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

Upper Eagle Creek HUC-12 (04100008 03 01)

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Cover Photo Credit: Upper Eagle downstream (Martin 2020)

Acknowledgements

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Acronyms and Abbreviations

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

Numbers

319	Section 319 of the Clean Water Act

A

ALU	Aquatic Life Use

B

BMP	Best Management Practice

C

CSA	Critical Sewage Area
CTIC	Conservation Tillage Information Center

D

DAP	Domestic Action Plan

E

ECBP	Eastern Corn Belt Plains
EQIP	Environmental Quality Incentives Program

F

FLS	Federally Listed Species

G

GLC	Great Lakes Commission
GLRI	Great Lakes Restoration Initiative
GLWQA	Great Lakes Water Quality Agreement

H

H2Ohio	H2Ohio Initiative (Ohio state funding mechanism for water quality improvement)
HAB	Harmful Algal Bloom
HELP	Huron-Erie Lake Plains Ecoregion
HSTS	Home Sewage Treatment System
HUC	Hydrologic Unit Code

I

IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index
IJC	International Joint Commission

M

MIwb	Modified Index of Well Being
MWH	Modified Warmwater Habitat

N

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

O

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

P

PAD-US	Protected Areas Database of the United States

Q

QHEI	Qualitative Habitat Evaluation Index

R

RM	River Mile

S

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

T

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

U

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

W

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

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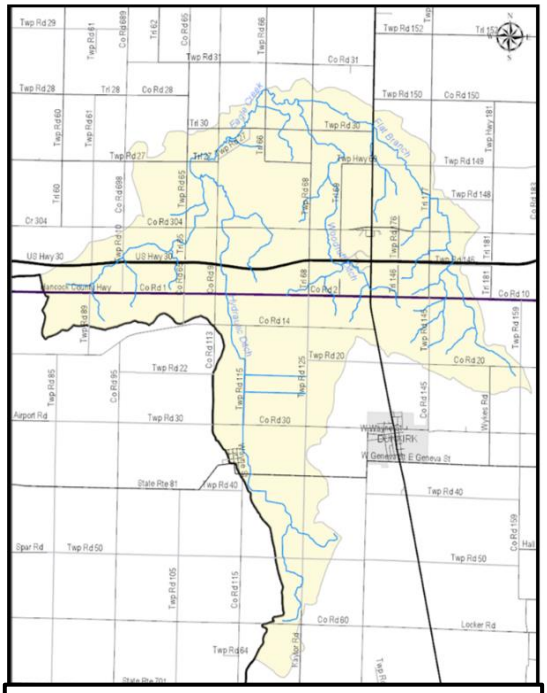
Chapter 1: Introduction

The **Upper Eagle Creek HUC-12 (04100008 03 01)** watershed covers 16,875.33 acres or 26.37 square miles (Map 1.1). Like most of the HUC-12 watersheds in the Blanchard River watershed, agriculture land makes up a majority of the **Upper Eagle Creek HUC-12**, covering 13,635.29 acres or 80.80% of the watershed (OEPA). About 8% of the land use is forest, while nearly 7% involves land that has been developed. Map 1.2 on the next page shows the land use for the **Upper Eagle Creek HUC-12.** There are no cities or incorporated villages within the watershed, however, the unincorporated Village of Williamstown is located in the watershed on SR 68 just north of US 30.



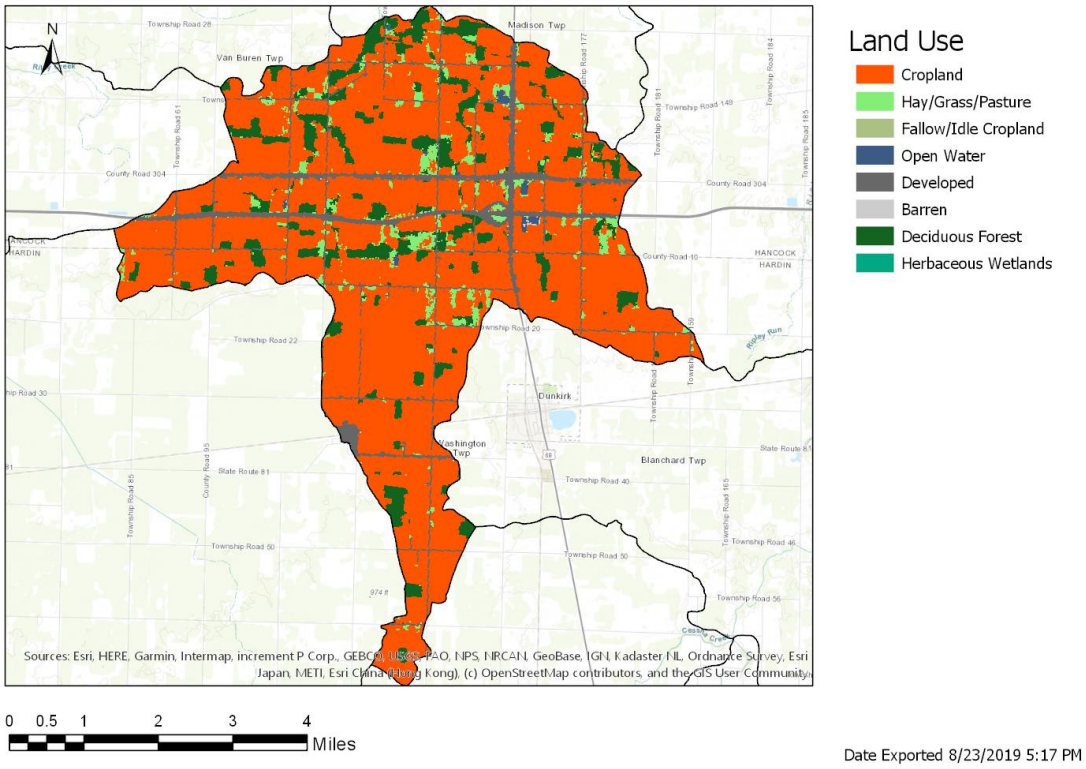
Map 1.1 Upper Eagle Creek HUC-12 (04100008 03 01) (Reynolds)

The **Upper Eagle Creek HUC-12** starts at the headwaters of Eagle Creek (RM 18.62) and flows north to below Flat Branch (RM 15.65) where the Eagle Creek enters the Lower Eagle HUC-12. Almost all of the watershed is contained in Hancock County, except for the upper reach, which lies in Hardin County. There are two main tributaries that flow into Eagle Creek in this watershed. Flat Branch flows in a northwest direction with its headwaters starting in Hardin County. Flat Branch runs along the east boundary of the watershed and enters Eagle Creek at RM 15.65. Hydraulic Ditch flows in a northerly direction with its headwaters starting in Hardin County. The ditch flows just west of the midline of the watershed and enters Eagle Creek at RM 18.05.

