure from ecoregion biocriteria (<4 IBI or ICI units; <0.5 MIwb units).

a Narrative evaluation used in lieu of ICI (G=Good; MG=Marginally Good; F=Fair; L Fair=Low Fair; P=Poor; VP=Very Poor).

H Headwater sample

W Wading sample

Tolerance Categories: VT=Very Tolerant, T=Tolerant, MT=Moderately Tolerant, F=Facultative, MI=Moderately Intolerant, I=Intolerant.

3.2.3 Detailed Causes and Associated Sources

One of the three sampling locations (RM 10.70) within the **Black Creek HUC-12** is in *Full Attainment* of the MWH designation. The two locations in the lower segment of the creek (RM 2.50 and RM 0.90) are in *Partial Attainment* of the MWH designation, resulting from under-performing macroinvertebrate communities, attributed to natural flow dynamics at the time of sampling in 2015. While biological impairment within this critical area at a near-field level is not related to NPS contributions, an analysis of

the QHEI scoring shows an abundance of high- and moderate-influence MWH habitat attributes in Black Creek. Many of these habitat attributes (i.e., heavy/moderate silt cover, channelized, etc.) are likely a result of land use activities, which are mainly agricultural operations within the watershed.

From a far-field perspective, agricultural land use activities contribute to excessive nutrient loadings to Lake Erie that result in eutrophication and the formation of HABs. The use of a variety of BMPs on private agricultural lands, at both in-field and edge-of-field locations can help reduce the amount and concentration of nutrient-laden surface runoff and tile drainage. Many BMPs can not only address reduction of nutrients in surface and drainage water, but they can also simultaneously address the loss of sediment from agricultural lands, which contributes to sediment-covered substrates in local waterways. In addition, a reduction of sediment loss to local waterways can also reduce nutrient loss to near-field and far-field waterbodies, as nutrients will also adsorb to sediment particles, potentially becoming dissolved at a later time. The implementation of BMPs on agricultural lands that are prone to sediment and nutrient loss serves as a benefit for both near-field and far-field waterbodies.

3.2.4 Outline Goals and Objectives for the Critical Area

The overarching goal of any NPS-IS is to improve water quality scores or meet nutrient reduction goals in order to remove a waterbody's impairment status. Agricultural land use activities in *Critical Area #1* contribute to far-field impairment through excessive nutrient loss (phosphorus) to local waterways that flow to Lake Erie. Through the GLWQA Annex 4 and the subsequent DAP for the State of Ohio, nutrient target loads have been set for the Maumee River, which is the largest contributing waterbody to the WLEB and is fed by the St. Marys River, to which Black Creek is a tributary. These phosphorus target loads have been set at levels that are 40% lower than the current estimated loadings. Ohio's Nutrient Mass Balance Study has also shown that a large portion of the nutrient load to Lake Erie occurs during springtime rains (OEPA, 2018c).

Many objectives within the **Black Creek HUC-12** align with the priorities of the H2Ohio Initiative, a water quality initiative with a focus on phosphorus reduction. This program will provide economic incentives to producers who develop nutrient management plans for their fields and implement effective and cost-efficient BMPs that include: soil testing, variable rate fertilization, subsurface nutrient application, manure incorporation, conservation crop rotation, cover crops, drainage water management structures, two-stage ditch construction, edge of field buffers and headwaters and coastal wetlands that reduce agricultural runoff (H2Ohio, 2019).

Goals

The OEPA has modeled nutrient loadings associated with various land uses and sources within each HUC-12 in the Maumee River Basin, and has set phosphorus reduction goals for each associated source, based upon springtime load estimates. To achieve the desired phosphorus reduction from agricultural land use in the **Black Creek HUC-12**, the following goal has been established:

Goal 1. Reduce springtime phosphorus loading contributions in *Critical Area #1* to a level at or below 9,600 lbs/year (40% reduction).
NOT ACHIEVED: Current spring load contribution is estimated to be 16,000 lbs/year.

Objectives

In order to make substantive progress toward the achievement of the springtime phosphorus load reduction goal of 6,400 lbs for the **Black Creek HUC-12**, effort must commence on more widespread implementation, according to the following objectives within *Critical Area #1.*

Objective 1: Reduce erosion and nutrient loss through the installation of grassed waterways that receive/treat surface water from least 1,100 acres.

