Nine-Element Nonpoint Source Implementation Strategy (NPS-IS) for Miller City Cutoff HUC-12 (04100008 06 03)

Prepared for:
Putnam Soil and Water Conservation District

Prepared by:
Civil & Environmental Consultants, Inc.
Toledo, Ohio

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Acknowledgements

Version 1.0 prepared and written by:

Curt Tobe
Sarah Rieman
Putnam Soil and Water Conservation District
1206 E. Second Street
Ottawa, OH 45875

Deanna Bobak
Amy Towell
Civil & Environmental Consultants, Inc.
4841 Monroe Street, Suite 103
Toledo, OH 43623

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Cover photo: Miller City Cutoff. Photo courtesy of Civil & Environmental Consultants, Inc.

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
BRWP	Blanchard River Watershed Partnership
C	
CAFF	Confined Animal Feeding Facility
CAFO	Concentrated Animal Feeding Operation
CRP	Conservation Reserve Program
CSA	Critical Sewage Area
D	
DAP	Domestic Action Plan
DO	Dissolved Oxygen
E	
E. coli	*Escherichia coli*
ECHO	Enforcement and Compliance History Online
EPT	*Ephemeroptera, Plecoptera* and *Trichoptera* – sensitive macroinvertebrate species
EQIP	Environmental Quality Incentives Program
F	
FLS	Federally Listed Species
FOTG	Field Office Technical Guide
FSA	Farm Service Agency
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	Metric Tons per Annum
MWH	Modified Warmwater Habitat

N

NH_3	Nitrogen, as Ammonia
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NPS-IS	Nonpoint Source-Implementation Strategy
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory

O

O&M	Operations and Maintenance
ODA	Ohio Department of Agriculture
ODH	Ohio Department of Health
ODNR	Ohio Department of Natural Resources
Ohio EPA	Ohio Environmental Protection Agency
OpTIS	Operational Tillage Information System
OLEC	Ohio Lake Erie Commission
OSU	Ohio State University

P

PAD-US	Protected Areas Database of the United States

Q

QHEI	Qualitative Habitat Evaluation Index

R

RM	River Mile

S

SNC	Significant Noncompliance
SWCD	Soil and Water Conservation District

T

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

U

USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

V

VNMP	Voluntary Nutrient Management Plan
VRT	Variable Rate Technology

W

WAP	Watershed Action Plan
WLEB	Western Lake Erie Basin
WQS	Water Quality Standards (Ohio Administrative Code 3745-1)
WWH	Warmwater Habitat
WWTP	Wastewater Treatment Plant

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CHAPTER 1: INTRODUCTION

The **Miller City Cutoff Hydrologic Unit Code (HUC)-12 (04100008 06 03)** is located in northern Putnam County, Ohio. It contains a watershed of 22.64 square miles (Figure 1). The **Miller City Cutoff HUC-12** wholly contains Caton Ditch, a direct tributary to the Blanchard River. The watershed is primarily rural, and the dominant land use is cultivated cropland (~90%). The **Miller City Cutoff HUC-12** lies within the Western Lake Erie Basin (WLEB) watershed, which currently is the focus of state and federal funding for 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.

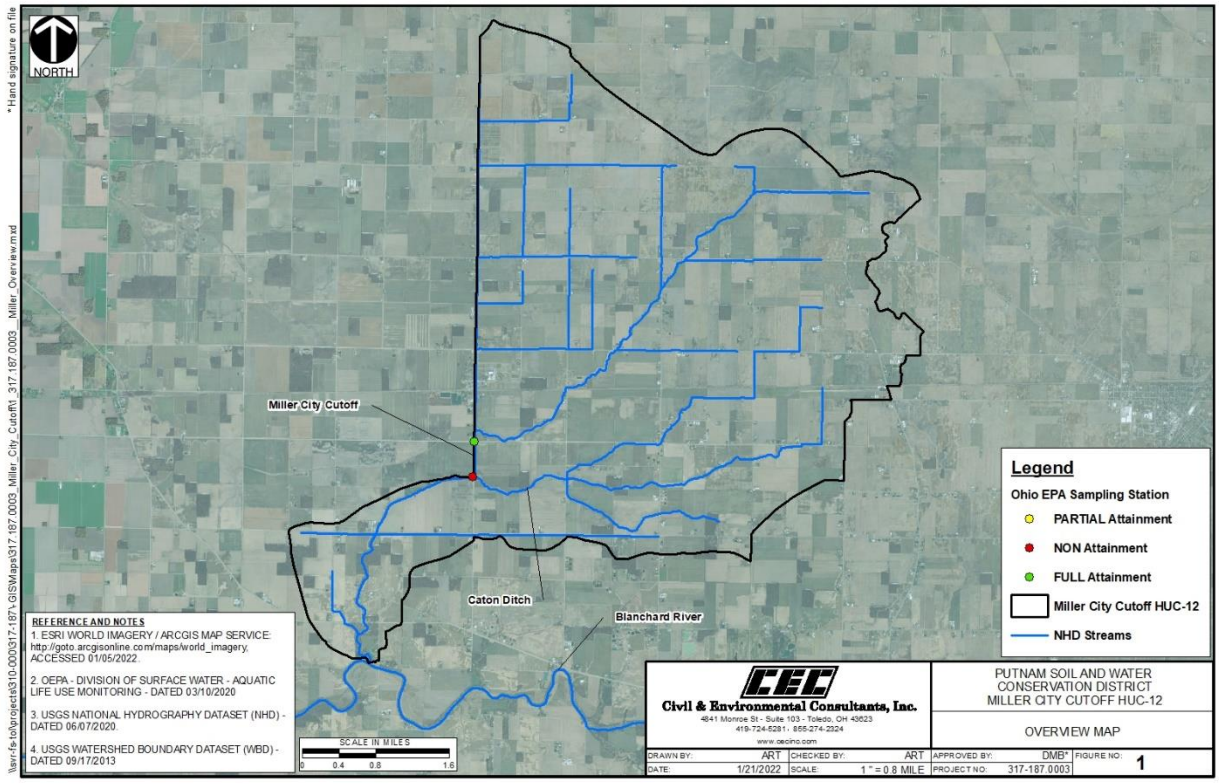

Figure 1: Miller City Cutoff HUC-12 Overview

1.1 Report Background

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 (Table 1). 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. The Ohio Environmental Protection Agency (Ohio EPA) has historically supported watershed-based planning in many forms (Ohio EPA, 2016).

Table 1: Nine Elements for Watershed Plans and Implementation Projects

Element	Description
a	Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve load reductions
b	Load reductions expected from management measures described under element (c) below
c	Description of the NPS measures that need to be implemented to achieve load reductions estimated under element (b) above and an identification of the critical areas in which those measures will be needed to implement this plan
d	An estimate of the amounts of technical and financial assistance needed, associated costs and/or sources and authorities that will be relied upon to implement this plan
e	An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing and implementing the NPS management measures that will be implemented
f	A schedule for implementing the NPS measures identified in this plans that is reasonably expeditious
g	A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented
h	A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards
i	A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under element (h) above

(Source: USEPA, 2008)

In 1997, Ohio EPA issued guidance for the development of Watershed Action Plans (WAP), 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 (Ohio EPA, 2016). In response, Ohio EPA developed a new template for watershed planning in the form of a Nonpoint Source-Implementation Strategy (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).

State of Ohio Domestic Action Plan

The state of Ohio has had a long history of identifying problems and combating Harmful Algal Blooms (HABs) within Lake Erie (OLEC, 2020). After successfully abating nutrient enrichment in the 1980s, the occurrence and severity of HABs within Lake Erie began to increase in the mid-1990s. Building on efforts initiated by the Ohio Phosphorus Task Force, Ohio participated at the federal level in the Great Lakes Water Quality Agreement (GLWQA) of 2010. Along with Michigan and Ontario, Ohio committed to a goal of reducing phosphorus loadings to Lake Erie by 40% in both 2015 and in 2019 through signing the Lake Erie Collaborative Agreement, leading to the precursor of Ohio's Domestic Action Plan (DAP).

In 2018, all sub-watersheds (HUC-12s) within the Ohio portions of the Auglaize HUC-8 (including the Ottawa River, Little Auglaize River and Little Flatrock Creek), the Blanchard HUC-8 (including Eagle Creek), the St. Marys HUC-8 and the Platter Creek HUC-12 were recommended for designation as a "Watershed in Distress". This recommendation was due to relatively higher concentrations of phosphorus in surface waters contributing to 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 GLWQA and the subsequent DAP developed by the State of Ohio (ODA, 2018). As a result, nutrient loadings were modeled and reduction targets were set for these priority areas, as well as all sub-watersheds within the WLEB.

Miller City Cutoff HUC-12 NPS-IS

The development of NPS-IS is critical to the efforts focused on implementing Ohio's 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 *Miller City Cutoff HUC-12 NPS-IS* is sponsored and developed by the Putnam Soil and Water Conservation District (SWCD) through a grant provided by the Ohio EPA. The coordination of this NPS-IS for the **Miller City Cutoff HUC-12** is a continuation of formalized watershed planning efforts led by the Putnam SWCD throughout the county, and builds upon planning efforts conducted by the Blanchard River Watershed Partnership (BRWP) within the greater Blanchard River watershed.

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

Removal of NPS impairments and reduction in overall nutrient loss within the **Miller City Cutoff HUC-12** is crucial to the attainment and maintenance of aquatic life use (ALU) standards within Caton Ditch, the Miller City Cut-off and its tributaries. Furthermore, removal of NPS impairments and reduction in overall nutrient loss will reduce the severity, extent and occurrence of HABs within the WLEB. Within the **Miller City Cutoff HUC-12**, Miller City Cutoff is in *Full Attainment* of its Warmwater Habitat (WWH) designation, while Caton Ditch is in *Non-Attainment* of its Modified Warmwater Habitat (MWH) designation due to direct habitat alterations, flow alterations and nutrient and organic enrichment from agricultural-related crop production and channelization. Nutrient loadings from the **Miller City Cutoff HUC-12** also 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 **Miller City Cutoff 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 sub-basins at the

HUC-8 level, including the Auglaize, St. Joseph, St. Marys, Blanchard, Tiffin, Ottawa-Stony, River Raisin, Cedar-Portage, Upper Maumee and Lower Maumee watersheds. The Blanchard HUC-8 (04100008) drains approximately 771 square miles (493,434 acres) and wholly contains the Blanchard River (approximately 104 miles) from its headwaters near in Hardin County, to its confluence with the Auglaize River west of Dupont in Putnam County, Ohio (BRWP, 2020; Ohio EPA, 2022b).

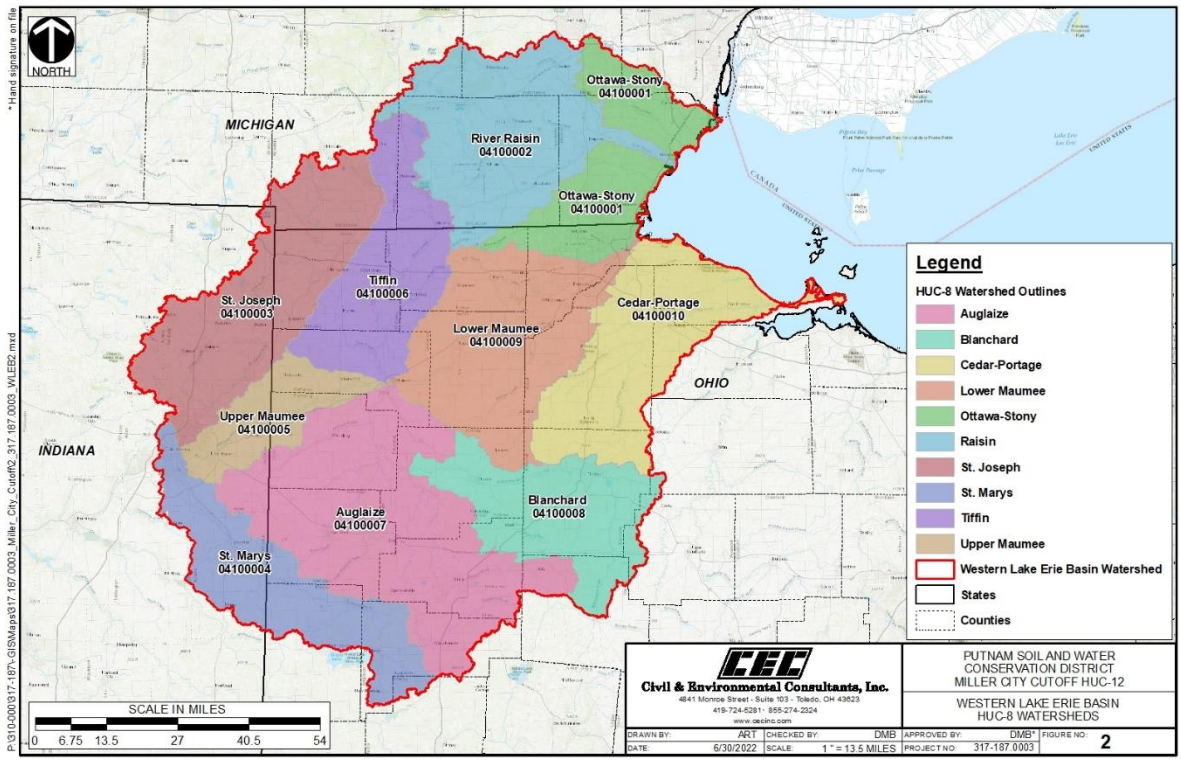

Figure 2: Western Lake Erie Basin Watershed

The Blanchard River rises just north of Kenton, Ohio and flows north from Hardin County to Findlay, Ohio, where it continues westerly until it empties into the Auglaize River at River Mile (RM) 26.2 in western Putnam County. Its largest tributaries include Cranberry Creek, Riley Creek, Ottawa Creek, Eagle Creek, Lye Creek and The Outlet. The Blanchard HUC-8 can be broken down into six main HUC-10 watersheds: the *Headwaters Blanchard River HUC-10,* the *Lye Creek-Blanchard River HUC-10, Eagle Creek-Blanchard River HUC-10*, *Riley Creek HUC-10, Ottawa Creek-Blanchard River HUC-10* and the *Cranberry Creek-Blanchard River HUC-10* (Figure 3).