Loadings from the **Upper Eagle Creek HUC-12** not only have a near-field effect on the downstream portion of Eagle Creek and the Blanchard River, but also have a far-field effect on Lake Erie.

The federal and state nonpoint source funding opportunities require strategic watershed plans to be written at the HUC-12 watershed level, using the nine key elements in the Guide to Developing Nonpoint Source Implementation Strategic Plans in Ohio developed by the OEPA. The Blanchard River Watershed Partnership (BRWP), with collaboration from local agencies and stakeholders, has started to develop Nine-Element Nonpoint Source Implementation Strategic Plans (NPS-IS plans) for the Blanchard River Watershed. The development of Nine Element Nonpoint Source Implementation Strategies (NPS-IS) is vital to the efforts needed to meet the goal of Ohio's Domestic Action Plan (DAP) to reduce total spring loadings to Lake Erie

by 40%, based on the 2008 loadings by 2025. The approved NPS-IS Plans will have both near-field (within stream/watershed) and far-field (Lake Erie) effects.



Map 1.2 Upper Eagle Creek-Blanchard River Land Use Map (Created in GIS by Elaine

1.1 Report Background

The Blanchard River Watershed Partnership (BRWP) is a community-based volunteer 501(c) (3) organization that seeks to address problems and concerns that affect the health of the Blanchard River Watershed, and educate all citizens about the dynamics of the Blanchard River and its tributaries. The BRWP members and Board of Directors include interested citizens, local government agencies, educators, representatives of industry and other stakeholders who have come together with one goal in mind: to improve and maintain water quality within the watershed. One of the main ways to achieve improved water quality was through the development of watershed action plans (WAP). In June 2011, the BRWP received full endorsement of The Outlet/Lye Creek (HUC 04100008 02) WAP. In November 2012, the

BRWP received full endorsement of another WAP for the Riley Creek Watershed (HUC 04100008 04). These two action plans were written at the HUC-10 level. Implementation activities in these two watersheds have been occurring since their endorsement. After the endorsement of these two WAPs, designed to outline the process for restoration activities, the BRWP was able to write or assist with grant writing that resulted in the award of over $11,000,000 in funding.

With the new requirement from the U.S. EPA to develop plans that align with the nine-element plans, the focus of the BRWP is now on developing NPS-IS plans for individual HUC-12 watersheds based on their grade in the BRWP Report Card, which was created in 2012. Many of the current federal and state efforts to improve and protect water quality are based upon a watershed approach focusing more on geographic boundaries defined by drainage areas instead of political boundaries. This approach provides a flexible, coordinated framework that aligns public and private efforts with targeted problems in a watershed. The guiding principles of this approach are stakeholder partnerships, a geographic focus, and sound scientific data. It has been shown that involving the public in watershed planning and decision-making generates a high level of support and long-term success. Using a watershed approach ensures the most equitable balancing of environmental protection, economic prosperity, and quality of life issues. We need to keep in mind that we all live upstream and/or downstream in a watershed, and that each individual action has an effect somewhere in that watershed.

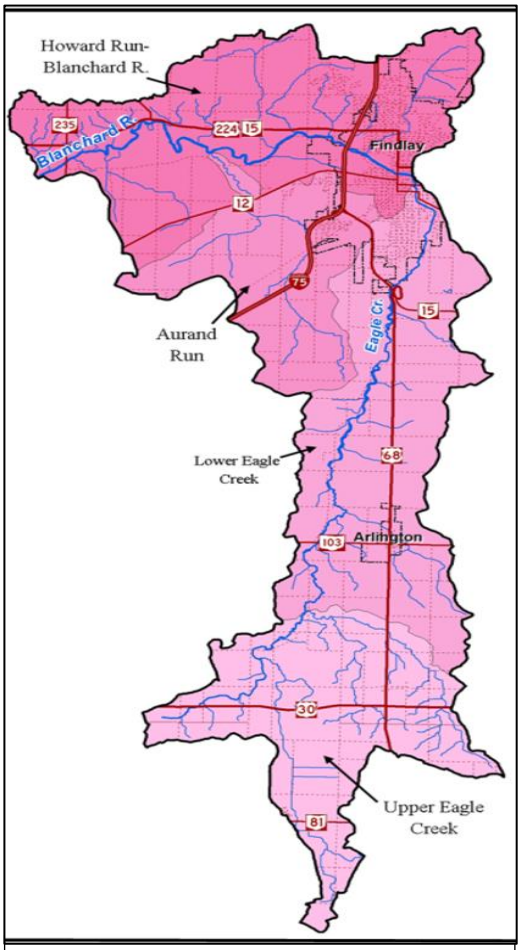
This NPS-IS plan is being written for the **Upper Eagle Creek HUC-12 watershed** to address nonpoint source causes and sources of impairments that have been specifically identified in the watershed. Removal of nonpoint source impairments in the **Upper Eagle Creek HUC-12** will address nonpoint source impairment and allow for stepwise improvement toward achieving the attainment of water quality standards. In addition, nutrient load reductions achieved through the implementation of projects in this watershed will address the goals to reduce far-field Western Lake Erie Basin (WLEB) load reduction to Lake Erie, as described in the Domestic Action Plan (DAP) for Ohio in accordance with the Annex 4 agreement.

1.2 Watershed Profile and History

The Blanchard River Watershed is identified using the 8-digit Hydrological Unit Code (HUC), 04100008. There are six subwatersheds within the Blanchard River Watershed. Each of these subwatersheds is identified using a HUC-10. The Eagle Creek watershed HUC-10 is 04100008 03. There are four smaller HUC-12 watersheds located in the Eagle Creek watershed. Map 1.4 on the following page shows the HUC-12 subwatersheds in the Eagle Creek watershed. The Blanchard River Watershed covers 493,434-acres (771 square miles) and drains into the Auglaize River west of the Village of Dupont in Putnam County. From here, the water flows into the Maumee River at Defiance and eventually into Lake Erie at Toledo. Map 1.5 on page 5 shows the location of the Blanchard River Watershed in the Western Lake Erie Basin. Map 1.6

on page 6 shows the location of the **Upper Eagle Creek HUC-12 watershed** in the Blanchard River Watershed.

Prior to European immigrant settlement in the 1800's, wetlands were common and, based on soil survey information, made up about 42 percent of the watershed. Due to the clearing of swamp forest and the subsequent drainage of the land, most of the wetlands have been drained. Wetlands occurring in cropland currently constitute less than one percent of the watershed, and wooded wetlands constitute about 3.2% of the watershed.