Objective 2: Reduce nutrient loss from subsurface tile drainage through the installation of drainage water management structures and/or saturated buffers that drain at least 500 acres.

Objective 3: Implement nutrient management planning on at least 10,000 additional acres[4].

Objective 4: Create, enhance and/or restore at least 150 acres of wetlands for treatment of agricultural runoff and/or nutrient reduction purposes from 3,750 total agricultural acres.

Objective 5: Plant cover crops on at least 50% of croplands (~8,600 acres) annually, resulting in plantings of at least 8,170 additional acres[5].

These objectives will be directed towards implementation on prioritized agricultural lands and are estimated to reach the phosphorus spring load reduction goal (Table 13). Additional conservation activities within the **Black Creek HUC-12**, both on priority and secondary lands, may also make incremental progress towards phosphorus reduction goals. The implementation of BMPs included in these objectives, as well as BMPs implemented through federal and state programs and other voluntary efforts will be tracked to monitor progress towards phosphorus reduction goals within the watershed.

[4] Certified nutrient management plans are currently in place for an estimated 540 acres within the Black Creek HUC-12.

[5] Cover crops are estimated to be planted on approximately 5% of agricultural fields. Cover crop plantings are not dependent upon grant funding.

Table 13: Estimated Nutrient Loading Reductions from Each Objective

Objective Number	Best Management Practice	Total Acreage Treated	Estimated Annual Phosphorus Load Reduction (lbs)	Estimated Spring Phosphorus Load Reduction (lbs)
1	Grassed Waterways[a]	1,100	440	280
2	Drainage Water Management Structures and Saturated Buffers	500	250	160
3	Nutrient Management (Planning and Implementation)[b]	10,000	6,000	3,900
4	Wetlands[c]	3,750[d]	1,970	1,280
5	Cover Crops	8,600	1,200	780
	TOTAL	**24,350***	**9,860**	**6,400**

(Source Model: Spreadsheet Tool for Estimating Pollutant Loads (STEPL), Version 4.4, (USEPA, 2019))

NOTES

a Grassed Waterways phosphorus reduction efficiency estimated from reference values listed in OSUE, 2018.

b Nutrient Management consists of "managing the amount (rate), source, placement (method of application) and timing of plant nutrients and soil amendments to budget, supply and conserve nutrients for plant production; to minimize agricultural nonpoint source pollution of surface and groundwater resources; to properly utilize manure or organic byproducts as a plant nutrient source; to protect air quality by reducing odors, nitrogen emissions (ammonia, oxides of nitrogen) and the formation of atmospheric particulates; and/or to maintain or improve the physical, chemical and biological condition of soil," as defined by the STEPL guidance documents (Tetra Tech, 2018).

c Phosphorus load reduction for wetlands was calculated using the estimated 5-year average cropland nutrient yield in the Maumee River watershed from 2013-2017 (1.05 lbs/acre phosphorus), provided by Heidelberg University National Center for Water Quality Research.

d If drainage water is routed through restored/created wetlands, it is assumed a 50% reduction in phosphorus from total nutrient yield for the drainage area, with a 25:1 ratio of drainage area to the receiving wetland. For this objective of 150 wetland acres, total drainage area is 3,750 acres.

** Total acreage treated exceeds number of agricultural land acres within watershed. More than one BMP may be implemented within fields.*

Water quality monitoring is an integral part of the project implementation process. Both project-specific and routinely scheduled monitoring will be conducted to determine progress towards meeting the goals (i.e., water quality standards and nutrient reduction targets). Through an adaptive management process, the aforementioned objectives will be reevaluated and modified as necessary. Objectives may be added to make further progress towards attainment or reduction goals, or altered, as a systems approach of multiple BMPs can accelerate the improvement of water quality conditions. The *Nonpoint Source Management Plan Update* (OEPA, 2013a) will be utilized as a reevaluation tool for its 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.

3.3 Critical Area #2: Conditions, Goals & Objectives for Nutrient Reduction from HSTS in Black Creek HUC-12

3.3.1 Detailed Characterization

Ohio's Nutrient Mass Balance Study (OEPA, 2018c) estimated a small percentage (4%) of the nutrient loadings to Lake Erie via the Maumee River were from contributions from failing HSTS (OEPA, 2018a). This estimate is consistent with estimates from several other studies. The OEPA has modeled nutrient loadings associated with various land uses and sources within each HUC-12 in the Maumee River Basin, and has set phosphorus reduction goals for each associated source, including failing or inefficient HSTS, based upon springtime load estimates. *Critical Area #2* contains the unsewered community of Chattanooga, an unincorporated area within Liberty Township, as well as a cluster of homes along Frahm Pike and State Route 49 (Figure 10).