The *Cranberry Creek-Blanchard River HUC-10* has a drainage area of 148.57 square miles (~95,082 acres) (Table 2). Land use within the *Cranberry Creek-Blanchard River HUC-10* is mainly agricultural and rural. The largest community found within the *Cranberry Creek-Blanchard River HUC-10* is the village of Ottawa, Ohio which is residence to 4,456 people (US Census Bureau, 2020). The *Cranberry Creek-Blanchard River HUC-10* is further divided into five HUC-12 watersheds, one of which is the **Miller City Cutoff HUC-12.** The **Miller City Cutoff HUC-12** contains the Miller City Cutoff, which is a man-made diversion channel for the headwaters of South Powell Creek and Caton Ditch, a direct tributary to the

Blanchard River (Figure 3). The **Miller City Cutoff HUC-12** is similar in land use characteristics as the greater HUC-10 watershed and supports mainly agricultural activities. Formerly, lands in this region formed a large wetland complex known as the Great Black Swamp. Once drained, the Great Black Swamp yielded the fertile soils that are cultivated today.

Table 2: Sub-watersheds in the Cranberry Creek-Blanchard River HUC-10

Cranberry Creek-Blanchard River HUC-10 (04100008 06)		
HUC-12	**Area (Square miles)**	**Area (Acres)**
Cranberry Creek (01)	45.26	28,963.35
Pike Run-Blanchard River (02)	28.64	18,327.47
Miller City Cutoff (03)	22.64	14,491.03
Bear Creek (04)	12.67	8,110.51
Deer Creek-Blanchard River (05)	39.36	25,189.83

(Source: Ohio EPA, 2020a)

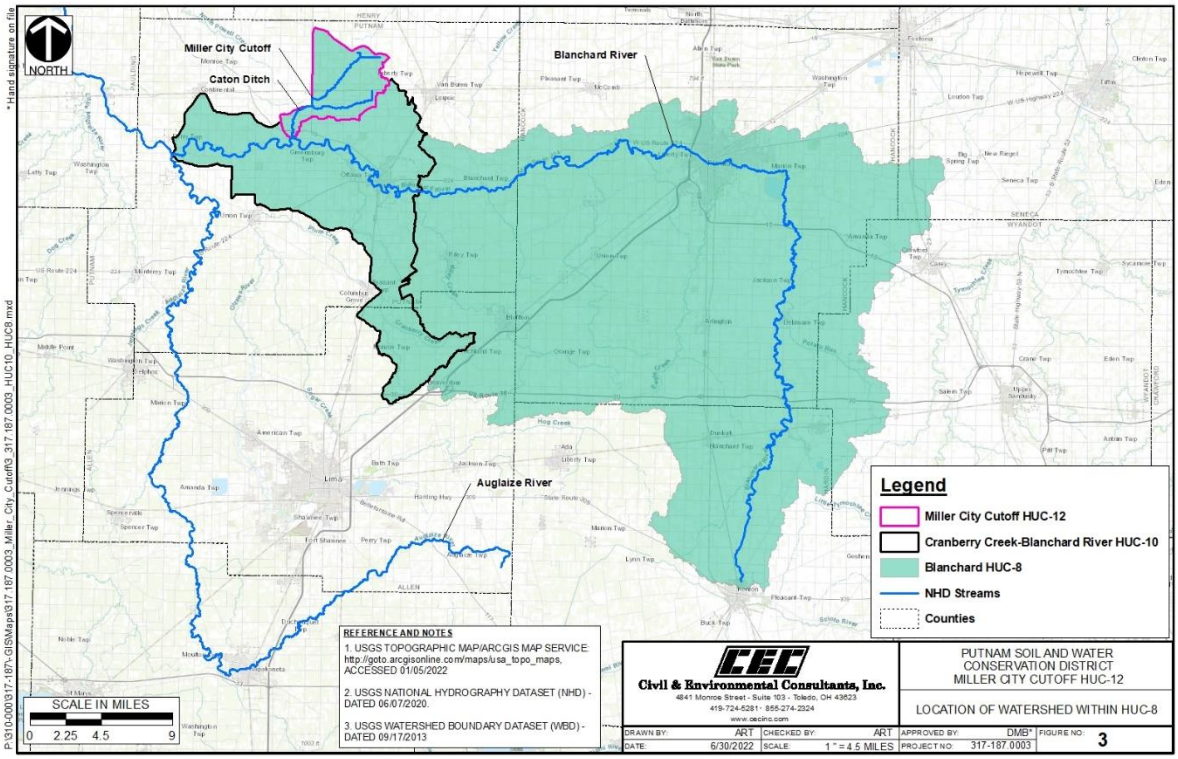

Figure 3: Location of the Miller City Cutoff HUC-12

The Great Black Swamp

Large parts of the Maumee River, Maumee Bay and Lake Erie drainage areas were once covered by the Great Black Swamp, an area approximately 120 miles long by 40 miles wide (Figure 4). This swamp, formed more than 20,000 years ago by retreating glaciers, was dominated by clay-rich soils with low permeability and dense vegetation. The difficulty associated with travel through the dense, swampy,

insect-populated terrain left this one of the last areas of Ohio to be developed. In 1859, a law provided for the installation of public ditches, and by 1900, a vast system of ditches had drained the majority of the area to allow crop production on this fertile land. Estimates suggest there are three times as many man-made ditches as there are natural streams (by length) throughout this region. Ditches that do not have adequate buffer space or are in direct contact with farmland provide a means for sediment and nutrient runoff to enter tributaries that flow to Lake Erie. Low permeability soils and a flat landscape result in flooding during average rain events, which accelerates runoff into ditches, resulting in an area that would benefit from floodplain expansion and wetland restoration (Maumee RAP, 2006).

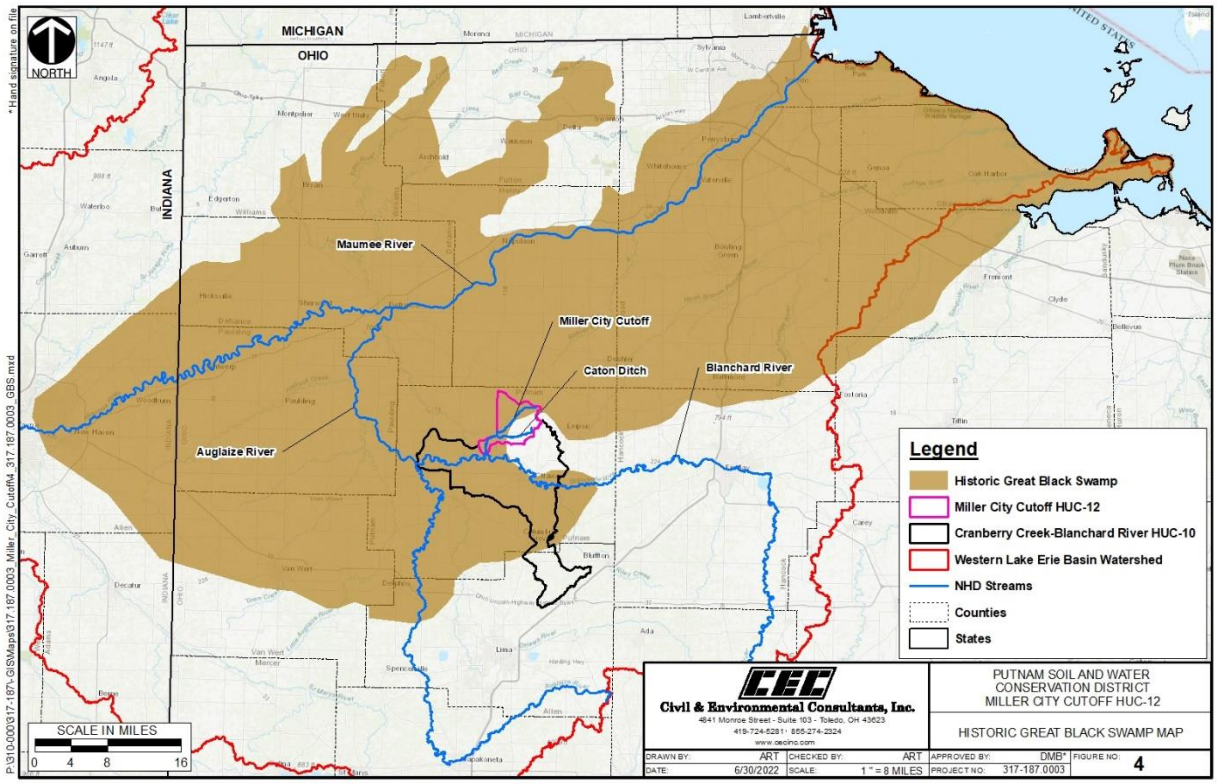

Figure 4: Historic Great Black Swamp

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 and the public at large. Within the Blanchard River watershed, Putnam SWCD serves as a partner organization to the BRWP to actively promote conservation, address NPS pollution and implement water quality projects. The mission of the Putnam SWCD is to be the leading partnership providing dedicated service to customers through quality natural resource management assistance. The Putnam SWCD strives to provide the highest quality assistance through professional, dedicated and honest service to its customers. In addition, the Putnam SWCD has been an active partner in natural resource management throughout Putnam County and has actively pursued grant opportunities throughout the region, having enrolled tens of thousands of acres in various best management practices

(BMPs). The Putnam SWCD frequently collaborates with surrounding counties and offers a multitude of educational opportunities ranging from organized farm tours, field days, and youth programming.

Chapters 1, 2 and 3 of this NPS-IS were primarily prepared using the *Biological and Water Quality Study of the Blanchard River, 2007, Technical Report EAS/2007-6-2* (Ohio EPA, 2007), *Total Maximum Daily Loads for the Blanchard River Watershed* (Ohio EPA, 2009) and the *2020 Ohio Integrated Report* (Ohio EPA, 2020a). Project information for Chapter 4 was solicited from organizational stakeholders and community partners, including the BRWP, Putnam County Engineers Office, The Nature Conservancy, Black Swamp Conservancy, and the Ohio Department of Natural Resources (ODNR). In addition, the Putnam SWCD held public meetings on January 13, 2022 in both Continental and Miller City to discuss the planning effort with local landowners. The Putnam SWCD frequently works one-on-one with landowners throughout the county, including those within the **Miller City Cutoff HUC-12**, and will continue to engage landowners in discussions concerning natural resource conservation and BMP implementation.

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 *Cranberry Creek-Blanchard River HUC-10* is comprised of five HUC-12 watersheds; this document focuses on the #03 hydrologic unit—the **Miller City Cutoff HUC-12**. The **Miller City Cutoff HUC-12** contains 22.64 square miles (14,491.03 acres) and wholly contains Caton Ditch and the Miller City Cutoff. Miller City Cutoff is 5.7 miles long[1] and flows south from Miller City to Caton Ditch at RM 3.05. Caton Ditch is an 8.4 mile-long[2] stream originating in northern Putnam County, Ohio that drains 17.83 square miles and has an average fall of 6.4 ft/mile (ODNR, 2001). Caton Ditch meets the Blanchard River at RM 13.23 at the downstream terminus of the HUC-12 (Ohio EPA, 2022b). Miller City Cutoff is a man-made diversion ditch, cutting off the headwaters of South Powell Creek. This 5.7 mile-long stream flows southwest to Miller City, where it is diverted due south along State Route 108 into Caton Ditch at RM 3.05 (Ohio EPA, 2009). Approximately 45 miles (237,600 linear feet) of streams and ditches flow throughout the sub-watershed.

The HELP ecoregion is largely flat and artificially drained

The **Miller City Cutoff HUC-12** is entirely in the Huron-Erie Lake Plains (HELP) ecoregion. The HELP ecoregion is characterized by a broad and nearly level lake plain, with extensive lacustrine and still-water deposits (Ohio EPA, 2018a). Stream gradients within the HELP ecoregion are typically low, and adjacent lands are typically poorly drained. Nearly 70% of streams within the HELP ecoregion have been channelized or hydrologically modified to varying degrees for drainage conveyance (Ohio EPA, 2018a). The **Miller City Cutoff HUC-12** falls mostly within the Maumee Plains sub-ecoregions, with a small southern portion extending into the Paulding Plains sub-ecoregion. In both sub-ecoregions, streams are sluggish, low-gradient, turbid and frequently carry high suspended sediment loads that endanger biota (USEPA, undated map). Elm-ash swamp and beech forests were typical in the HELP ecoregion prior to settlement (USEPA, 2013). Today, the ecoregion is characterized by extensive corn and soybean production.