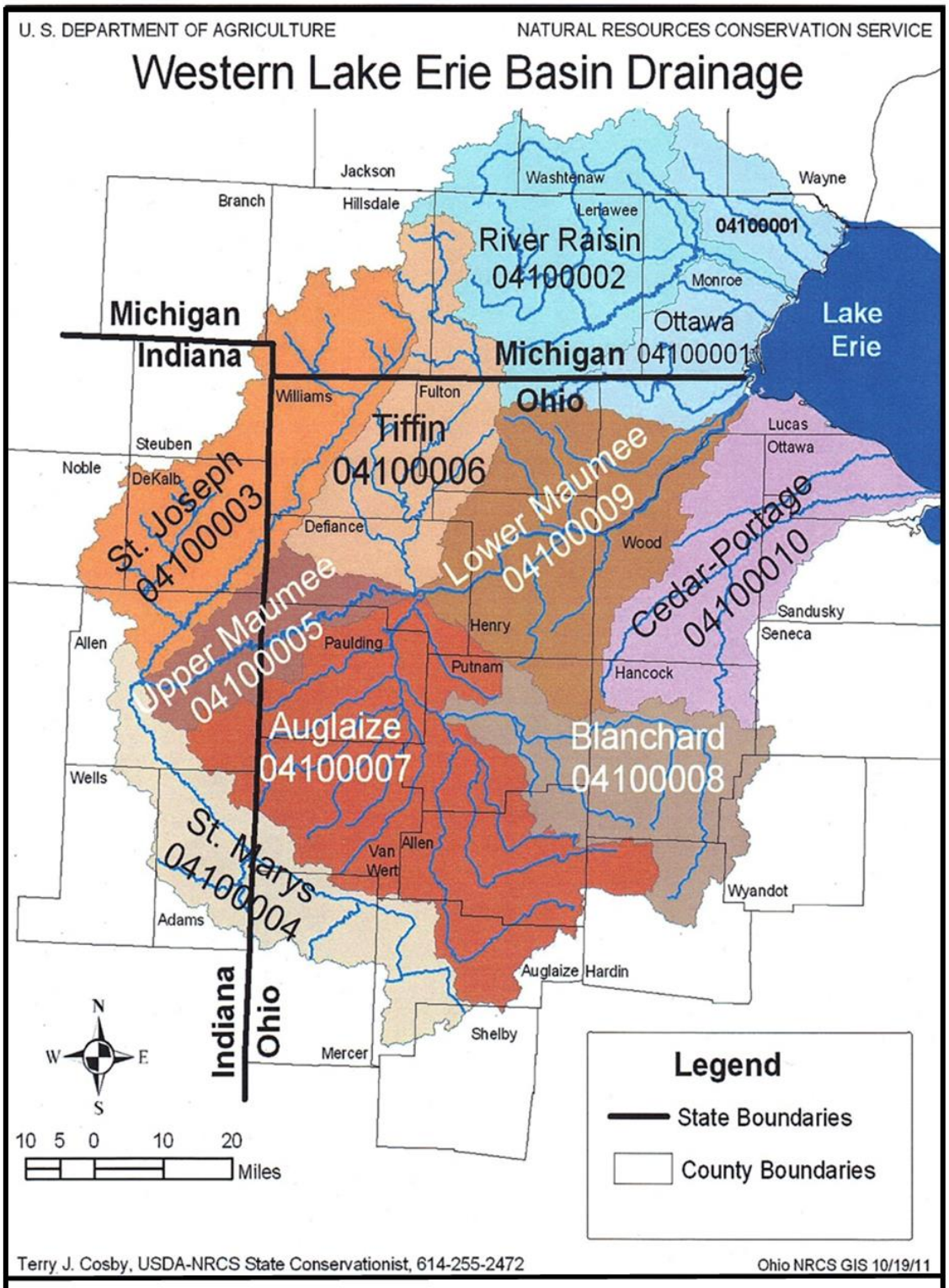
Map 1.4 HUC-12 watersheds within the Eagle Creek HUC-10

In addition to addressing the impairments in the **Upper Eagle Creek HUC-12**, this NPS-IS plan will have a cross benefit to meet phosphorus load reduction goals in the Western Lake Erie Basin described in the Ohio Domestic Action Plan for Ohio in accordance with the Annex 4 agreement.

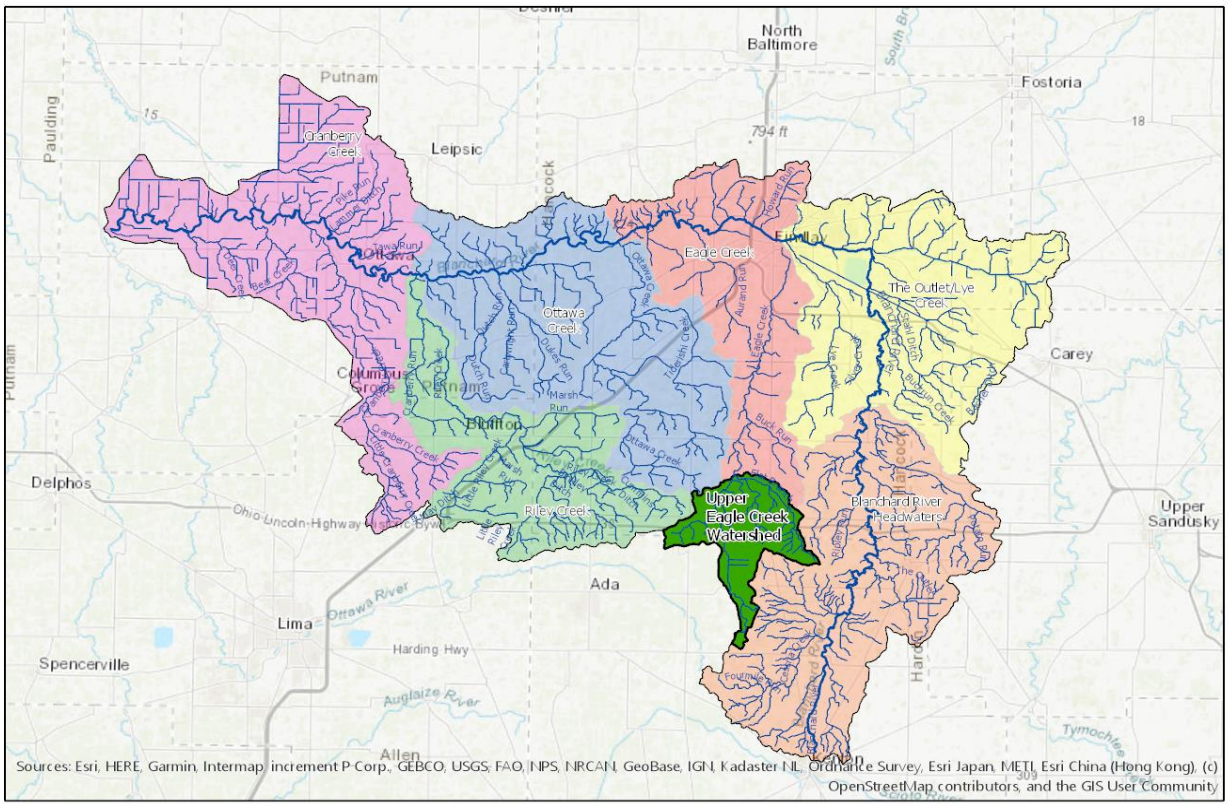
1.3 Public Participation and Involvement

The Blanchard River Watershed Partnership (BRWP) works to engage stakeholders in all activities. The BRWP collaborates with soil and water conservation districts within the Blanchard River Watershed, as well as agencies such as the National Resources Conservation Service (NRCS), the county Farm Bureaus, county Ag Councils, township trustees, school district representatives, universities, the National Center for Water Quality Research (NCWQR), county commissioners, village representatives, mayors, county health departments, landowners, producers, and any other stakeholders who are appropriate for a particular project.