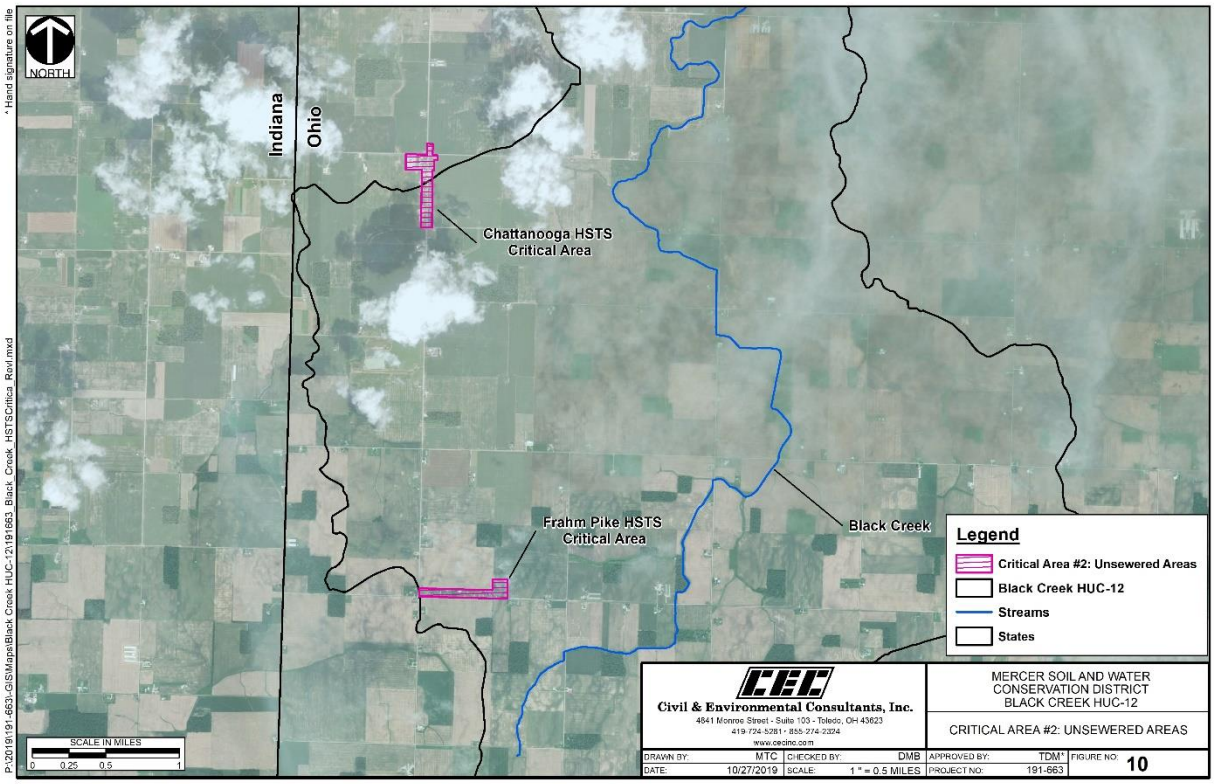

Figure 10: Black Creek HUC-12 Critical Area #2

The unincorporated community of Chattanooga covers approximately 34 acres of residential and commercial properties. The southern half of Chattanooga lies within the **Black Creek HUC-12**, while the northern half lies within the Duck Creek HUC-12. Black Creek flows parallel to Chattanooga approximately 1.5 miles to the east. The nearest open waterway to Chattanooga is within 0.25 miles, flowing through an agricultural field adjacent to residential lots on the western side of Chattanooga. TMACOG estimates that at least 35 residences and business operations are unsewered within this community.

The cluster of homes located along Frahm Pike/State Route 49 covers an area of approximately 26 acres. Aerial imagery shows a cluster of approximately 25 residences along this stretch.

3.3.2 Detailed Biological Conditions

Biological data do not exist for this critical area, as no streams or open ditches flow directly through Critical Area #2.