[1] The *Ohio River Miles Index* (Ohio EPA, 2022b) shows the Miller City Cutoff to have a length of approximately 5.7 miles; however, many basemaps frequently label the southern portion of Caton Ditch as the Miller City Cutoff. For the purposes of this NPS-IS, Caton Ditch is the direct tributary to the Blanchard River, and Miller City

[2] The *Gazetteer of Streams* (ODNR, 2001) lists Caton Ditch with a length of 5.5 miles; however, the *Ohio River Miles Index* (Ohio EPA, 2022b) shows Caton Ditch to have a length of approximately 8.4 miles. Biological sampling stations utilize the river mile locations in the *River Mile Index*.

Soils within the **Miller City Cutoff HUC-12** are mainly described as fine-grained, though pockets of loamy soils do exist along a band in the northeastern part of the sub-watershed (Figure 5). Dominant soils include the somewhat poorly drained Blount soils, the very poorly drained Pewamo soils, and the very poorly drained Paulding clay. These soils overlay the Salina Group Dolomite bedrock, which dominates in the western half of the *Blanchard River HUC-8* (Ohio EPA, 2009). The poorly draining soils in this area were a driving factor for the existence of the Great Black Swamp. Artificial drainage was installed within this swamp to utilize the highly productive land in the watershed for agricultural purposes. Due to the clearing of swamp forest and the subsequent drainage of the land, the National Wetland Inventory (NWI) shows that few of these wetlands remain today (Figure 6).

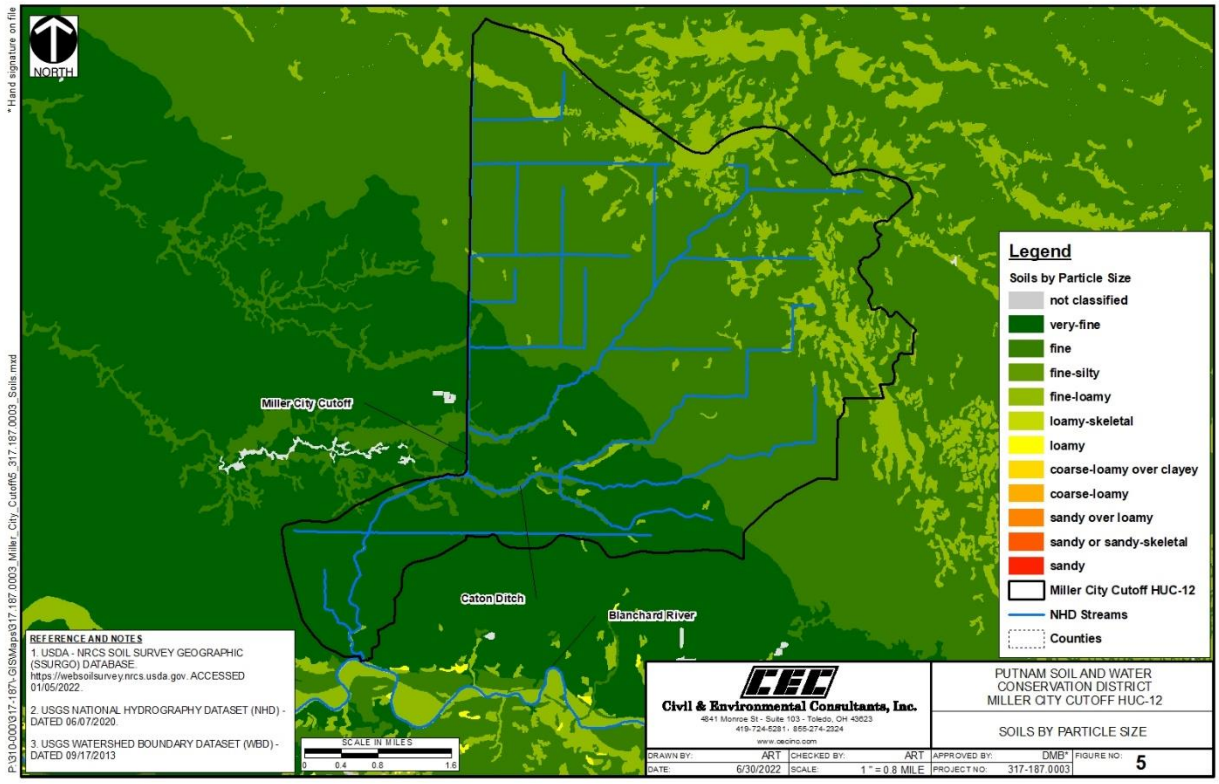

Figure 5: Soils Classified by Particle Size

Urban areas are essentially non-existent in the **Miller City Cutoff HUC-12** (Figure 7). The largest concentration of population exists in Miller City, a small village split between the **Miller City Cutoff HUC-12**, the *North Powell Creek HUC-12*, and the *Upper Powell Creek HUC-12* that has a population of approximately 130 people (U.S. Census Bureau, 2020). The sub-watershed spans four townships within Putnam County, but is mostly located within Liberty and Palmer Townships; small portions of the sub-watershed are within Ottawa Township and Greensburg Township. One National Pollutant Discharge Elimination System (NPDES)-permitted facility is located within the **Miller City Cutoff HUC-12 (**Ohio EPA, 2022a). The Miller City High School Wastewater Treatment Plant (WWTP) discharges to a tributary of the Miller City Cutoff. The USEPA documents NPDES permit compliance through the Enforcement and Compliance History Online (ECHO) database (USEPA, 2021). Results discussed here cover the three-year (12 quarters) compliance history from April 1, 2019 through March 31, 2022. In the last 12 quarters, the

facility has had exceedances in *Escherichia coli* (*E. coli*), nitrogen as ammonia (NH_3), and dissolved oxygen (DO). The facility was in Significant Noncompliance (SNC) for two quarters due to the frequency and magnitude of the NH_3 exceedances.

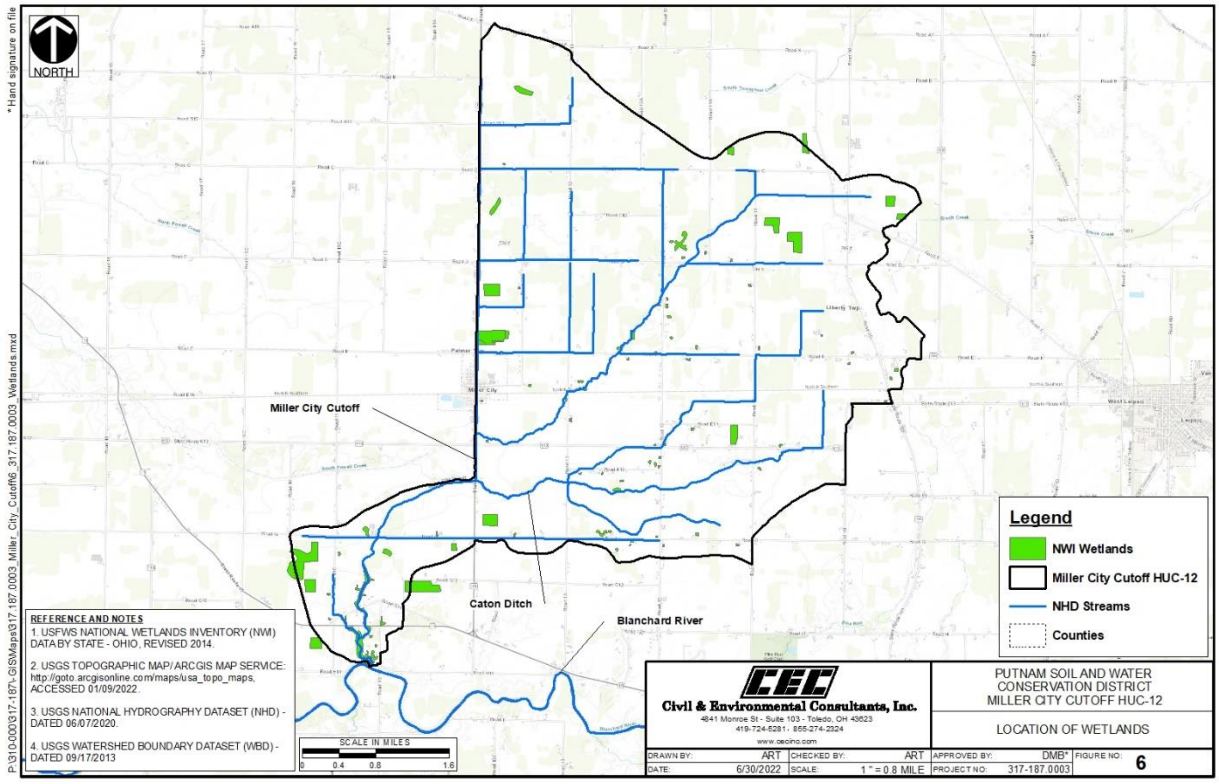

Figure 6: Wetlands in the Miller City Cutoff HUC-12

Within the **Miller City Cutoff HUC-12**, the population is estimated to be 1,066, with 378 housing units in unsewered areas. In the rural landscape, residences and small businesses use Home Sewage Treatment Systems (HSTS), which are a potential source of NPS pollution for bacteria and nutrients. Studies conducted by the Ohio Department of Health (ODH) across Ohio have shown an average HSTS failure rate of 39% within the WLEB (ODH, 2013). The Toledo Metropolitan Area Council of Governments (TMACOG) conducted a study of locations and densities of HSTS throughout the WLEB in 2018. Within Putnam County, 13 areas were identified as Critical Sewage Areas (CSAs), in which larger-scale efforts should be initiated to address failing HSTS and/or potentially establish sewer service. One CSA was identified in the **Miller City Cutoff HUC-12**, which includes the community of Miller City. Total phosphorus and nitrogen loads from HSTS in the **Miller City Cutoff HUC-12** are estimated to be 0.29 metric tons annum (MTA) and 2.86 MTA, respectively, based on mass.

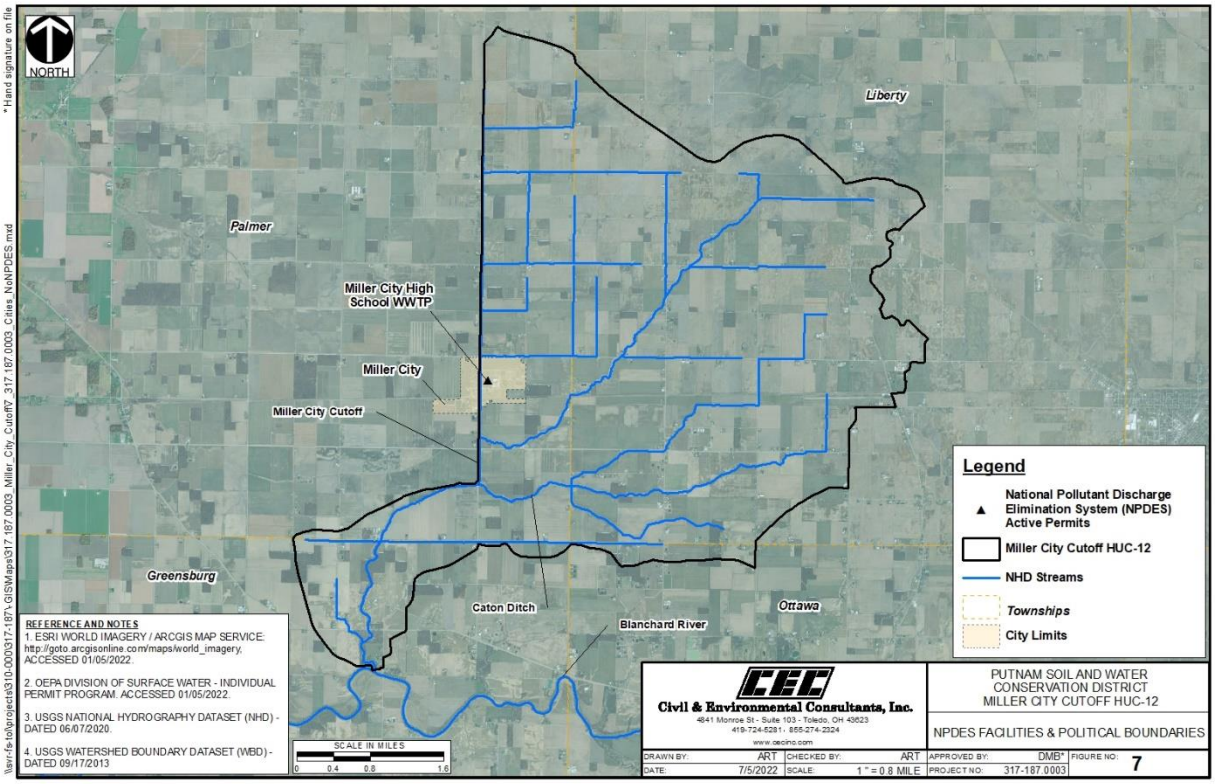

Figure 7: Political Boundaries in the Miller City Cutoff HUC-12

Effective in January 2018, the Putnam County Health Department (PCHD) developed an Operation and Maintenance (O&M) Program for HSTS within the county (PCHD, 2017). Under the O&M Program, the PCHD will prioritize the enrollment of approximately 6,800 HSTS across the county through the rating system in Table 3. Approximately one-tenth of the systems will be enrolled per year over ten years, and each enrolled system will receive a five-year operation permit. Systems will be enrolled from highest to lowest ratings. Enrollment in the O&M Program will help ensure that HSTS are pumped at least once every ten years, that applicable service contracts are maintained, that each HSTS is evaluated at least once per permit cycle, that testing as required by NPDES permit is accomplished (if applicable) and that current operation permits are in place.