The initial planning process for developing the **Upper Eagle Creek HUC- 12** Nine-Element Nonpoint Source Implementation Strategic Plan (NPS-IS plan) was conducted by the BRWP. Partners were contacted to inform them that the BRWP had received funding from the Lake Erie Commission to write an NPS-IS Plan for the **Upper Eagle Creek HUC-12**. These partners included the City of Findlay, the City of Findlay Regional Planning Board, the Hancock County Soil & Water Conservation District (HSWCD), the Hancock County Public Health Department, the Hancock County Commissioners, the Hardin County Public Health Department, and the Hardin County Soil and Water Conservation District.



Map 1.5: Location of the Blanchard River Watershed in the Western Lake Erie Basin



Map 1.6 Location of the Upper Eagle Creek Watershed within the Blanchard River Watershed (Image by Elaine Reynolds)

The watershed was scouted by doing a road-by-road observation and inspection of the conditions of the waterways, agricultural fields, and other features that would be useful in developing the **Upper Eagle Creek HUC-12** NPS-IS plan. Once initial information was gathered in regards to the background and history of the watershed, partners and stakeholders were asked to contribute their input regarding impairments, critical areas, and appropriate Best Management Practices (BMP's) and projects within the Upper Eagle Creek HUC-12. The Hancock Public Health Department assisted the BRWP in compiling information regarding home sewage treatment systems (HSTS) in the Upper Eagle Creek watershed. The Hancock Soil and Water Conservation District thoroughly reviewed the Critical Areas, goals, objectives and project sheets for each of these areas. The Hancock SWCD also provided precise land use information for this watershed.

Once the Critical Areas were established and goals, objectives and project sheets for each Critical Area were completed, project sheets were sent back to the appropriate agency for additional review. Any final changes and suggestions comprised were included in the plan. The completed plan was then sent to all involved stakeholders for a final review before the plan was submitted to the Ohio Environmental Protection Agency (OEPA).

Chapter 2: Characterization and Assessment Summary

2.1 Summary of Watershed Characterization for the Upper Eagle Creek-HUC-12

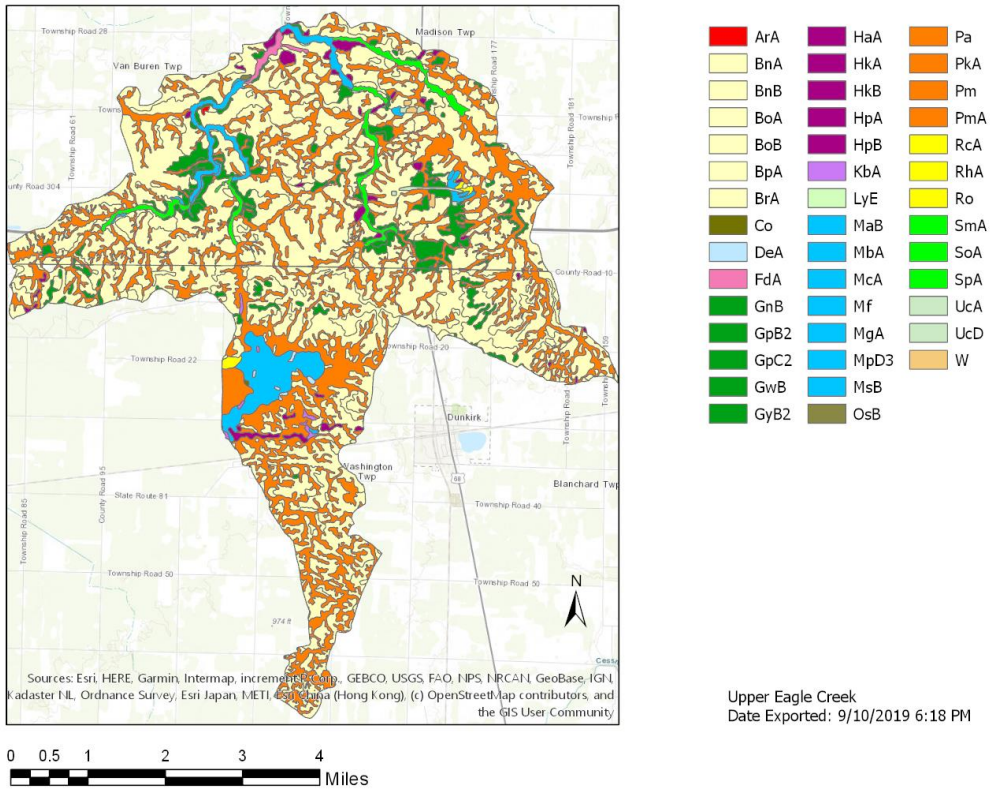
2.1.1 Physical and Natural Features

The **Upper Eagle Creek HUC-12** starts in Hardin County just south of CR 60 and the TR. 125 intersection. Eagle Creek flows northward to Findlay for about 3.6 miles where it the enters the Lower Eagle Creek HUC-12. The eastern boundary occurs just east of SR 68. The western boundary occurs along Eagle Creek stating near the Hancock-Hardin County line (See Map 1.1 on page 1).

All of the **Upper Eagle Creek-HUC 12** lies within the Eastern Corn Belt Plains (ECBP) ecoregion. In an ECBP ecoregion, the land surface is flat and smooth, soils are leached basic or slightly acid soils with a clay-enriched B horizon and the predominant land use is cropland. In addition, the predominant forest type is beech/maple forest and the primary land use is agriculture (Knowlton, OSU). The dominant soil (58.2%) in the **Upper Eagle Creek HUC-12** is of the Blount series. The Blount series consists of very deep, somewhat poorly drained soils that are moderately deep or deep to dense till. Blount soils formed in till are on wave-worked till plains, till plains, and near-shore zones, with the slope ranging from 0 to 6 percent (USDA). The soil classification data for the **Upper Eagle Creek HUC-12** can be found on the next page in Map 2.1.