3.3.3 Detailed Causes and Associated Sources

In 2018, TMACOG identified the unincorporated area of Chattanooga as a CSA, an area of dense housing/business units within an unsewered area. Sanitary sewer improvements or efforts undertaken to repair failing or inefficient HSTS within CSAs will not only prevent the distribution of human waste into the environment, but would also help contribute to progress on meeting overall WLEB nutrient reduction goals set by the GLWQA and Ohio's DAP.

The area surrounding Frahm Pike and State Route 49 is an additional cluster of homes within a developing area of the **Black Creek HUC-12**. Though not as densely populated as the unincorporated area of Chattanooga, addressing HSTS issues in clustered areas through new infrastructure or replacement efforts is more feasible and efficient than in sparsely populated areas.

3.3.4 Outline Goals and Objectives for the Critical Area

The overarching goal of any NPS-IS is to improve water quality scores or meet nutrient reduction goals in order to remove a waterbody's impairment status. Elimination of HSTS nutrient contributions should be addressed to reduce the amount of fecal materials and nutrients introduced to the environment and local waterways. In order to meet the 40% overall nutrient reduction goals of the Ohio DAP, reductions in nutrient contributions from failing HSTS should also be considered. Using current estimates from the OEPA Division of Surface Water, springtime phosphorus load contributions from HSTS should be no more than 100 lbs. Current estimates are 160 lbs., resulting in the need of an overall reduction by 60 lbs.

Goals

The OEPA has modeled nutrient loadings associated with various land uses and sources within each HUC-12 in the Maumee River Basin, and has set phosphorus reduction goals for each associated source, based upon springtime load estimates. To achieve the desired phosphorus reduction from HSTS in the **Black Creek HUC-12**, the following goal has been established:

Goal 1. Reduce springtime phosphorus loading contributions in *Critical Area #2* to a level at or below 100 lbs/year (40% reduction).
NOT ACHIEVED: Current springtime load contribution is estimated to be 160 lbs/year.

TMACOG's HSTS study (2018) estimated the annual phosphorus load from the entire **Black Creek HUC-12** to be 0.17 metric tons per annum (MTA), with a total household count of 250. Using these numbers, an average household's yearly Total P contribution in this watershed is 0.00068 MTA, equivalent to

1.50 lbs per year within the **Black Creek HUC-12**. Using TMACOG's estimate of at least 35 households in the unincorporated area of Chattanooga, phosphorus loads could be reduced by 53 lbs annually, accounting for approximately 35 lbs for the springtime load. For the developing area around Frahm Pike, conversion of HSTS to sanitary sewer infrastructure or replacement of failing individual HSTS could reduce annual phosphorus loadings by an additional 33 lbs annually, equivalent to 21 lbs for springtime load. Approximately five additional failing HSTS outside of these identified CSAs would need to be replaced to fully meet the 60 lb springtime load reduction target. Sanitary sewer connection to isolated or sparsely populated areas is not likely.

Objectives

In order to achieve the springtime phosphorus load reduction goal for the **Black Creek HUC-12**, the following objectives need to be achieved within *Critical Area #2*.

Objective 1: Reduce HSTS contributions through replacement efforts for at least 35 households or sanitary sewer infrastructure in the unincorporated area of Chattanooga.

Objective 2: Reduce HSTS contributions through replacement efforts for at least 25 households or sanitary sewer infrastructure in the developing area of Frahm Pike/State Route 49.

Objective 3: Reduce HSTS contributions through replacement efforts for at least 5 households outside of the identified CSAs.

Water quality monitoring is an integral part of the project implementation process. Both project-specific and routinely scheduled monitoring will be conducted to determine progress towards meeting the goals (i.e., water quality standards and nutrient reduction targets). Through an adaptive management process, the aforementioned objectives will be reevaluated and modified as necessary. Objectives may be added to make further progress towards attainment or reduction goals, or altered, as a systems approach of multiple BMPs can accelerate the improvement of water quality conditions. The *Nonpoint Source Management Plan Update* (OEPA, 2013a) will be utilized as a reevaluation tool, as well as other state and federal agency resources for its listing of all eligible NPS management and nutrient reduction 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

Projects and evaluation needs identified for the **Black Creek HUC-12** are based upon identified causes and associated sources of NPS pollution. Over time, these critical areas will need to be reevaluated to determine progress towards meeting restoration, attainment and nutrient reduction goals. Time is an important variable in measuring project success and overall status when using biological indices as a measurement tool. Some biological systems may show fairly quick response (i.e., one season), while others may take several seasons or years to show progress towards recovery. In addition, reasons for the impairment other than those associated with NPS sources may arise. Those issues will need to be addressed under different initiatives, authorities or programs that may or may not be accomplished by the same implementers addressing the NPS issues.