Rural landscape throughout Putnam County

Table 3: Putnam County Health Department Home Sewage Treatment System Operation and Maintenance Program Rating System

Rating	Age of System (permit year)	Type of System	Watershed
1	2007 - current	Non-Discharging (on-site)	No Watershed
2	1950 - 2006	Discharging	Creek Watershed
3	Pre-1950s or unknown	Unknown	River Watershed

(Source: PCHD, 2017)

Specific landmarks and features within this watershed include:

- Miller City New Cleveland High School; and
- Ruhe's Airport

2.1.2 Land Use and Protection

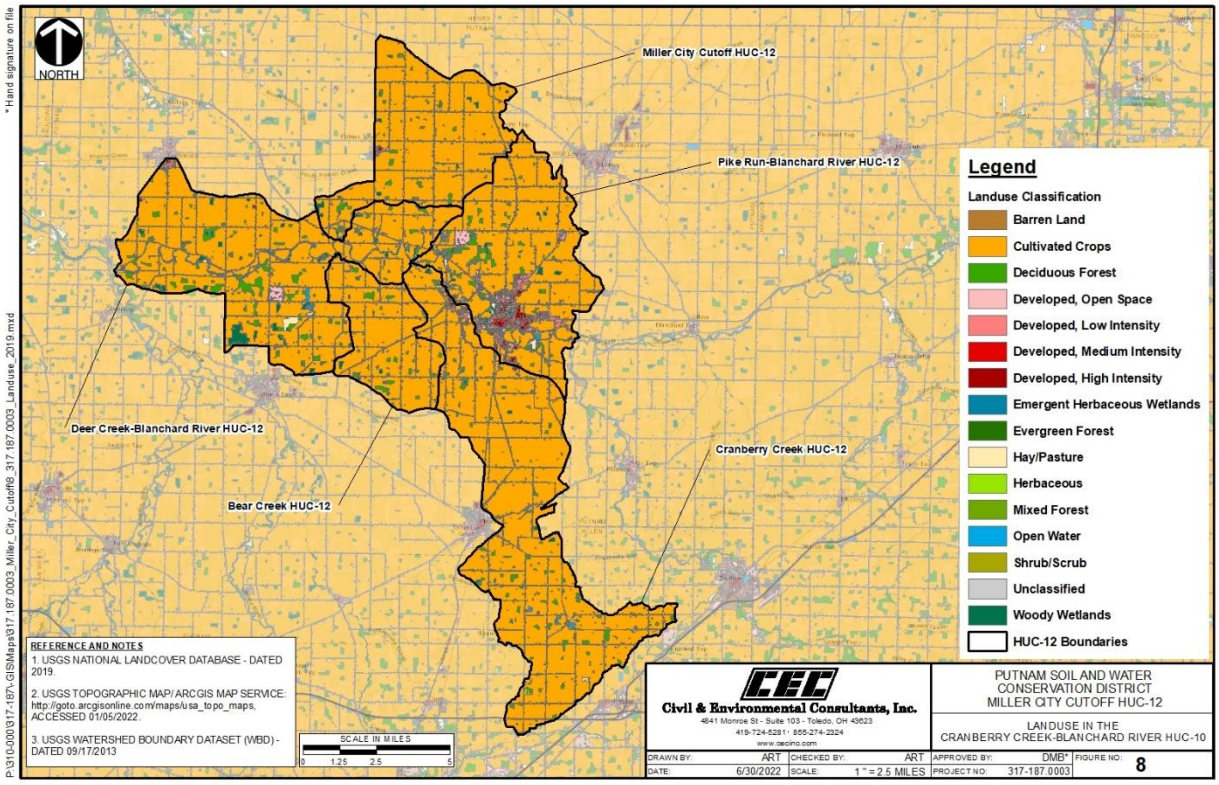

Figure 8: Land Use in the Cranberry Creek-Blanchard River HUC-10

Land use within the **Miller City Cutoff HUC-12** is fairly homogenous (Figure 8). The dominant land use activity within the **Miller City Cutoff HUC-12** is cultivated crop production (90%) (Table 4). The 2017 United States Department of Agriculture (USDA) Census of Agriculture lists soybeans as the largest field crop harvested in Putnam County (58%), while corn accounts for 28% of crops (USDA, 2019). In general, farms are of medium size, with the average operation covering 228 acres (USDA, 2019). While no large Concentrated Animal Feeding Operations (CAFOs) or Ohio Department of Agriculture (ODA)-permitted Confined Animal Feeding Facilities (CAFFs) are located within the sub-watershed, small livestock operations do exist. Estimated counts of animals are generally low and are shown in Table 5. Putnam

County realized a slight increase in the inventory of cattle and calves, as well as hogs and pigs from 2012 to 2017 (USDA, 2019).

Table 4: Land Use Classifications in the Miller City Cutoff HUC-12

Land Use	Miller City Cutoff HUC-12 (04100008 06 03)		
	Area (mi^2)	Area (acres)	% Watershed Area
Barren Land	< 0.01	1.53	0.01%
Cultivated Crops	20.36	13,034.71	89.96%
Deciduous Forest	0.46	295.98	2.04%
Developed, High Intensity	0.07	44.13	0.30%
Developed, Low Intensity	0.59	376.56	2.60%
Developed, Medium Intensity	0.25	157.23	1.08%
Developed, Open Space	0.60	382.88	2.65%
Emergent Herbaceous Wetlands	0.01	6.18	0.04%
Hay/Pasture	< 0.01	1.11	0.01%
Herbaceous	0.01	7.62	0.05%
Mixed Forest	0.001	0.79	0.01%
Open Water	0.01	6.31	0.04%
Shrub/Scrub	0.01	4.83	0.03%
Woody Wetlands	0.27	171.17	1.18%
Total	**22.64**	**14,491.03**	**100.00%**

(Source: Homer et al., 2020)

Table 5: Estimated Animal Counts in the Miller City Cutoff HUC-12

Livestock Type	Animal Units
Beef	532
Dairy	262
Swine	9,351
Sheep	47
Horse	5
Chicken	0
Turkey	0
Duck	0

(Source: USDA Census of Agriculture, 2012, as presented in the STEPL Input Data Server (Tetra Tech, 2017))

While no lands are listed for this sub-watershed in the United States Geological Survey's (USGS) Protected Areas Database of the United States (PAD-US), privately held land may provide critical habitat for the two threatened or endangered species listed for Putnam County by the US Fish and Wildlife Service (USFWS) (Table 6). Caton Ditch and Miller City Cutoff are not currently listed in Appendix A of the *Ohio Mussel Survey Protocol*, indicating that mussels may be present, but the Federally Listed Species (FLS) on the USFWS listing are not expected to be found (ODNR, 2022).

Table 6: Threatened and Endangered Species in Putnam 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 **Miller City Cutoff 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 remote sensing techniques used within the Operational Tillage Information System (OpTIS). From 2014-2018, OpTIS estimated an average of 27.5% of crop fields in the Blanchard River watershed were under no-till conditions, 60.8% were under some form of reduced tillage and 11.7% were under traditional tillage regimes (Dagan, 2019). OpTIS also estimated cover crop usage across the Blanchard River watershed. An average 7.1% of fields had winter commodity crops, while 3.0% utilized a winter cover crop over the same five-year period. According to summary data provided by the Ohio EPA regarding the use of the Environmental Quality Incentives Program (EQIP) within the **Miller City Cutoff HUC-12,** no conservation practices were certified in this sub-watershed between March 30, 2017 and mid-2019 (USDA-NRCS, 2018). Additional data provided by the Farm Service Agency (FSA) on current contracts within Putnam County are found in Table 7.

Table 7: Conservation Reserve Program (CRP) Contract Acreage in Putnam County

Practice	Acres*
Establishment of Permanent Introduced Grasses and Legumes	93.05
Wildlife Food Plot	0.70
Establishment of Permanent Native Grasses	160.90
Filter Strips	2,897.86
Riparian Buffer	72.57
Wetland Restoration	15.50
Wetland Restoration, Non-Floodplain	93.72
Rare or Declining Habitat	1.40
Marginal Pastureland and Wildlife Habitat Buffer	1.60
Tree Planting	4.60
Upland Habitat Buffers	54.70
Wildlife Habitat for Pheasants	99.39
Hardwood Tree Planting	37.25
Pollinator Habitat	162.95
Prairie Strips	18.10
Permanent Wildlife Habitat, Noneasement	18.40
Field Windbreak Establishment, Noneasement	66.80
Grass Waterways, Noneasement	46.70

(Source: USDA-NRCS, 2018)

NOTES
**Acres reported at the county level and may not necessarily fall within the Blanchard River watershed boundaries.*

Putnam County is also an active administrator of the H2Ohio Initiative, a water quality initiative with a focus on phosphorus reduction, particularly within the WLEB. This program provides economic incentives to producers who develop voluntary nutrient management plans (VNMPs) for their fields and implement effective and cost-efficient BMPs that include: soil testing, variable rate technology (VRT) 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). Enrollment within Putnam County for the 2021 crop year includes over 422,000 acres (Table 8).

Table 8: 2021 H2Ohio Enrollment for in Putnam County

Practice	Acres*
VNMP Development	128,539.7
VNMP Implementation	128,539.7
VRT	53,783.3
Subsurface Placement	21,375.0
Manure Incorporation – Poultry	6,327.7
Manure Incorporation – Other	9,030.4
Small Grains	18,258.5
Forage	1,261.5
Cover Crops	55,455.3
Water Control Structures	103.0
TOTAL	**422,674.1**

(Source: personal communication with Sarah Rieman, Putnam SWCD, December 1, 2021)

NOTES
**Acres reported at the county level and may not necessarily fall within the Blanchard River watershed boundaries.*
VNMP Voluntary Nutrient Management Plan
VRT Variable Rate Technology

2.2 Summary of HUC-12 Biological Trends

Ohio EPA sampled the **Miller City Cutoff HUC-12** in 2005, as documented in the *Biological and Water Quality Study of the Blanchard River, 2007, Technical Report DSW/EAS 2007-6-2* (Ohio EPA, 2007). This report serves as the Technical Support Document (TSD) for the Total Maximum Daily Loads (TMDL) study completed for the Blanchard River watershed and published on May 22, 2009. During the TMDL study, both Caton Ditch and Miller City Cutoff were recommended for the MWH designation. Follow up sampling in the Miller City Cutoff in 2017 for a basin-wide study in northwest Ohio for Use Attainability Analysis and rule-making led to the redesignation of Miller City Cutoff as a WWH stream.

A summary of the sample locations and their biological status in the **Miller City Cutoff HUC-12** is provided in Table 9. For reference, water quality standards (WQS) for the HELP ecoregion are presented in Table 10.

Table 9: Biological Indices Scores for Sites in Miller City Cutoff HUC-12

Miller City Cutoff HUC-12 (04100008 06 03)							
River Mile	**Drainage Area (mi^2)**	**IBI**	**MIwb[a]**	**ICI[b]**	**QHEI**	**Attainment Status**	**Location**
Miller City Cutoff (WWH)^							
0.37[H]	9.0	36	N/A	G	21.0	Full	State Route 613
Caton Ditch (MWH)^^							
3.1[H]	15.5	22*	N/A	LF*	48.0	Non	State Route 108

(Source: Ohio EPA, 2007; Ohio EPA, 2020)

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

N/A Not applicable

^ 2017 data

^^ 2005 data

Table 10: Water Quality Standards for the Huron-Erie Lake Plains (HELP)

HELP Ecoregion	WWH WQS			MWH WQS		
	Headwater	**Wading**	**Boat**	**Headwater**	**Wading**	**Boat**
IBI	28	32	34	20	22	20
MIwb	N/A	7.3	8.6	N/A	5.6	5.7
ICI	34	34	34	22	22	22
QHEI[a]	55	60	60	43.5	43.5	43.5

(Source: Ohio EPA, 2010)

NOTES

WQS Water Quality Standards

EWH Exceptional Warmwater Habitat

WWH Warmwater Habitat

MWH Modified Warmwater Habitat

a 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 assemblage's indicative of WWH. For MWH streams, Ohio EPA suggests a score of 43.5 for the support of tolerant aquatic assemblages (Ohio EPA, 2013).

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])

Attempts to evaluate fish communities in both Caton Ditch and the Miller City Cutoff in the **Miller City Cutoff HUC-12** were made in 2005; however, many sites within the Cranberry Creek-Blanchard River HUC-10 assessment unit were limited with data collection. Communities in the Miller City Cutoff were unable to be fully evaluated, as the stream was dry or nearly dry during the duration of the summer low flow conditions (Ohio EPA, 2007). New data collected in 2017 in the Miller City Cutoff yielded substantial improvement in flow conditions within the waterway, and communities in the Miller City Cutoff met IBI criteria for WWH streams with a score of 36 (Ohio EPA, 2017). In Caton Ditch, dry conditions were observed at RM 4.1, and fish communities at RM 3.1 performed poorly. Communities were dominated by pollution tolerant species such as bluntnose minnows and creek chub. Channelization, silty substrates and minimal flow conditions were major impediments to the development of biological communities in Caton Ditch (Ohio EPA, 2007).