The EPA 2009 TMDL Report states that most of the streams are channelized with narrow riparian corridors, if present. Lack of water in the tributaries becomes a problem during summer months. The Hancock County SWCD (HSWCD) maintains Flat Branch from SR 68 to Hardin CR 20 using one-sided construction according to Ohio Drainage Law petition ditch and maintenance procedures. The HSWCD also does clear and snag along the entire main stretch of Eagle Creek. Additionally, the HSWCD also does clear and snag along the entire main channel of Woodruff Ditch, and from the mouth of Flat Branch to the SR 68 bridge.

The EPA's National Pollutant Discharge Elimination System (NPDES) requires a permit for all facilities discharging pollutants from a point source to a waterway of the state. There are no facilities with NPDES permits within the **Upper Eagle Creek HUC-12**. However, Sulphur Springs Campground (now known as Arrowhead Campgrounds) was informed by the EPA in 2010 that they needed an NPDES Permit. Records at the EPA office in Bowling Green, Ohio show that no such permit has been issued.



Map 2.1: Classification of Soil Types within the Upper Eagle Creek HUC-12
(Reynolds)

2.1.2 Land Use and Protection

As shown in Table 2.1, 80.80% of the **Upper Eagle Creek HUC-12** is used for agricultural cropland. As with most of the agricultural area in the Blanchard River Watershed, corn and soybeans are the two dominant crops being grown. Approximately 8% of farmland in the Upper Eagle Creek HUC-12 are being used for winter wheat (USDA Ag Census, 2017). There are roughly 658 acres of alfalfa and grass pastureland.

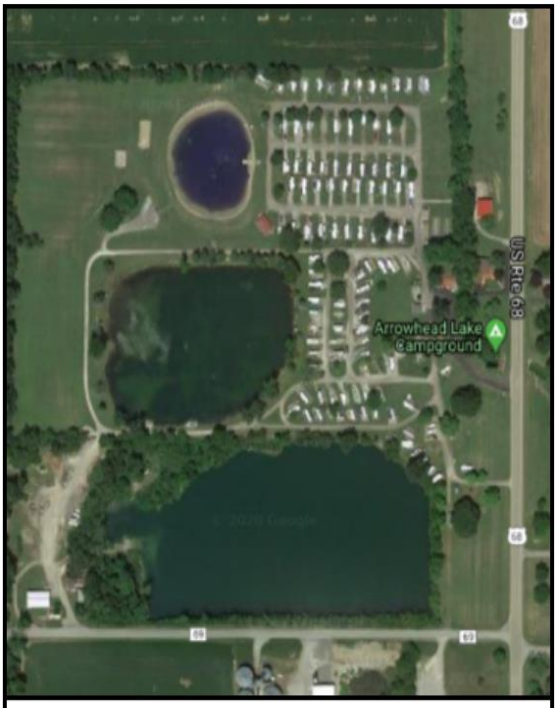
Table 2.1: Land Use in the Upper Eagle Creek HUC-12

Land Use	Miles^2	Acres	% of Watershed
Cropland	21.31	13,635.29	80.80%
Deciduous Forest	2.16	1,383.77	8.20%
Developed	1.87	1,198.14	7.10%
Pasture/Grassland	1.03	658.13	3.90%
Total	**26.37**	**16,875.33**	**100.00%**

While there are no protected lands or parks within the **Upper Eagle Creek HUC-12**, there are two federally endangered species listed within Hancock County, as well as five other species which are listed as endangered or threatened (Ohio ODNR). See Table 2.2 on the next page.

There are no school buildings or sewered areas in the watershed. The only recreational area is a campground owed by Arrowhead Land Holdings, LLC. The campground covers around 42 acres and has two lakes and a pond covering 28.9 acres. Picture 2-1 shows an aerial view of the campground.

The population within the **Upper Eagle Creek HUC-12** is estimated at 870, with 375 housing units (TMACOG, 2018). Although these housing units are in unsewered areas, there are no identified clusters or Critical Sewage Areas (CSAs) identified in the Toledo Metropolitan Area Council of Governments' (TMACOG) home sewage treatment systems (HSTS) inventory conducted for the WLEB (TMACOG, 2018).



Picture 2-1: Arrowhead Campground along SR. 68
(Hancock Auditor)

Table 2.2: Threatened and Endangered Species in Hancock County		
Species	**Status**	**Habitat Characteristics**
Plains Clubtail (*Gomphus externis*)	Endangered	Typically found near slow-moving, large, muddy streams and rivers, with adults flying from mid-July to mid-August
Clubshell Mollusk (*Pleurobema clava*)	Federally Endangered	Found in small to medium streams with gravel/sand substrate and relatively little silt; mussel will bury itself in the bottom substrate to depths of up to four inches
Western Banded Killfish (*Fundulus diaphanus menona*)	Threatened	Found in areas with an abundance of rooted aquatic vegetation, clear waters, and with substrates of clean sand or organic debris free of silt
Purple Lilliput (*Toxolasma lividus*)	Endangered	Found in small to medium sized streams, less often in large rivers and lakes; most often found in well packed sand or gravel in water depths of less than one meter
Rayed Bean (*Villosa fabalis*)	Federally Endangered	Typically found in smaller, headwater creeks, but is sometimes found in large rivers and wave-washed areas of glacial lakes; prefers gravel/sand substrates, and is often found in and around roots of aquatic vegetation
Black Sandshell (*Ligumia recta*)	Threatened	Usually found in riffles or raceways with good current in large streams; prefers sandy mud or gravel substrates
Kirtland's Snake (*Clonophis kirtlandii*)	Threatened	Generally found in open wetlands such as wet prairies, prairie fens, wet meadows and marshes, but can also occur in openings or along the edges of forested wetlands and floodplains
(Sources: ODNR Division of Wildlife, 2020 and USFWS, 2019)		

Several conservation practices are being utilized within the **Upper Eagle Creek HUC-12** watershed. 63% of farmers in this watershed are utilizing conservation tillage practices, and 14% of farmers in the watershed are using cover crops (Hancock SWCD). The USGS has an edge-of-field monitoring site (USGS-40505108339120) located on a farm on TR 69 south of Arlington. The site has monitored surface and tile runoff from the cropland field since September 8, 2009. Daily precipitation levels are recorded (in inches), and daily discharge rates are recorded (cubic feet per second).

2.2 Summary of Upper Eagle Creek HUC-12 Biological Trends

The **Upper Eagle Creek HUC-12** was sampled starting in 2005 and reported in 2009 as a part of the Ohio EPA's the Total Maximum Daily Load Report (TMDL). The 2009 TMDL report was used extensively in preparation of the **Upper Eagle Creek HUC-12** NPS-IS Plan, in addition to the OEPA 2018 Ohio Integrated report. The OEPA Water Quality on Hydrological Units interactive map was also a great source of data and information for this report. The habitat and biological data presented in this plan are from these reports collectively.

Site specific evaluations of the Primary Contact Recreation use were conducted in the **Upper Eagle Creek HUC-12** in 2005. Evaluation of the Recreational Use Assessment reported a score of 0 due to impairment from bacteria (2018 WQR).