Implementation of practices described in this NPS-IS plan will also contribute to nutrient load reduction (specifically the 40% reduction in phosphorus load) to protect and restore use attainment in Lake Erie. Nutrient load reduction efforts are consistent with the Lake Erie Collaborative Agreement through the International Joint Commission (IJC) and Ohio's DAP (OLEC, 2018).

For the **Black Creek HUC-12** there are two *Project and Implementation Strategy Overview Tables* (subsection 4.1 and 4.2). Future versions of this NPS-IS may include subsequent sections as more critical areas are refined and more projects become developed to meet the requisite objectives within a critical area. The projects described in the *Overview Table* have been prioritized using the following three-step prioritization method:

Priority 1 — Projects that specifically address one or more of the listed Objectives for the Critical Area.

Priority 2 — Projects where there is land-owner willingness to engage in 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 water quality in the **Black Creek HUC-12**.

Priority 3 — In an effort to generate interest in projects, an information and education campaign will be developed and delivered. Such outreach will engage citizens to spark interest by stakeholders to participate and implement projects like those mentioned in Priority 1 and 2.

Project Summary Sheets (PSS) are in subsection 4.1.1 and 4.2.1; these provide the essential nine elements for short-term and/or next step projects that are in development and/or in need of funding. As projects are implemented and new projects developed, these sheets will be updated. Any new PSS created will be submitted to the state of Ohio for funding eligibility verification (i.e., all nine elements are included).

4.1 Critical Area #1 Project and Implementation Strategy Overview Tables

Table 14: Black Creek HUC-12 (04100004 03 02) — Critical Area #1							
Goal	**Objective**	**Project #**	**Project Title (EPA Criteria g)**	**Lead Organization (EPA 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							
Altered Stream and Habitat Restoration Strategies							
Agricultural Nonpoint Source Reduction Strategies							
1	1	1	Grassed Waterway Installation	Mercer SWCD/ Mercer Ag Solutions	Short (1-3 yrs)	$60,000	Ohio EPA §319, GLRI, H2Ohio, GLC, NRCS-USDA CRP
1	3	2	Agricultural BMPs – Nutrient Management Planning	Mercer SWCD/ Mercer Ag Solutions	Short (1-3 yrs)	$55,000	Ohio EPA §319, GLRI, H2Ohio, GLC, NRCS-USDA CRP
1	2, 4	3	Agricultural BMPs – Program for Drainage Water Management Structures, Saturated Buffers, Grassed Waterways and Wetlands	Mercer SWCD/ Mercer Ag Solutions	Short (1-3 yrs)	$220,000	Ohio EPA §319, GLRI, H2Ohio, GLC, NRCS-USDA CRP
1	5	4	Agricultural BMPs – Cover Crops	Mercer SWCD/ Mercer Ag Solutions	Short (1-3 yrs)	$28,000	H2Ohio, GLRI, GLC, NRCS-USDA CRP
High Quality Waters Protection Strategies							
Other NPS Causes and Associated Sources of Impairment							

4.1.1 Project Summary Sheet(s)

The Project Summary Sheets provided below were developed based on the actions or activities needed to achieve nutrient reduction targets in the **Black Creek HUC-12**. These projects are considered next step or priority/short term projects and are considerably ready to implement. Medium and longer-term projects will not have a Project Summary Sheet, as these projects are not ready for implementation or need more thorough planning.