Macroinvertebrates (Invertebrate Community Index [ICI])

During the 2005 TMDL study, macroinvertebrate communities were assessed in both the Miller City Cutoff and Caton Ditch. Macroinvertebrate communities in the Miller City Cutoff were dominated by mainly pollution tolerant and facultative midges. Almost 50% of the community was considered to be pollution tolerant. Community performance was attributed to elevated nutrients and an excessive organic load from failing HSTS and WWTP effluent. The Miller City Cutoff was reassessed in 2017, and benthic communities scored in the Good range. Eleven *Ephemeroptera, Plecoptera* and *Trichoptera* (EPT) taxa and four sensitive taxa were collected (Ohio EPA, 2017). Within Caton Ditch, Poor macroinvertebrate communities were a result of multiple factors related to habitat and water quality. Silty, channelized conditions, minimal flow, elevated nutrients and low DO levels were reflected in community compositions (Ohio EPA, 2007). The Low Fair evaluation did not meet even the recommended MWH use designation.

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 2005, and during follow up sampling in 2017 (Table 11). Though the Miller City Cutoff was in *Full Attainment* of the WWH designation, habitat scored within the Very Poor range for QHEI scores. Conversely, habitat within Caton Ditch achieved the recommended threshold for MWH communities (QHEI=43.5); however, aquatic communities were limited in reaching WQS for MWH streams.

Table 11: QHEI Matrix with WWH and MWH Attribute Totals for Sites in the Miller City Cutoff HUC-12

Miller City Cutoff HUC-12 (04100008 06 03)																															
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 MWH Attributes
Miller City Cutoff (WWH)^																															
0.37[H]	21.0	3.33											**0**	•	•	•	•	•	**5**		•			•		•		•	•	•		**6**
Caton Ditch (MWH)^^																															
3.1[H]	48.0	9.09		•		•	•	•			•		**5**		•				**1**	•	•			•			•	•	•	•	•	**8**

(Source: Ohio EPA, 2007; Ohio EPA, 2020)

NOTES

QHEI Qualitative Habitat Evaluation Index

WWH Warmwater Habitat

MWH Modified Warmwater Habitat

H Headwater sample

^ 2017 data

^^ 2005 data

Generally, streams that have QHEI scores of at least 60 are capable of supporting WWH assemblages. Strong correlations exist between habitat attributes and a stream's ability to support healthy aquatic assemblages (Ohio EPA, 1999). The presence of certain attributes are shown to have a larger negative impact on fish and macroinvertebrate communities. Streams designated as WWH should exhibit no more than four total MWH attributes; additionally, no more than one of those four should be of high-influence (Ohio EPA, 2013). Despite the overall adequate performance of fish and macroinvertebrate communities in Miller City Cutoff in 2017, no WWH attributes were noted at RM 0.37. While Caton Ditch exhibited five WWH attributes, habitat was largely dominated by low-influence MWH attributes.

2.3 Summary of HUC-12 Pollution Causes and Associated Sources

As listed in the 2007 *Biological and Water Quality Study of the Blanchard River*, one biological sampling site in Caton Ditch is in *Non-Attainment* of the MWH designation due to direct habitat alterations, flow alteration and organic and nutrient enrichment effects from agricultural-related crop production and channelization (Table 12). In 2005, the Miller City Cutoff was recommended for the MWH designation,

and attainment status was not fully determined (Ohio EPA, 2007). In 2017, sampling in the Miller City Cutoff led to the recommendation for the WWH designation, and communities were in *Full Attainment.*

Table 12: Causes and Sources of Impairments for Sampling Locations in the Miller City Cutoff HUC-12

Miller City Cutoff HUC-12 (04100008 06 03)				
River Mile	**Primary Cause(s)**	**Primary Source(s)**	**Attainment Status**	**Location**
Miller City Cutoff (WWH)^				
0.37[H]	--	--	Full	State Route 613
Caton Ditch (WWH)^^				
3.1 [H]	Direct habitat alterations, organic enrichment/DO, flow alterations, nutrients	Ag-related channelization, crop production	Non	State Route 108

(Source: Ohio EPA, 2007; Ohio EPA, 2020)

NOTES
H Headwater sample
WWH Warmwater Habitat
MWH Modified Warmwater Habitat
DO Dissolved oxygen
^ 2017 data
^^ 2005 data

Loss of sediments from the surrounding landscape may also imply loss of nutrients, as a fraction of these nutrients introduced to the landscape through fertilization techniques and other sources bind to soil particles. As soil particles are lost to local waterways, additional nutrients can become available for microorganism uptake, and in situations where nutrients concentrate and are overabundant, eutrophication occurs and drives HAB formation. This can occur both in-stream as well as in far-field, receiving waterbodies, such as Lake Erie. Ohio EPA has estimated spring phosphorus loadings from individual sub-watersheds 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 13). 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 13: Estimated Spring Total Phosphorus Loadings from Contributing NPS Sources in the Miller City Cutoff HUC-12

	Agricultural Load (lbs)	Developed/Urban Load (lbs)	Natural Load (lbs)	HSTS Load (lbs)	NPS Total (lbs)
Current Estimates*	11,000	370	<100	270	12,000
Target Loadings	6,600	220	<100	160	7,000

(Source: OLEC, 2020)

NOTES
**Estimated using two significant figures*

2.4 Additional Information for Determining Critical Areas and Developing Implementation Strategies

Assessment data from the 2005 sampling event and data referenced in the *Biological and Water Quality Study of the Blanchard River, 2007, Technical Report EAS/2007-6-2, Total Maximum Daily Loads for the Blanchard River Watershed* and the *2020 Ohio Integrated Report* were used in the development of this NPS-IS (Ohio EPA, 2007; Ohio EPA, 2009; Ohio EPA, 2020a). 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, two sampling sites are located in the **Miller City Cutoff HUC-12**. One location in the Miller City Cutoff is in *Full Attainment* of the WWH designation and one location in Caton Ditch is in *Non-Attainment* of the MWH designation due to habitat alterations, flow alterations and organic and nutrient enrichment from agricultural-related crop production and channelization. Upstream from the Caton Ditch sampling location at RM 3.1, excessive siltation was noted in 2005, and silt/muck substrates and silty, channelized conditions were observed throughout the stream in addition to the noted causes (Ohio EPA, 2007). Excessive siltation may be decreased by the implementation of agricultural BMPs that help stabilize soil loss from crop fields. In addition, BMP implementation that reduces soil loss also simultaneously helps reduce nutrient loss, as nutrients are adsorbed to soil particulates.

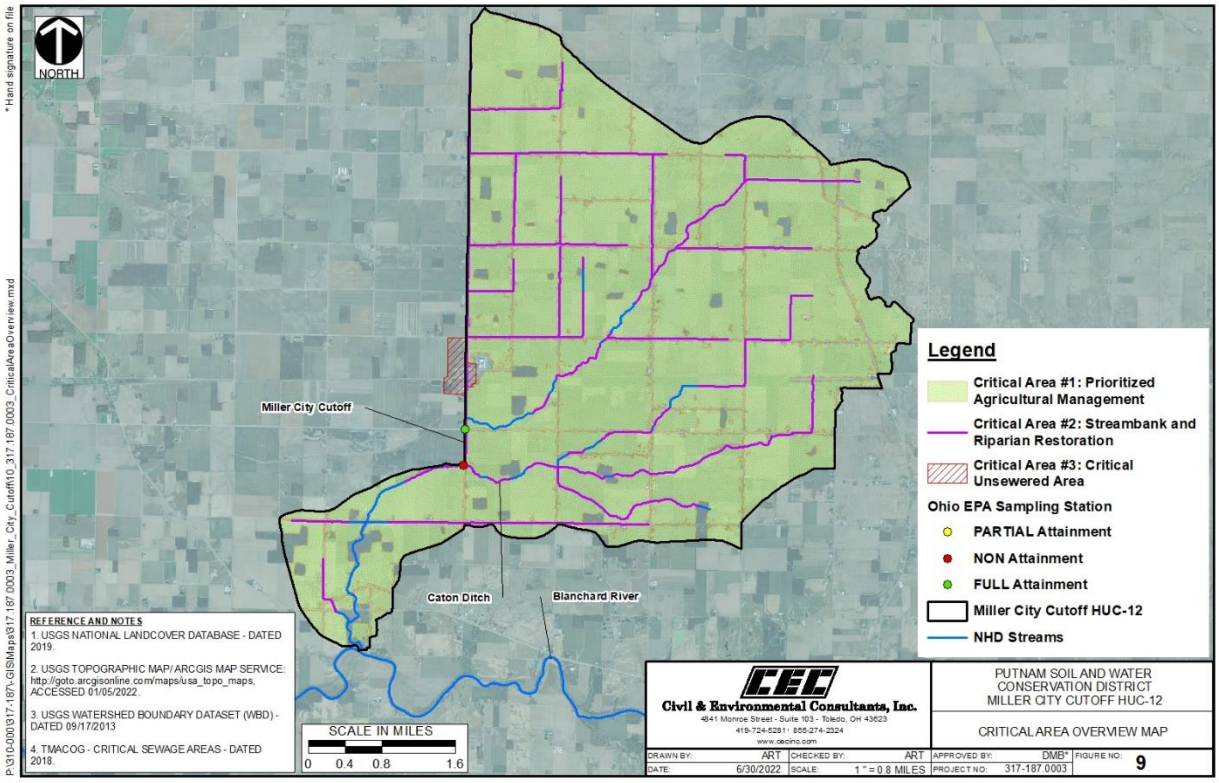

Figure 9: Miller City Cutoff HUC-12 Critical Area Overview[3]

Three critical areas have been identified within the **Miller City Cutoff HUC-12** (Figure 9). Two critical areas will address far-field effects of nutrients in Lake Erie, the end receiving waterbody of drainage from the **Miller City Cutoff HUC-12** (Table 14). Many BMP implementation activities nested within this watershed also simultaneously benefit near-field effects in Caton Ditch and the Miller City Cutoff through sediment reduction. Because many of these BMPs offer dual benefits of nutrient and sediment

[3] Critical area maps developed with the most recently available digital geographic data and may not reflect current land use or existing conditions that have changed since digital publication.

reduction and agricultural land prioritization is not substantially different for nutrient and sediment reduction within this sub-watershed, only one critical area is identified to address impacts from agricultural lands. One critical area has also been developed to address near-field impairment for in-stream, streambank and riparian needs. It is expected that projects developed for this critical area will also contribute to far-field benefits in sediment and nutrient reduction. Additional critical areas may be developed in subsequent versions of this NPS-IS.

Table 14: Miller City Cutoff HUC-12 Critical Area Descriptions

Critical Area Number	Critical Area Description	Impairments Addressed
1	Nutrient Reduction in Prioritized Agricultural Lands	Far-field (Lake Erie), with near-field benefits
2	Streambank and Riparian Restoration	Near-field
3	Nutrient Reduction in Unsewered Areas	Far-field (Lake Erie), with near-field benefits

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* (Ohio EPA, 2020c) estimated 90% of the nutrient loadings to Lake Erie via the Maumee River (of which the Auglaize/Blanchard Rivers are large tributaries) 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 BMPs are recommended for agricultural operations to minimize nutrient and associated sediment 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. Lands maintained under conventional agricultural production or managed as pasture are prone to contribute excessive sediment and nutrient loadings to adjacent waterways that eventually flow to the WLEB. Lands that are proximal to streams and ditches or do not currently implement specific BMPs are most vulnerable to excessive nutrient and sediment loss, and these lands are also prioritized as critical within this watershed. *Critical Area #1* contains prioritized agricultural lands throughout **Miller City Cutoff HUC-12** (Figure 10).

Of the 13,035 agricultural acres in the **Miller City Cutoff HUC-12**, prioritized lands are operations that meet one or more of the following criteria:

- Lands directly adjacent to streams or drainage waterways;
- Lands with persistent rill or gully erosion;
- Lands with uncontrolled or unfiltered subsurface drainage water;
- Lands without a current (<3 years) nutrient management plan or soil test; or,
- Lands with high soil phosphorus levels (>40 ppm Mehlich).