Table 2.3: Biological Indices Scores for Selected Sites in the Upper Eagle Creek HUC-12

Location	River Mile	Drainage Area (mi)	IBI	MIwb[a]	ICI[b]	QHEI	Attainment Status
Eagle Creek / Flat Branch WWH							
Eagle Creek at TR 27	17.7	12.9	32*	a	MG[ns]	55.5	Partial
Flat Branch at TR 66	1.0	6.6	---	a	F*	---	Non
Flat Branch west TR 66	0.05	10.9	26*	a	MG[ns]	54.0	Non

(Source: 2009 TMDL Report)

NOTES
IBI Index of Biotic Integrity
a The Modified Index of Well Being (MIwb) is not applicable to headwater sites (drainage ≤20 mi2).
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.*
ns Nonsignificant departure from biocriteria (<4 IBI or ICI units, or <0.5 MIwb units).
--- No data available.

According to the OEPA 2018 Integrated Water Quality Report, the causes of impairments are: low flow alterations, organic enrichment (sewage) biological indicators, nutrient/eutrophication biological indicators, and phosphorous (total). The sources of impairment are: crop production with subsurface drainage and channelization. The TMDL report noted that failing HSTS were indicated by fecal coliform levels which were consistently a problem throughout the Eagle Creek sampling locations, including the site at TR 27 in this watershed (2009 TMDL Report).

Table 2.4: Water Quality Standards for the Eastern Corn Belt Plain (ECBP) Ecoregion			
ECBP Ecoregion	**WWH Standards**		
	Wading	**Headwater**	**Boat**
IBI	40	40	42
Mlwb	8.3	--	8.5
ICI	36	36	36
QHEI	60	60	60

2.2.1 Sediment and stream habitat

The 2005 TMDL Study did not describe sediment or silt impairment.

Table 2.5 below shows the characterization of the habitat TMDL using QHEI metrics for the site on Flat Branch and Eagle Creek. Both sites have been designated WWH in the TMDL Report. Neither site achieved the Total Habitat Score of 3 needed to meet the goal. The number of high-influence attributes need to retain a score of at least 1 or lower, and the total number of modified attributes needs to be lowered to at least 4.

Table 2.5: Characterization of the Habitat using QHEI metrics (Ohio EPA 2009)									
Stream/River	**River Mile**	**Stream Designation**	**QHEI Score**	**# of High Influence Attributes**	**Total # of Modified Attributes**	**Subscore[1]**			**Total Habitat Score**
						QHEI	**High Influence**	**Modified**	
Eagle Creek	17.7	WWH	55.5	1	7	0	1	0	1
Flat Branch	0.05	WWH	54	1	7	0	1	0	1
[1]Habitat TMDL points are assigned to WWH streams based on achieving the following minimum targets: QHEI = 60 points; total number of modified attributes < 5; and number of high influence modified attributes < 2 One point is assigned if these targets are not met.									

2.2.2 Macroinvertebrates (Invertebrate Community Index [ICI])

According to the 2009 TMDL report and the 2018 OEPA Integrated Water Quality Report, the macroinvertebrate community in the **Upper Eagle Creek HUC-12** reflects an impaired aquatic resource.

Table 2.6: Macroinvertebrate Data Results for the Upper Eagle Creek HUC-12

River Mile (drainage area mi^2)	# Qualitative Taxa	Total Taxa	ICI[b]	Quality EPT
Eagle Creek RM 17.70 (12.9)	41	41	MG^{ns}	7
Flat Branch RM 1.10 (6.6)	37	37	F*	2
Flat Branch RM 0.05 (10.9)	27	27	MG^{ns}	5
Hydraulic Ditch 1.50 (nr)	38	38	nr	13

Source: 2005 TMDL Study

b - A narrative evaluation of the qualitative sample based on attributes such as community composition, EPT taxa richness, and number of sensitivity taxa were used when quantitative data were not available or considered unreliable due to current velocities less than 0.3 fps flowing over artificial substrates.

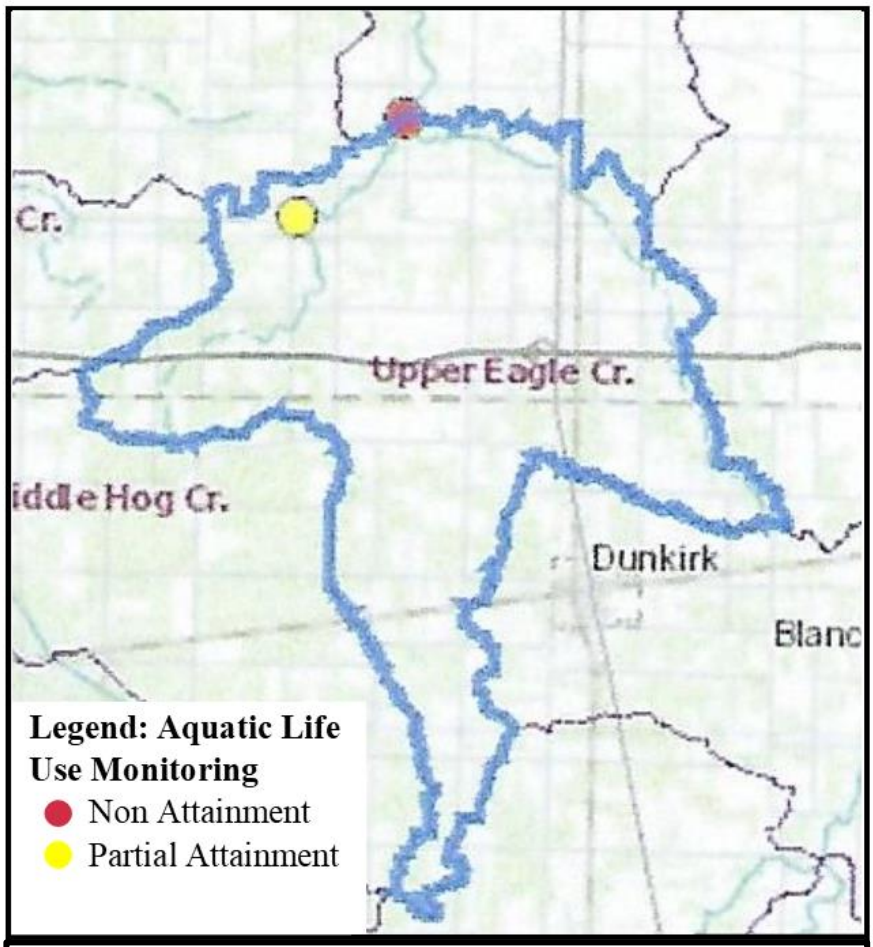
ns – Nonsignificant departure from biocriteria (≤4 IBI or ICI units, or ≤0.5 units)

* - Indicates significant departure from the applicable biocriteria (>4 IBI or ICI units, or >0.5 Mlwb Units. Underlined scores are in the Poor or Very Poor range.