Table 15: Critical Area #1 – Project #1		
Nine Element Criteria	**Information needed**	**Explanation**
n/a	**Title**	Grassed Waterway Installation
criteria d	**Project Lead Organization & Partners**	Mercer Soil and Water Conservation District; Mercer County Ag Solutions
criteria c	**HUC-12 and Critical Area**	Black Creek HUC-12 (04100004 03 02) – *Critical Area #1*
criteria c	**Location of Project**	Private landowner – exact location not disclosed, but near the intersection of Erastus Durbin and Oregon Roads
n/a	**Which strategy is being addressed by this project?**	Agricultural Nonpoint Source Reduction
criteria f	**Time Frame**	Short (1-3 years)
criteria g	**Short Description**	Install grassed waterways to treat at least 200 acres of drainage area in an agricultural field impacted by gully erosion.
criteria g	**Project Narrative**	Mercer SWCD will work with a local landowner in a prioritized agricultural land to install 1 – 3 acres (1,100-3,300 feet) of grassed waterway in areas impacted by gully erosion. This waterway will filter surface water from approximately 200 acres of cultivated cropland before water is routed to an unnamed tributary to (Big) Black Creek, which eventually leads to the St. Marys River. This project summary sheet may be combined with other project summary sheets to form a singular project, which could be delivered as a program, according to funding source, timing considerations and identification of landowner needs.
criteria d	**Estimated Total cost**	$60,000
criteria d	**Possible Funding Source**	Ohio EPA §319, GLRI, H2Ohio, GLC, NRCS-USDA CRP
criteria a	**Identified Causes and Sources**	Cause: Nutrient loadings, leading to far-field impacts Source: Agricultural land use activities
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	Objective #1: Reduce erosion and nutrient loss through the installation of grassed waterways that receive/treat surface water from least 1,100 acres.

Table 15: Critical Area #1 – Project #1		
Nine Element Criteria	**Information needed**	**Explanation**
	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	Objective #1: Reduce erosion and nutrient loss through the installation of grassed waterways that receive/treat surface water from least 200 acres of 1,100 acres. (18%) Goals: The overall goal in *Critical Area #1* is to reduce estimated total spring phosphorus loads. Current estimates indicate 16,000 lbs. of phosphorus in the spring load is attributed to agricultural land use activities. In order to meet the GLWQA nutrient reduction goals, spring loadings must be reduced by 40%, or 6,400 lbs. It is expected that this project will cause a decrease in spring phosphorus loadings by 50 lbs, or 0.8%.
	Part 3: Load Reduced?	Estimated annual reduction: 283 #N/year; 75 #P/year; 51 tons sediment/year
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	Mercer SWCD will verify installation of the grassed waterway. It is generally unrealistic to monitor load reduction from individual agricultural practices; however, ambient monitoring is conducted throughout the WLEB by organizations such as OEPA, NOAA, and Heidelberg University. These entities will continue long term monitoring on various tributaries in the Maumee basin to track load reduction trends.
criteria e	**Information and Education**	Project information will be shared at the Mercer SWCD annual meeting and in their brochure of accomplishments. Project highlights will also be shared on social media and/or Mercer SWCD's website.

Table 16: Critical Area #1 – Project #2		
Nine Element Criteria	**Information needed**	**Explanation**
n/a	**Title**	Agricultural BMPs – Nutrient Management Planning
criteria d	**Project Lead Organization & Partners**	Mercer Soil and Water Conservation District; Mercer County Ag Solutions
criteria c	**HUC-12 and Critical Area**	Black Creek HUC-12 (04100004 03 02) – *Critical Area #1*
criteria c	**Location of Project**	Private landowners – exact location not disclosed
n/a	**Which strategy is being addressed by this project?**	Agricultural Nonpoint Source Reduction
criteria f	**Time Frame**	Short (1-3 years)
criteria g	**Short Description**	Create nutrient management plans
criteria g	**Project Narrative**	Mercer SWCD will work with local landowners in prioritized agricultural lands to create nutrient management plans for 5-8 operations (~1,400 acres) that meet one or more criteria for prioritized agricultural lands within the Black Creek HUC-12. This project summary sheet may be combined with other project summary sheets to form a singular project, which could be delivered as a program, according to funding source, timing considerations and identification of landowner needs.
criteria d	**Estimated Total cost**	$55,000
criteria d	**Possible Funding Source**	Ohio EPA §319, GLRI, H2Ohio, GLC, NRCS-USDA CRP
criteria a	**Identified Causes and Sources**	Cause: Nutrient loadings, leading to far-field impacts Source: Agricultural land use activities
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	Objective #3: Implement nutrient management planning on at least 9,015 acres.
	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	Objective #3: Implement nutrient management planning on at least 1,400 acres of 10,000 acres. (14%) Goals: The overall goal in *Critical Area #1* is to reduce estimated total spring phosphorus loads. Current estimates indicate 16,000 lbs. of phosphorus in the spring load is attributed to agricultural land use activities. In order to meet the GLWQA nutrient reduction goals, spring loadings must be reduced by 40%, or 6,400 lbs. It is expected that this project will cause a decrease in spring phosphorus loadings by 1,080 lbs, or 17%.
	Part 3: Load Reduced?	Estimated annual reduction: 2,705 #N/year; 1,660 #P/year; sediment reduction not applicable