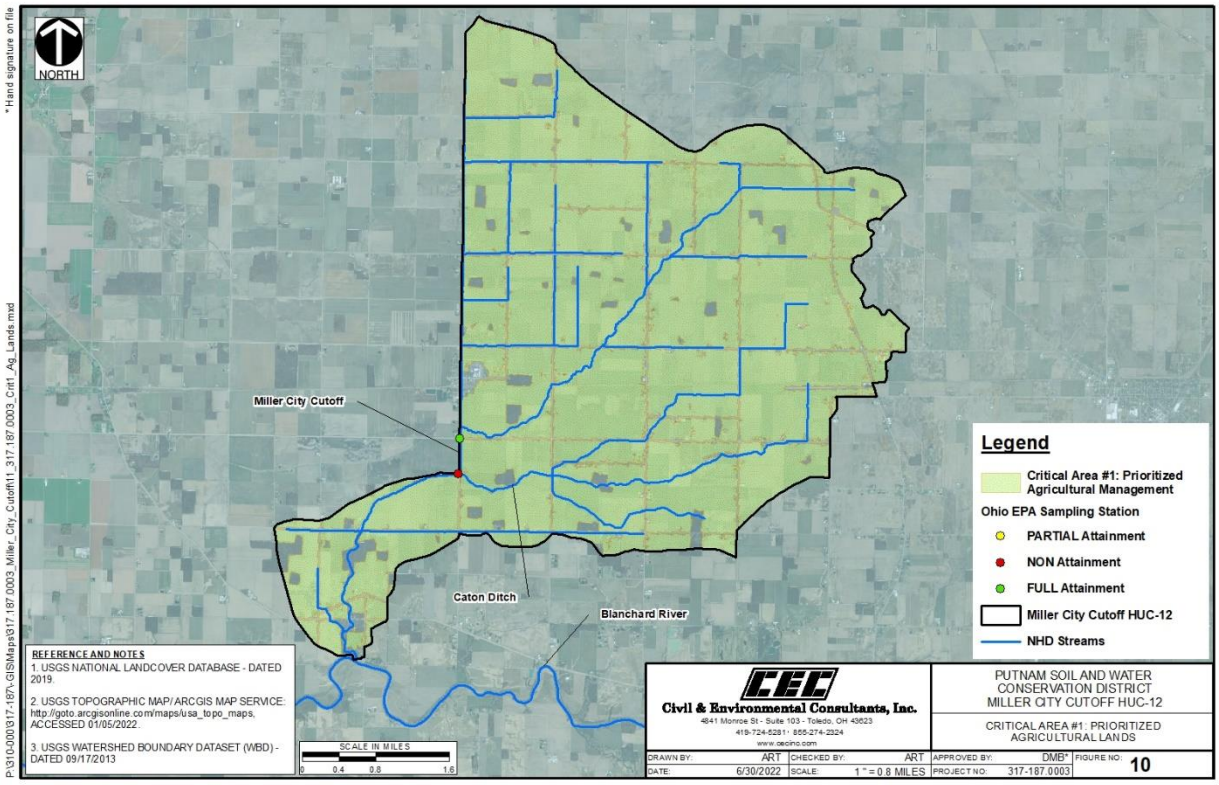

Figure 10: Miller City Cutoff HUC-12 Critical Area #1

3.2.2 Detailed Biological Conditions

Fish community data for the two sampling locations within the **Miller City Cutoff HUC-12** are summarized below (Table 15). Analysis of the abundance, diversity and pollution tolerance of existing fish species found by Ohio EPA at each sampling location, in relation to the corresponding QHEI score, aids in the identification of causes and sources of impairment. Fish communities in the Miller City Cutoff met IBI expectations for WWH streams during sampling in 2017, though these communities were unable to be sampled in 2005 due to dry summer conditions. Habitat within the Miller City Cutoff was Very Poor, scoring a 21, exhibiting no WWH attributes, and despite reaching WWH standards for IBI, fish communities were dominated by tolerant species such as bluntnose minnow and creek chub. Communities in Caton Ditch during the 2005 sampling event reached attainment levels for the MWH designation; however, a score of 22 is considered Poor qualitatively. Low scores at the Caton Ditch sampling location can be attributed to flow conditions and nutrient eutrophication from surrounding agricultural areas. Pollution tolerant species such as bluntnose minnows and creek chub were also dominant in Caton Ditch.

Table 15: Critical Area #1 – Fish Community and Habitat Data

Miller City Cutoff HUC-12 (04100008 06 03)							
River Mile	**Drainage Area (mi^2)**	**Total Species**	**QHEI**	**IBI**	**MIwb[a]**	**Predominant Species (Percent of Catch)**	**Narrative Evaluation**
Miller City Cutoff (WWH)^							
0.37[H]	9.0	18	21.0	36	N/A	Bluntnose minnow (49%), creek chub (26%), suckermouth minnow (6%)	Marginally Good
Caton Ditch (WWH)^^							
3.1[H]	15.5	14	48.0	22*	N/A	Bluntnose minnow (25%), creek chub (24%), green sunfish (17%)	Poor

(Source: Ohio EPA, 2007; Ohio EPA, 2020a)

NOTES
IBI Index of Biotic Integrity
a The Modified Index of Well Being (MIwb) is not applicable to headwater sites (drainage ≤20 mi^2).
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
N/A Not applicable
^ 2017 data
^^ 2005 data

Characteristics of the aquatic macroinvertebrate community for the **Miller City Cutoff HUC-12** sampling locations in *Critical Area #1* are summarized below (Table 16). Analysis of the abundance, diversity, and pollution tolerance of existing aquatic macroinvertebrates (bugs) found by Ohio EPA at these sampling locations, related to QHEI scores, can aid in the identification of causes and sources of impairment. Macroinvertebrate communities within Miller City Cutoff performed well, scoring in the Good range. Eleven EPT taxa and four sensitive taxa were collected out of 51 total taxa observed; however, the community was still dominated by tolerant and facultative organisms. Communities in Caton Ditch were adversely affected by water quality issues associated with elevated nutrients and low dissolved oxygen levels.

Table 16: Critical Area #1 – Macroinvertebrate Community Data

Miller City Cutoff HUC-12 (04100008 06 03)		
River Mile	**ICI Score-Narrative[a]**	**Predominant Species (Tolerance Categories)**
Miller City Cutoff (WWH)^		
0.37[H]	N/A – Good 4 sensitive taxa	*Turbellaria* (F), *Plumatella sp* (F), *Erpobdella punctata* (MT), *Erpobdella microstoma* (MT), *Paragordius varius* (MT), *Faxonius immunis* (T), *Lirceus sp* (MT), *Hydrachnidia* (F), *Acerpenna pygmaea* (MI), *Baetis intercalaris* (F), *Callibaetis sp* (MT), *Stenacron sp* (F), *Stenonema femoratum* (F), *Caenis sp* (F), *Coenagrionidae* (T), *Argia sp* (F), *Libellula sp* (MT), *Trichocorixa sp* (MT), *Cheumatopsyche sp* (F), *Hydropsyche simulans* (MI), *Hydroptila sp* (F), *Nectopsyche candida* (MI), *Nectopsyche diarina* (MI), *Peltodytes sp* (MT), *Uvarus sp* (MT), *Berosus sp* (MT), *Dubiraphia vittata group*

		(F), *Stenelmis sp* (F), *Anopheles sp* (F), *Ceratopogonidae* (T), *Ablabesmyia mallochi* (F), *Procladius (Holotanypus) sp* (MT), *Thienemanniella xena* (F), *Cricotopus (C.) bicinctus* (T), *Cryptochironomus ponderosus* (F), *Chironomus (C.) decorus group* (T), *Parachironomus frequens* (F), *Polypedilum (P.) illinoense* (T), *Dicrotendipes neomodestus* (F), *Cryptochironomus sp* (F), *Polypedilum (Uresipedilum) flavum* (F), *Cryptotendipes pseudotener* (F), *Paratendipes albimanus or P. duplicatus* (F), *Rheotanytarsus sp* (F), *Paratanytarsus sp* (F), *Tanytarsus sp* (F), *Tanytarsus glabrescens group sp 7* (F), *Hemerodromia sp* (F), *Physella sp, Planorbella (Pierosoma) pilsbryi* (T), *Ferrissia sp* (F)
Caton Ditch (WWH)^^		
3.1[H]	N/A – Low Fair* 0 sensitive taxa	*Turbellaria* (F), *Nematomorpha* (F), *Oligochaeta* (T), *Helobdella stagnalis* (T), *Helobdella triserialis* (MT), *Placobdella parasitica* (MT), *Erpobdella punctata* (MT), *Cambarus sp* (F), *Orconectes sp* (F), *Stenacron sp* (F), *Hexagenia limbata* (F), *Coenagrionidae* (T), *Corixidae* (F), *Cheumatopsyche sp* (F), *Helophorus sp* (MT), *Stenelmis sp* (F), *Anopheles sp* (F), *Chironomus (C.) decorus group* (T), *Microtendipes pedellus group* (F), *Paralauterborniella nigrohalteralis* (F), *Polypedilum (P.) illinoense* (T), *Tribelos jucundum* (MT), *Physella sp, Planorbella (Pierosoma) pilsbryi* (T), *Sphaerium sp* (F)

(Source: Ohio EPA, 2007; Ohio EPA, 2020a)

NOTES

a *Narrative evaluation used in lieu of ICI quantitative value in some cases*

H *Headwater sample*

N/A *Data not applicable or not available*

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

* *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.*

^ *2017 data*

^^ *2005 data*

3.2.3 Detailed Causes and Associated Sources

The Miller City Cutoff in the **Miller City Cutoff HUC-12** is in *Full Attainment* of the WWH designation, while Caton Ditch is in *Non-Attainment* of the MWH designation due to direct habitat alterations, flow alterations and nutrient and organic enrichment caused by channelization and agricultural activities. Many of the habitat attributes found during the QHEI sampling event (i.e., channelization, mucky substrates, sparse cover, etc.) are likely a result of land use activities, which are mainly agricultural operations within the watershed.

Channelized stream with little to no buffer from agricultural activities

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 not only near-field impairment and stressed aquatic communities in Caton Ditch, but also 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 Auglaize River/Blanchard River system, to which Caton Ditch is a direct 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 (Ohio EPA, 2018b; Ohio EPA, 2020c).

Many objectives within the **Miller City Cutoff HUC-12** align with the priorities of the H2Ohio Initiative, a water quality initiative with a focus on phosphorus reduction. Enrollment through this program will also help make incremental progress towards nutrient reduction goals.

Goals

Ohio EPA has modeled nutrient loadings within the WLEB, and has set phosphorus reduction goals, based upon springtime load estimates. To achieve the desired phosphorus reduction from agricultural land use in the **Miller City Cutoff 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 6,600 lbs/year (40% reduction).
NOT ACHIEVED: Current estimated load contribution is 11,000 lbs/year.

Simultaneous goals relate to the improvement of conditions within Caton Ditch, in order to improve the health of aquatic communities and meet WQS. Implementation of BMP objectives geared towards nutrient reduction efforts will generally also help make incremental progress towards the following goals:

Goal 2. Maintain IBI score at or above 28 at State Route 613 in Miller City Cutoff (RM 0.37).
✓ ACHIEVED: Site currently has a score of 36.

Goal 3. Maintain ICI score at or above 34 (Good) at State Route 613 in Miller City Cutoff (RM 0.37).
✓ ACHIEVED: Site currently has a score of Good.

Goal 4. Achieve QHEI score at or above 55 at State Route 613 in Miller City Cutoff (RM 0.37).
NOT ACHIEVED: Site currently has a score of 21.

Goal 5. Maintain IBI score at or above 20 at State Route 108 in Caton Ditch (RM 3.1).
✓ ACHIEVED: Site currently has a score of 22.

Goal 6. Achieve ICI score at or above 22 (Fair) at State Route 108 in Caton Ditch (RM 3.1).
NOT ACHIEVED: Site currently has a score of Low Fair (~14).

Goal 7. Achieve QHEI score at or above 55 at State Route 108 in Caton Ditch (RM 3.1).
NOT ACHIEVED: Site currently has a score of 48.

Objectives

In order to make substantive progress toward the achievement of the springtime phosphorus load reduction goal of 4,400 lbs for the **Miller City Cutoff HUC-12**, efforts must commence on more widespread implementation, according to the following objectives within *Critical Area #1.* Additionally, actions taken within *Critical Area #1* to address nutrient reduction will also help control NPS pollution and siltation that has impaired Caton Ditch.

Objective 1: Implement nutrient management (planning and implementation through soil testing and VRT) on at least 6,000 acres annually.

Objective 2: Plant cover crops on at least 4,000 acres annually.[4]

Objective 3: Implement conservation tillage (30-50% residue) on at least 4,500 acres.[5]

Objective 4: Reduce nutrient loss from subsurface tile drainage through the installation of drainage water management structures that drain at least 700 acres.

Objective 5: Reduce nutrient loss from subsurface tile drainage through the installation of blind inlets that drain at least 150 acres.

Objective 6: Reduce erosion and nutrient loss through the installation of grassed waterways or grassed surface drains (as a standalone practice or coupled with erosion control structures/other drainage management practices) that receive/treat surface water from at least 100 acres.

[4]Current estimates indicate cover crops occurs on approximately 400 acres in the Miller City Cutoff HUC-12, based upon OpTis data (Dagan, 2019). Cover crop plantings may be implemented in the absence of grant funding.

[5] Current estimates indicate reduced tillage occurs on approximately 7,000 acres in the Miller City Cutoff HUC-12, based upon OpTis data (Dagan, 2019).

Objective 7: Reduce erosion and nutrient loss through the installation of filter strips/buffers (of at least a 35 ft setback) and/or saturated buffers that receive/treat surface water from at least 1,500 acres.

Objective 8: Create, enhance and/or restore at least 15 acres of wetlands and/or water retention basins for treatment of agricultural runoff and/or nutrient reduction purposes from 375 total agricultural acres.

Objective 9: Reduce erosion from agricultural streambanks and drainage conveyances through natural channel design or two-stage ditch design stabilization techniques to at least 8,300 linear feet (1.6 miles).

These objectives will be directed towards implementation on prioritized agricultural lands and are estimated to reach the phosphorus spring load reduction goal (Table 17). Additional conservation activities within the **Miller City Cutoff 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.