The macroinvertebrate community was in fair condition at RM 1.10 on Flat Branch. Although the 37 taxa collected were reasonably diverse, only two were considered pollution tolerant. The sampling at RM 0.10 showed a marginally good assemblage. The sampling site on Hydraulic Ditch at RM 1.50 was rated in good condition. The EPT score of 13 suggests adequate water quality that enabled the establishment of a diverse community. Biological communities in the Eagle Creek WAU were impacted primarily by factors related to agricultural practices in the watershed (TMDL 2009).

2.2.3 Habitat (via Qualitative Habitat Evaluation Index [QHEI]

The OEPA sampling teams collected data related to water quality and habitat characteristics during the 2005 study. There were only two sites studied in the **Upper Eagle Creek HUC-12** that involved complete data. There were two other sites that had data reported for macroinvertebrates, but this data was not complete. Table 2.6 above shows the macroinvertebrate data from all four sites, and Table 2.7 on the next page shows data from the two sites that were completely studied. Map 2.1 on the next page shows the attainment status for aquatic life use at the two sites with complete data. The site on Eagle at TR 27 was in partial attainment. The site on Flat Branch near the mouth with Eagle Creek was in non-attainment. The score needed for QHEI to meet that water quality standards in a WWH is 60. The site on Eagle Creek at RM 17.7 had a score of 55.5, while the site on Flat Branch at RM 0.05 had a score of 54.0. One of the goals in restoring the water quality for the **Upper Eagle Creek HUC-12** will be to raise the QHEI score to at least 60 at both sites.



Map 2.2: Attainment Status for Aquatic Use

Table 2.7 Summary of Aquatic Assessment Score for the Upper Eagle Creek HUC-12

RM (Drainage Area(mi^2))	IBI*	Mlwb[a]	ICI[b]	Status[c]	QHEI	Causes	Sources
Eagle Creek RM 17.7 (12.9)	32	a	MG^{ns}	Partial	55.5	low flow alterations, organic enrichment (sewage) biological indicators, total phosphorus	crop production with subsurface drainage, channelization
Flat Branch RM 0.05 (10.9)	26	a	MG^{ns}	Non	54		

* - Significant departure from applicable biocriteria (> 4 IBI or ICI units, or > 0.5 Mlwb).
a - Mlwb is applicable to headwater streams with drainage area $\leq$ 20 mi^2.
b - A narrative evaluation of the qualitative sample based on attributes such as community composition, EPT taxa richness and number of sensitive taxa was used when qualitative data were not available or considered unreliable due to current velocities less than 0.3 fps flowing artificial substrate.
c – Attainment status based on a single organism group is parenthetically expressed.
ns – Nonsignificant departure from biocriteria ($\leq$ 4 IBI or ICI units, or > 0.5 Mlwb).

Table 2.8 Summary of Fish Population – Upper Eagle Creek HUC-12							
River / Stream	River Mile	Number Species	Tolerance to Pollution by Species				
			T	MT	M	MI	I
Eagle Creek	17.70	16	7	2	3	4	0
Flat Branch	0.10	12	6	1	2	3	0
T – tolerant; MT – moderately tolerant; M – intermediate; MI – moderately intolerant; I - intolerant							

2.2.4 Fishes (Modified Index of Well Being [Mlwb] & Index Biotic Integrity [IBI]

The fish population study was conducted at three sites in the watershed in August of 2005 as a part of the TMDL Study. Table 2.8 above summarizes the results of the study based on their tolerance to pollution. The sampling on Eagle Creek at RM 17.70 showed 16 species present. Nine of the sixteen species (56.3%) were either tolerant or moderately tolerant to pollution. The site on Flat Branch near the mouth showed 12 species present. Seven of the twelve species present (58.3%) were either tolerant or moderately tolerant to pollution.

2.3 Summary of NPS Pollution Causes and Associates Sources for the Upper Eagle Creek HUC-12

According to the *Ohio 2018 Integrated Water Quality Monitoring and Assessment Report*, the Ohio EPA has determined that the biological impairments in the **Upper Eagle Creek HUC-12** are primarily the result of low flow alteration, nutrient eutrophication, total phosphorus and organic enrichment due to sewage. The sources of these impairments are crop production with subsurface drainage and channelization.

The OEPA has estimated spring phosphorus loadings from individual subwatersheds throughout the greater WLEB watershed. These estimates also include a breakdown of estimated loads from contributing sources of NPS pollutants, such as agricultural lands/activities, developed/urban lands, natural sources, and failing HSTS (Table 2.9). Efforts to reduce nutrients from each of these contributing sources will focus on reaching the 40% reduction goal outlined by Annex 4 of the GLWQA and the Ohio DAP.

Table 2.9: Estimated Spring Nutrient Loadings from Contributing NPS Sources in the Upper Eagle Creek HUC-12					
	Agricultural Load (lbs)	Developed/Urban Load (lbs)	Natural Load (lbs)	HSTS Load (lbs)	NPS Total (lbs)
Current Estimates*	12,000	620	150	220	13.000
Target Estimates*	7,200	372	<100	132	7,800
(Source: Draft DAP 2.0) **Estimated using two significant figures*					

Chapter 3: Critical Area Conditions & Restoration Strategies

3.1 Overview of Critical Areas

During the TMDL Study conducted by the OEPA in 2005, there were only two sites in the **Upper Eagle Creek HUC-12 Watershed** studied. Neither of the two sites were reaching Full Attainment levels for a WWH set by the EPA. One site was located on Eagle Creek at RM 17.60 at TR 27. Samplings at this site showed an Index Community Integrity (ICI) score of 32 and a QHEI score of 55.50, resulting in a ***fair condition*** for ICI and ***partial attainment*** overall for the site. The second site studied was located on the Flat Branch at RM 0.5 near the mouth with Eagle Creek. Samplings at this site showed an Index Community Integrity (ICI) score of 26 and a QHEI score of 54.00, resulting in a ***poor condition*** for ICI and ***nonattainment*** overall for the site. According to the 2018 Ohio Water Quality Integrated Report, the causes and sources of impairment are shown in Table 3.1 below.

Table 3.1: Causes and Sources of Impairment in the Upper Eagle Creek HUC-12 Watershed

Causes of Impairment	Sources of Impairments
1. Low flow alteration 2. Organic Enrichment (sewage) biological indicators 3. Nutrient / eutrophication biological indicators 4. Total phosphorus	1. Crop production with subsurface drainage 2. Channelization

Critical Area 1will be identified within the **Upper Eagle Creek HUC-12 Watershed** as the area of cropland. Cropland production with subsurface drainage involves over 80% of the watershed, or 13,635.27 acres. The nutrient loadings in this critical area will address far-field effects of nutrients in Lake Erie, due to the fact that water from Upper Eagle Creek eventually flows into Lake Erie by way of the Maumee River in Toledo. In addition, implementation of Best Management Practices (BMPs) in the watershed will also benefit the near-field effects at the sampling sites in the watershed.