Table 16: Critical Area #1 – Project #2		
Nine Element Criteria	**Information needed**	**Explanation**
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	It is generally unrealistic to monitor load reduction from individual agricultural practices; however, ambient monitoring is conducted throughout the WLEB by organizations such as OEPA, NOAA, and Heidelberg University. These entities will continue long term monitoring on various tributaries in the Maumee basin to track load reduction trends. In addition, Mercer SWCD will conduct follow-up activities, as deemed necessary, to document nutrient management plan implementation.
criteria e	**Information and Education**	Project information will be shared at the Mercer SWCD annual meeting and in their brochure of accomplishments. Project highlights will also be shared on social media and/or Mercer SWCD's website.

Table 17: Critical Area #1 – Project #3		
Nine Element Criteria	**Information needed**	**Explanation**
n/a	**Title**	Agricultural BMPs – Program for Drainage Water Management Structures, Saturated Buffers, Grassed Waterways and Wetlands
criteria d	**Project Lead Organization & Partners**	Mercer Soil and Water Conservation District; Mercer County Ag Solutions
criteria c	**HUC-12 and Critical Area**	Black Creek HUC-12 (04100004 03 02) – *Critical Area #1*
criteria c	**Location of Project**	Private landowners – exact locations not disclosed
n/a	**Which strategy is being addressed by this project?**	Agricultural Nonpoint Source Reduction
criteria f	**Time Frame**	Short (1-3 years)
criteria g	**Short Description**	Cost share program to implement a suite of agricultural best management practices including drainage water management structures, saturated buffers, grassed waterways and wetlands.
criteria g	**Project Narrative**	Mercer SWCD will work with local landowners in prioritized agricultural lands to enroll and implement one or more components of the Agricultural BMP project, installing drainage water management structures, saturated buffers, grassed waterways and wetlands where best suited. Drainage water management structures will be installed in tiles that drain at least 15 acres, while fields with drainage areas of at least 30 acres will be coupled with saturated buffers, if suitable; grassed waterways will be focused in areas of gully erosion; and site specific, agricultural lands will be converted to wetlands by disconnecting fields from current drainage systems and replanting with native wetland vegetation. This project's goal will look to install at least six drainage water management structures, one saturated buffer, one ten-acre wetland and one grassed waterway.
criteria d	**Estimated Total cost**	$220,000
criteria d	**Possible Funding Source**	Ohio EPA §319, GLRI, H2Ohio, GLC, NRCS-USDA CRP
criteria a	**Identified Causes and Sources**	Cause: Nutrient loadings, leading to far-field impacts Source: Agricultural land use activities
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	Objective #1: Reduce erosion and nutrient loss through the installation of grassed waterways that receive/treat surface water from least 1,100 acres. Objective #2: Reduce nutrient loss from subsurface tile drainage through the installation of drainage water management structures and/or saturated buffers that drain at least 300 acres. Objective #4: Create, enhance and/or restore at least 175 acres of wetlands for treatment of agricultural runoff and/or nutrient reduction purposes from 4,375 total agricultural acres.
	Part 2: How much of the needed improvement for the whole Critical	Objective #1: Reduce erosion and nutrient loss through the installation of grassed waterways that receive/treat surface water from least 200 of 1,100 acres (18% and 75 lbs P/year).