Table 17: 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	Nutrient Management (Planning and Implementation through Soil Testing and VRT)[a]	6,000	2,740	1,780
2	Cover Crops	4,000	390	250
3	Conservation Tillage (30-50% Residue)	4,500	2,120	1,380
4	Drainage Water Management Structures	700	250	160
5	Blind Inlets[b]	150	140	90
6	Grassed Waterways/Grassed Surface Drains[c]	100	50	30
7	Filter Strips/Buffers (of at least 35 ft)[d]	1,500	880	570
8	Wetlands[e] and/or Water Retention Basins	15[f]	240	150
9	Stream Stabilization and/or Two-Stage Ditch	500 (8,300 linear feet)[g]	140	90
	TOTAL	**17,825***	**6,950**	**4,500**

(Source Model: Spreadsheet Tool for Estimating Pollutant Loads (STEPL), Version 4.4b, (USEPA, 2020))

NOTES

a 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).

b *Blind inlet phosphorus reduction efficiency estimated from values listed in Gonzalez, Smith and Livingston, 2016.*

c *Grassed waterway phosphorus reduction efficiency estimated from values listed in OSU Extension, 2018.*

d *Concentrated flow must be distributed so the area can slow, filter, and/or soak in runoff. Design specifications will be Field Office Technical Guide (FOTG) 393 Filter strips/area, and/or CRP CP-11 or CP2 Filter recharge areas. Conservation Cover (FOTG 327 and CRP CP-21) would not be designed to treat contributing runoff.*

e *Phosphorus load reduction for wetlands was calculated using data tables found in Ohio's DAP (OLEC, 2020).*

f *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 receiving wetland. For this objective of 15 wetland acres, total drainage area is 375 acres.*

g *One linear foot of stream is estimated to treat 0.05 acres.*

* *Total acreage treated exceeds number of agricultural land acres. 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* (Ohio EPA, 2020b) 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 Streambank and Riparian Restoration

3.3.1 Detailed Characterization

The 2007 *Biological and Water Quality Study of the Blanchard River* noted silty, channelized conditions throughout Caton Ditch, prompting a sediment TMDL for the sub-watershed. Though Caton Ditch is not currently under a county maintenance program, the stream shows little recovery from prior channelization and riparian vegetation was minimal, if existent at all along stretches of the stream (Ohio EPA, 2009). Much of the Miller City Cutoff also lacked riparian cover, and the waterway was dominated by MWH attributes (no sinuosity, channelized, silt covered and embedded substrates, etc). The *TMDL for the Blanchard River Watershed* recommended several implementation strategies to address sediment

and habitat conditions throughout the greater watershed, including reduction of in-stream erosion through stream restoration, two-stage ditch design in areas where stream restoration is not feasible, bio-engineering for stabilization, floodplain wetlands for retention and flood capacity and potentially changes to drainage management approaches within county maintenance programs to allow a more natural channel to form and promote vegetation growth on at least one stream bank (Ohio EPA, 2009). *Critical Area #2* contains approximately 38.5 miles of stream length and associated riparian corridors throughout the **Miller City Cutoff HUC-12** (Figure 11).

Using the rationale described in the *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (USEPA, 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 #2* includes the riparian and in-stream segments of approximately 38.5 miles of waterways, and a 75-foot buffer width on each side. The potential for restoration of up to 700 acres of riparian corridor exists in *Critical Area #2*.

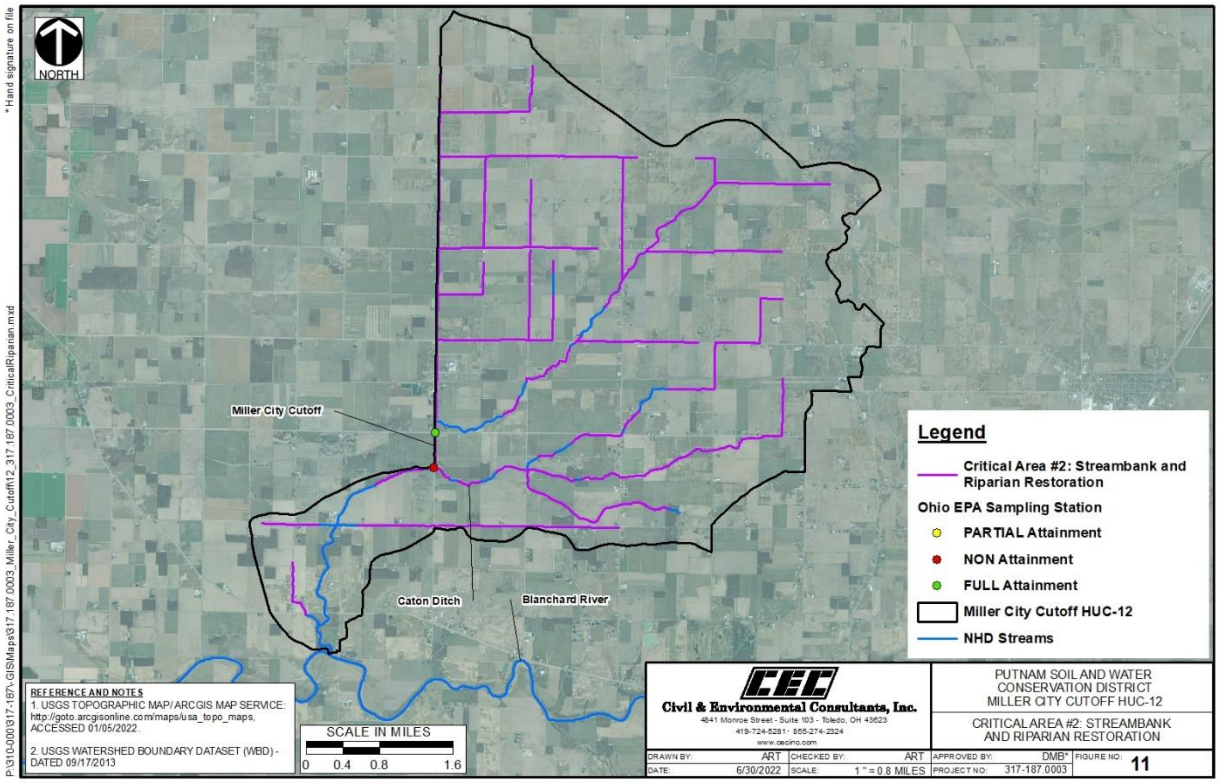

Figure 11: Miller City Cutoff HUC-12 Critical Area #2

3.3.2 Detailed Biological Conditions

Fish community data for the two sampling locations within the **Miller City Cutoff HUC-12** are summarized below (Table 18). Analysis of the abundance, diversity and pollution tolerance of existing fish species found by Ohio EPA at each sampling location, in relation to the corresponding QHEI score, aids in the identification of causes and sources of impairment. Fish communities in the Miller City Cutoff met IBI expectations for WWH streams during sampling in 2017, though these communities were unable

to be sampled in 2005 due to dry summer conditions. Habitat within the Miller City Cutoff was Very Poor, scoring a 21, exhibiting no WWH attributes, and despite reaching WWH standards for IBI, fish communities were dominated by tolerant species such as bluntnose minnow and creek chub. Communities in Caton Ditch during the 2005 sampling event reached attainment levels for the MWH designation; however, a score of 22 is considered Poor qualitatively. Low scores at the Caton Ditch sampling location can be attributed to flow conditions and nutrient eutrophication from surrounding agricultural areas. Pollution tolerant species such as bluntnose minnows and creek chub were also dominant in Caton Ditch.

Table 18: Critical Area #2 – Fish Community and Habitat Data

Miller City Cutoff HUC-12 (04100008 06 03)							
River Mile	**Drainage Area (mi^2)**	**Total Species**	**QHEI**	**IBI**	**MIwb[a]**	**Predominant Species (Percent of Catch)**	**Narrative Evaluation**
Miller City Cutoff (WWH)^							
0.37[H]	9.0	18	21.0	36	N/A	Bluntnose minnow (49%), creek chub (26%), suckermouth minnow (6%)	Marginally Good
Caton Ditch (WWH)^^							
3.1[H]	15.5	14	48.0	22*	N/A	Bluntnose minnow (25%), creek chub (24%), green sunfish (17%)	Poor

(Source: Ohio EPA, 2007; Ohio EPA, 2020a)

NOTES
IBI Index of Biotic Integrity
a The Modified Index of Well Being (MIwb) is not applicable to headwater sites (drainage ≤20 mi^2).
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
N/A Not applicable
^ 2017 data
^^ 2005 data

Characteristics of the aquatic macroinvertebrate community for the **Miller City Cutoff HUC-12** sampling locations in *Critical Area #2* are summarized below (Table 19). Analysis of the abundance, diversity, and pollution tolerance of existing aquatic macroinvertebrates (bugs) found by Ohio EPA at these sampling locations, related to QHEI scores, can aid in the identification of causes and sources of impairment. Macroinvertebrate communities within Miller City Cutoff performed well, scoring in the Good range. Eleven EPT taxa and four sensitive taxa were collected out of 51 total taxa observed; however, the community was still dominated by tolerant and facultative organisms. Communities in Caton Ditch were adversely affected by water quality issues associated with elevated nutrients and low dissolved oxygen levels.

Table 19: Critical Area #2 – Macroinvertebrate Community Data

Miller City Cutoff HUC-12 (04100008 06 03)		
River Mile	**ICI Score-Narrative[a]**	**Predominant Species (Tolerance Categories)**
Miller City Cutoff (WWH)^		
0.37[H]	N/A – Good 4 sensitive taxa	*Turbellaria* (F), *Plumatella sp* (F), *Erpobdella punctata* (MT), *Erpobdella microstoma* (MT), *Paragordius varius* (MT), *Faxonius immunis* (T), *Lirceus sp* (MT), *Hydrachnidia* (F), *Acerpenna pygmaea* (MI), *Baetis intercalaris* (F), *Callibaetis sp* (MT), *Stenacron sp* (F), *Stenonema femoratum* (F), *Caenis sp* (F), *Coenagrionidae* (T), *Argia sp* (F), *Libellula sp* (MT), *Trichocorixa sp* (MT), *Cheumatopsyche sp* (F), *Hydropsyche simulans* (MI), *Hydroptila sp* (F), *Nectopsyche candida* (MI), *Nectopsyche diarina* (MI), *Peltodytes sp* (MT), *Uvarus sp* (MT), *Berosus sp* (MT), *Dubiraphia vittata group* (F), *Stenelmis sp* (F), *Anopheles sp* (F), *Ceratopogonidae* (T), *Ablabesmyia mallochi* (F), *Procladius (Holotanypus) sp* (MT), *Thienemanniella xena* (F), *Cricotopus (C.) bicinctus* (T), *Cryptochironomus ponderosus* (F), *Chironomus (C.) decorus group* (T), *Parachironomus frequens* (F), *Polypedilum (P.) illinoense* (T), *Dicrotendipes neomodestus* (F), *Cryptochironomus sp* (F), *Polypedilum (Uresipedilum) flavum* (F), *Cryptotendipes pseudotener* (F), *Paratendipes albimanus or P. duplicatus* (F), *Rheotanytarsus sp* (F), *Paratanytarsus sp* (F), *Tanytarsus sp* (F), *Tanytarsus glabrescens group sp 7* (F), *Hemerodromia sp* (F), *Physella sp, Planorbella (Pierosoma) pilsbryi* (T), *Ferrissia sp* (F)
Caton Ditch (WWH)^^		
3.1[H]	N/A – Low Fair* 0 sensitive taxa	*Turbellaria* (F), *Nematomorpha* (F), *Oligochaeta* (T), *Helobdella stagnalis* (T), *Helobdella triserialis* (MT), *Placobdella parasitica* (MT), *Erpobdella punctata punctata* (MT), *Cambarus sp* (F), *Orconectes sp* (F), *Stenacron sp* (F), *Hexagenia limbata* (F), *Coenagrionidae* (T), *Corixidae* (F), *Cheumatopsyche sp* (F), *Helophorus sp* (MT), *Stenelmis sp* (F), *Anopheles sp* (F), *Chironomus (C.) decorus group* (T), *Microtendipes pedellus group* (F), *Paralauterborniella nigrohalteralis* (F), *Polypedilum (P.) illinoense* (T), *Tribelos jucundum* (MT), *Physella sp, Planorbella (Pierosoma) pilsbryi* (T), *Sphaerium sp* (F)

(Source: Ohio EPA, 2007; Ohio EPA, 2020a)

NOTES

a Narrative evaluation used in lieu of ICI quantitative value in some cases

H Headwater sample

N/A Data not applicable or not available

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

** 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.*

^ 2017 data

^^ 2005 data

3.3.3 Detailed Causes and Associated Sources

The data summarized previously in Table 11 (p.18) reveal a direct link between the presence of attributes in the watershed that have moderate to high influence on the aquatic communities throughout the **Miller City Cutoff HUC-12** in *Critical Area #2*. These contributing attributes in *Critical Area #2* include:

- Silt/Muck Substrates;
- Heavy/Moderate Silt Cover;
- Fair/Poor Development;
- No Fast Current;
- High/Moderate Embeddedness; and,
- High/Moderate Riffle Embeddedness.

Scoured, barren streambanks in Putnam County

Habitat, as scored by the QHEI, is not a WQS; however, habitat is highly correlated with the performance of aquatic communities. In general, sites that score at least 60 (or 55 for headwater streams) are successful at supporting WWH aquatic assemblages. Projects that address the above described habitat-related attributes (e.g., channelization, vegetative cover, etc.) through in-stream and riparian restoration will have a positive effect in the QHEI scoring index. As the habitat score (QHEI) becomes better, IBI and ICI index scores are also expected to improve.