Table 17: Critical Area #1 – Project #3		
Nine Element Criteria	**Information needed**	**Explanation**
	Area is estimated to be accomplished by this project?	Objective #2: Reduce nutrient loss from subsurface tile drainage through the installation of drainage water management structures and/or saturated buffers that drain at least 100 of 500 acres (20% and 60.7 lbs P/year). Objective #4: Create, enhance and/or restore at least 10 acres of 150 acres of wetlands for treatment of agricultural runoff and/or nutrient reduction purposes from 3,750 total agricultural acres. (7% and 131 lb P/year) Goals: The overall goal in *Critical Area #1* is to reduce estimated total spring phosphorus loads. Current estimates indicate 16,000 lbs. of phosphorus in the spring load is attributed to agricultural land use activities. In order to meet the GLWQA nutrient reduction goals, spring loadings must be reduced by 40%, or 6,400 lbs. It is expected that this project will cause a decrease in spring phosphorus loadings by 173 lbs, or 2.7%.
	Part 3: Load Reduced?	Estimated annual reduction: 3,023 #N/year; 266 #P/year; 77.6 tons sediment/year
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	Mercer SWCD will verify installation of all BMPs. It is generally unrealistic to monitor load reduction from individual agricultural practices; however, ambient monitoring is conducted throughout the WLEB by organizations such as OEPA, NOAA, and Heidelberg University. These entities will continue long term monitoring on various tributaries in the Maumee basin to track load reduction trends.
criteria e	**Information and Education**	Project information will be shared at the Mercer SWCD annual meeting and in their brochure of accomplishments. Project highlights will also be shared on social media and/or Mercer SWCD's website.

Table 18: Critical Area #1 – Project #4		
Nine Element Criteria	**Information needed**	**Explanation**
n/a	**Title**	Agricultural BMPs – Cover Crops
criteria d	**Project Lead Organization & Partners**	Mercer Soil and Water Conservation District; Mercer County Ag Solutions
criteria c	**HUC-12 and Critical Area**	Black Creek HUC-12 (04100004 03 02) – *Critical Area #1*
criteria c	**Location of Project**	Private landowners – exact locations not disclosed
n/a	**Which strategy is being addressed by this project?**	Agricultural Nonpoint Source Reduction
criteria f	**Time Frame**	Short (1-3 years)
criteria g	**Short Description**	Cost share program to implement cover crop plantings.
criteria g	**Project Narrative**	Mercer SWCD will administer a cost-share program to local landowners in prioritized agricultural lands to plant cover crops on at least 1,000 acres annually. Landowners will enroll no less than 10 acres minimally, and the maximum amount enrolled by one operation will not exceed 400 acres. Cost-share will pay out at $25 per acre.
criteria d	**Estimated Total cost**	$28,000
criteria d	**Possible Funding Source**	H2Ohio, GLRI, GLC, NRCS-USDA CRP, EQIP
criteria a	**Identified Causes and Sources**	Cause: Nutrient loadings, leading to far-field impacts Source: Agricultural land use activities
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	Objective #5: Plant cover crops on at least 8,600 acres annually, resulting in plantings of at least 8,170 additional acres.
	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	Objective #5: Plant cover crops on at least 1,000 acres of 8,600 acres annually, resulting in plantings of at least 8,170 additional acres. (12%). Goals: The overall goal in *Critical Area #1* is to reduce estimated total spring phosphorus loads. Current estimates indicate 16,000 lbs. of phosphorus in the spring load is attributed to agricultural land use activities. In order to meet the GLWQA nutrient reduction goals, spring loadings must be reduced by 40%, or 6,400 lbs. It is expected that this project will cause a decrease in spring phosphorus loadings by 91 lbs, or 1.4%.
	Part 3: Load Reduced?	Estimated annual reduction: 1,380 #N/year; 140 #P/year; 41 tons sediment/year
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	Mercer SWCD will verify cover crop plantings. It is generally unrealistic to monitor load reduction from individual agricultural practices; however, ambient monitoring is conducted throughout the WLEB by organizations such as OEPA, NOAA, and Heidelberg University. These entities will continue long term monitoring on various tributaries in the Maumee basin to track load reduction trends.

Table 18: Critical Area #1 – Project #4		
Nine Element Criteria	**Information needed**	**Explanation**
criteria e	**Information and Education**	Project information will be shared at the Mercer SWCD annual meeting and in their brochure of accomplishments. Project highlights will also be shared on social media and/or Mercer SWCD's website.

4.2 Critical Area #2 Project and Implementation Strategy Overview Table

Table 19: Black Creek HUC-12 (04100004 03 02) — Critical Area #2							
Goal	**Objective**	**Project #**	**Project Title (EPA Criteria g)**	**Lead Organization (EPA 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							
Altered Stream and Habitat Restoration Strategies							
High Quality Waters Protection Strategies							
Other NPS Causes and Associated Sources of Impairment							
1	1,2	-	HSTS Replacement and/or Sanitary Sewer Infrastructure	TBD	TBD	TBD	TBD

At this time, no short-term projects have been identified for Critical Area #2; therefore, no Project Summary Sheets are included.

CHAPTER 5: WORKS CITED

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