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. For *Critical Area #2,* addressing in-stream and riparian habitat conditions within Caton Ditch, the Miller City Cutoff and contributing tributaries will help ameliorate stresses from land use, reduce excessive siltation and maintain or boost index values for aquatic communities.

The remaining goals for *Critical Area #2* of the **Miller City Cutoff HUC-12** are to at least maintain, if not improve, the aquatic scores in the Miller City Cutoff and Caton Ditch sampling locations through the improvement of in-stream habitat, streambank condition and riparian corridors. These goals are to specifically:

Goal 1. Maintain IBI score at or above 28 at State Route 613 in Miller City Cutoff (RM 0.37).
✓ ACHIEVED: Site currently has a score of 36.

Goal 2. Maintain ICI score at or above 34 (Good) at State Route 613 in Miller City Cutoff (RM 0.37).
✓ ACHIEVED: Site currently has a score of Good.

Goal 3. Achieve QHEI score at or above 55 at State Route 613 in Miller City Cutoff (RM 0.37).
NOT ACHIEVED: Site currently has a score of 21.

Goal 4. Maintain IBI score at or above 20 at State Route 108 in Caton Ditch (RM 3.1).
✓ ACHIEVED: Site currently has a score of 22.

Goal 5. Achieve ICI score at or above 22 (Fair) at State Route 108 in Caton Ditch (RM 3.1).
NOT ACHIEVED: Site currently has a score of Low Fair (~14).

Goal 6. Achieve QHEI score at or above 55 at State Route 108 in Caton Ditch (RM 3.1).
NOT ACHIEVED: Site currently has a score of 48.

Objectives

The implementation of these objectives, partnered with implementation throughout *Critical Area #1* will help ameliorate negative impacts from excessive nutrients and sediments in the **Miller City Cutoff HUC-12**, and positive gains will be made towards removing both near-field and far-field impairments. In order to achieve the overall NPS restoration goal of reaching *Full Attainment* in the **Miller City Cutoff HUC-12**, the following objectives need to be achieved within *Critical Area #2.*

Objective 1: Stabilize at least six miles (31,680 linear feet) of degraded or downcut streambanks through a two-stage ditch or natural channel design approach and/or bio-engineering techniques.

Objective 2: Restore at least three miles (15,840 linear feet) of in-stream channel habitat through natural channel design methods and bioengineering, including, but not limited to, constructed riffles, habitat rocks/boulders, root wads, mud sills and tree revetments.

Objective 3: Create, enhance or restore at least 35 acres[6] of woody riparian corridor and/or riparian floodplain wetlands in tributary locations.

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* (Ohio EPA, 2020b) 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.

[6] With a 75 foot buffer on one river side, this equates to riparian corridor restoration along ~20,300 linear feet (~3.9 miles).

3.4 Critical Area #3: Conditions, Goals & Objectives for Nutrient Reduction in Critical Unsewered Areas

3.4.1 Detailed Characterization

Ohio's *Nutrient Mass Balance Study* (Ohio EPA, 2020c) estimated a small percentage (3%) of the nutrient loadings to Lake Erie via the Maumee River were from contributions from failing HSTS. This estimate is consistent with estimates from several other studies. Ohio EPA 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 #3* contains one CSA identified by TMACOG in 2018, which includes homes and/or businesses within Miller City, along with 90 unmapped, unsewered households with potentially compromised HSTS within the **Miller City Cutoff HUC-12** (Figure 12).

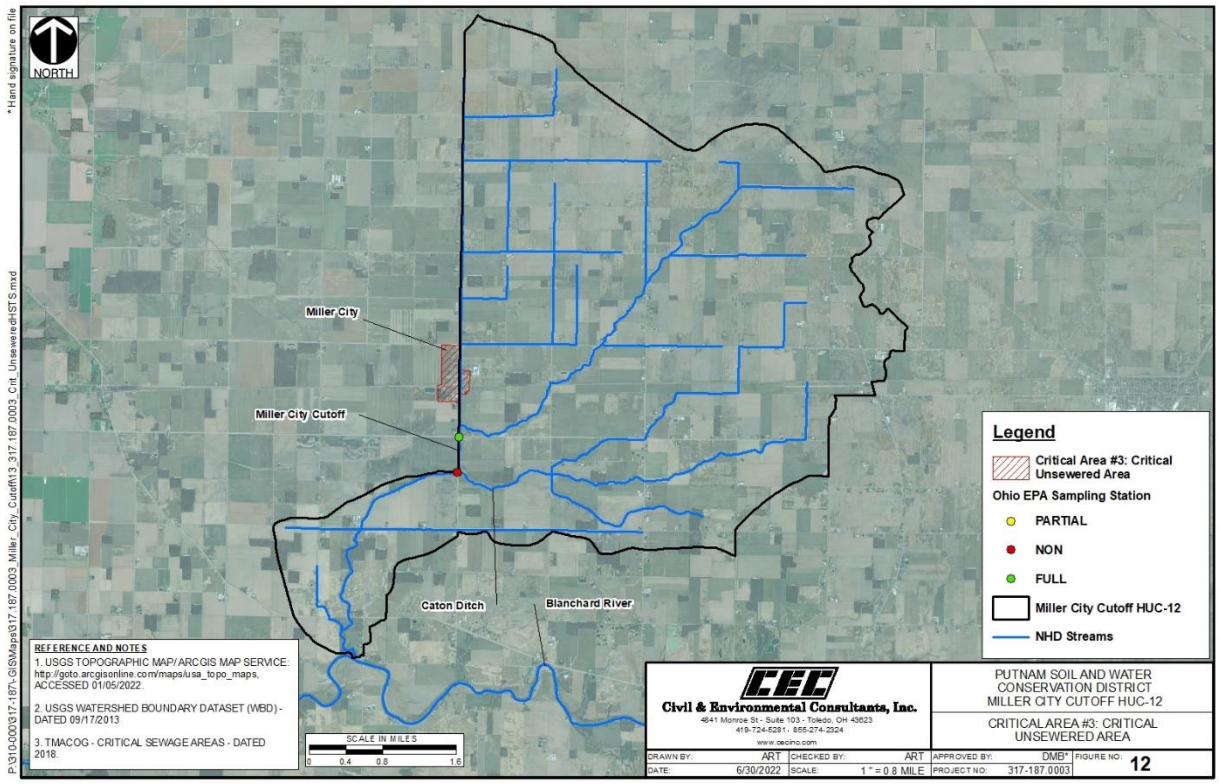

Figure 12: Miller City Cutoff HUC-12 Critical Area #3

Miller City is a small village covering ~250 acres with a population of ~130 people. The Miller City-New Cleveland schools are located within the village boundaries. TMACOG identified the Miller City CSA to cover approximately 98 acres, and it includes at least 55 homes and businesses (TMACOG, 2018); however, only 18% (~18 acres) of the total CSA area is located within the **Miller City Cutoff HUC-12**. Assuming equal distribution of HSTS throughout the CSA, ten (10) HSTS are contained within the CSA within the boundaries of the **Miller City Cutoff HUC-12**. The 2018 study also estimated an additional 368 unsewered housing units throughout the **Miller City Cutoff HUC-12** outside of the CSA boundaries (TMACOG, 2018). Using current estimates for HSTS failure rate in the WLEB, 144 of these homes may be

individually contributing to phosphorus loading within this sub-watershed. These households are unmapped, and HSTS improvement efforts would best be addressed on a case-by-case basis.

3.4.2 Detailed Biological Conditions

Biological data do not exist for this critical area, as no biological sampling stations are located within or directly adjacent to the areas designated as CSAs.

3.4.3 Detailed Causes and Associated Sources

Organic enrichment from failing HSTS and package plants was noted as cause for recreational impairment within Caton Ditch, and Miller City Cutoff was impacted by the unsewered condition of Miller City (Ohio EPA, 2009). In 2018, TMACOG identified Miller City as a CSA, indicating an area of dense housing/business units that are unsewered. 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 *TMDL for the Blanchard River Watershed* recommended the construction of wastewater treatment infrastructure for Miller City (Ohio EPA, 2009).

3.4.4 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 *Ohio's Domestic Action Plan* (2020), springtime phosphorus load contributions from HSTS in the **Miller City Cutoff HUC-12** should be no more than 160 lbs (OLEC, 2020). Current estimates are 270 lbs, resulting in the need of an overall reduction by 110 lbs.

Goals

Ohio EPA 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 **Miller City Cutoff HUC-12**, the following goal has been established:

Goal 1. Reduce springtime phosphorus loading contributions in *Critical Area #3* to a level at or below 160 lbs/year (40% reduction).
NOT ACHIEVED: Current estimated springtime load contribution is 270 lbs/year.

The HSTS study conducted by TMACOG (2018) estimated the annual phosphorus load from the entire **Miller City Cutoff HUC-12** to be 0.29 MTA, with a total household count of 378. Using these numbers, an average household's yearly total phosphorus contribution in this watershed is 0.00077 MTA, equivalent to 1.70 lbs per year (~1.11 lbs springtime load) within the **Miller City Cutoff HUC-12**. Establishing sewer

service within Miller City could reduce springtime phosphorus loadings by 11 lbs annually. An additional 90 homes throughout the **Miller City Cutoff HUC-12** would need to have a failing HSTS replaced or be connected to sanitary sewer service in order to meet the 40% springtime reduction goal for HSTS-related phosphorus contributions. Given only one cluster of homes/businesses was identified as a CSA within the **Miller City Cutoff HUC-12**, these improvements would likely be accomplished on a case-by-case basis.

Objectives

In order to make substantive progress toward the achievement of the springtime phosphorus load reduction goal of 110 lbs for the HSTS contribution in the **Miller City Cutoff HUC-12**, effort must commence on more widespread implementation, according to the following objectives within *Critical Area #3.*

Objective 1: Reduce HSTS contributions through replacement efforts or connection to sanitary sewer infrastructure for at least 10 households in the clustered community/CSA of Miller City.

Objective 2: Reduce HSTS contributions through replacement efforts or connection to sanitary sewer infrastructure for at least 90 unmapped, unclustered households on an individualized, case-by-case basis.

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* (Ohio EPA, 2020b) 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 **Miller City Cutoff 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 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 **Miller City Cutoff HUC-12** there are three *Project and Implementation Strategy Overview Tables* (subsection 4.1, 4.2 and 4.3). 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 **Miller City Cutoff 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) follow the *Overview Tables*, if projects were identified; 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 Table

Table 20: Miller City Cutoff HUC-12 (04100008 06 03) — 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							
1-4	5	1	Blind Inlet Implementation	Putnam SWCD	Short (1-3 years)	$7,500	Ohio EPA §319, GLC
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 **Miller City Cutoff 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 21: Critical Area #1 – Project #1

Nine Element Criteria	Information needed	Explanation
n/a	Title	Blind Inlet Implementation
criteria d	Project Lead Organization & Partners	Putnam SWCD
criteria c	HUC-12 and Critical Area	Miller City Cutoff (04100008 06 03) – *Critical Area #1*
criteria c	Location of Project	Private lands near County Road D and State Route 108
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategies
criteria f	Time Frame	Short (1-3 years)
criteria g	Short Description	Design and installation of a blind inlet
criteria g	Project Narrative	One private landowner will install a blind inlet in order to provide extra filtration for surface water before entry into the subsurface drainage system within a 15-acre field that drains to a tributary of the Miller City Cutoff. Design services will be provided by the Putnam SWCD.
criteria d	Estimated Total cost	$7,500
criteria d	Possible Funding Source	Ohio EPA §319, GLC
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?	The overall goal in *Critical Area #1* is to reduce estimated springtime phosphorus loads. Current estimates indicate the agricultural contribution to the springtime load is 11,000 lbs. of phosphorus. In order to meet the GLWQA and DAP nutrient reduction goals, annual loads must be reduced by 40%, or 4,400 lbs. of phosphorus.
	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	It is expected that this project will cause a decrease in springtime phosphorus loadings by 9 lbs. (0.2% progress) through incremental progress made towards Objective #5: Reduce nutrient loss from subsurface tile drainage through the installation of blind inlets that drain at least 150 acres. This project will make 10% progress towards objective completion.
	Part 3: Load Reduced?	Estimated annual reduction: 31 #N/year; 14 #P/year; 2.4 tons sediment/year

Table 21: Critical Area #1 – Project #1		
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 Ohio EPA, 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	The Putnam SWCD will highlight project components through the district newsletter and annual meeting, as well as through social media postings. The SWCD will also host a Technician Tour at the site to promote the benefits of blind inlets. Appropriate signage will be placed at the project site.

4.2 Critical Area #2 Project and Implementation Strategy Overview Table

Table 22: Miller City Cutoff HUC-12 (04100008 06 03) — 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							
Agricultural Nonpoint Source Reduction Strategies							
High Quality Waters Protection Strategies							
Other NPS Causes and Associated Sources of Impairment							

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

4.3 Critical Area #3 Project and Implementation Strategy Overview Table

Table 23: Miller City Cutoff HUC-12 (04100008 06 03) — Critical Area #3							
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							
High Quality Waters Protection Strategies							
Other NPS Causes and Associated Sources of Impairment							
1	TBD	--	HSTS Nutrient Reduction	TBD	TBD	TBD	TBD

At this time, no short-term projects have been identified for *Critical Area #3*; therefore, no Project Summary Sheets are included.

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