The OEPA has estimated spring phosphorus loadings from HUC-12 watersheds in the Blanchard River Watershed and throughout the Western Lake Erie Basin (WLEB) watershed. Table 3.2 below summarizes these loadings from contributing sources of NPS pollutants. Efforts to reduce nutrient loadings from each of these sources will be based on the goal of reaching the 40% reduction outlined by Annex 4 of the GLWQA and the Ohio DAP.

Critical Area 2 will focus on the impairment of the organic enrichment (sewage) biological indicators, which are most likely coming from failing Home Septic Treatment Systems (HSTS). The TMDL Report notes that ***fecal coliform levels in Eagle Creek at CR 27 (RM17.7) could be from local septic tanks that were not identified.*** Specifically, the focus will be on the Village of Williamstown and HSTSs in the rural area of the watershed. The HSTSs in these areas were

identified by the Hancock Public Health Department and the Hardin County Health Department as failing, due to being unpermitted or because they are more than 30 years old.

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

3.2.1 Detailed Characterization

Several studies, including the Ohio's Nutrient Mass Balance Study (OEPA, 2018c), estimated that nearly 88% of the nutrient loadings to Lake Erie from the Maumee River were primarily from land use activities. According to the OEPA and the NRCS, 69 – 71% of land use is cropland. With the dominance of agricultural land use throughout the WLEB watershed, it is only logical to focus on the use of BMPs on agricultural operations to reduce the nutrient loading to local waterways and drainage ditches through surface and tile flow. Although BMPs would be beneficial on all cropland, the focus will be on cropland that is located within 500 feet of any waterway. This area will be Priority Area 1. Priority Area 2 will include all the remaining land in the watershed. Map 3.1 on the next page shows the locations of the two priority areas.

Of the 13,635.27 acres of cropland in the **Upper Eagle Creek HUC-12**, the hierarchy of priority with be based on the following criteria:

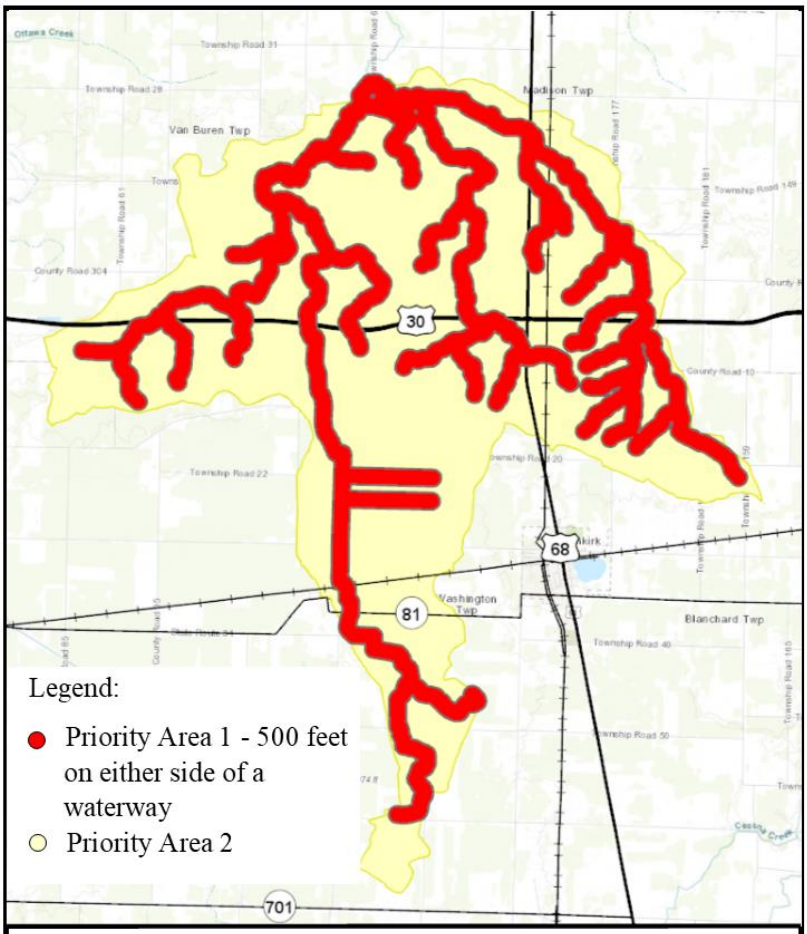
- Lands within 500 feet of a stream or drainage waterway;
- Lands with high soil phosphorus levels (>40 ppm Mehlich);
- Lands without a current (<3 years) nutrient management plan; and
- Lands currently not using conservation tillage techniques and/or cover crops.

Table 3.2: Upper Eagle Creek HUC-12 Critical Area 1 Descriptions

Critical Area Number	Critical Area Description	Impairments Addressed
1	Nutrient Reduction in Prioritized Agricultural Lands	Near-field benefits in the Eagle Creek HUC-10, with additional far-field benefits (Lake Erie)

The failure of the two sampling sites in the watershed to reach attainment likely are a result of land use activities associated with crop production.

From a far-field perspective, crop production in the watershed is responsible for contributing excessive phosphorus loading to Lake Erie, which results in eutrophication and HABs. The use of a specific group of Best Management Practices (BMPs) on private agricultural lands can help to reduce the amount and concentration of phosphorus loading from both surface and tile runoff. A secondary benefit of the BMPs will also help reduce sediment and nitrate/nitrite loadings. Use of the BMPs will also serve as a benefit for the near-field waterways.



Map 3.1: Priority Areas in Critical Area 1

3.2.2 Outline Goals and Objectives for Critical Area 1

The main goal of any NPS-IS Plan is to improve the water quality scores and/or the nutrient reduction goals in order to raise the water quality scores to reach attainment for the HUC-12 watershed. Critical Area 1 goals will focus on reduction of the excessive phosphorus loading from the agricultural fields which is contributing to the far-field impairment to the local waterways that flow to Lake Erie. The GLWQA Annex 4 and the DAP for the state of Ohio have set target loads for the Maumee River, which is fed by water from the Eagle Creek which eventually flows to the Maumee River by way of the Blanchard River and the Auglaize River. The target loads have been set at a level that is 40% lower than the average load measure at the Waterville site on the Maumee River in 2008. The Ohio Nutrient Mass Balance Study has shown that most of the nutrient load to Lake Erie occurs during the springtime rains (OEPA, 2018c). While this critical area is focused on the loss of phosphorus, a mutual benefit of reducing sediment and nitrate/nitrites in the **Upper Eagle Creek HUC-12** should result in a potential improvement of the macroinvertebrate community at the two sampling sites.

The objectives proposed within the **Upper Eagle Creek HUC-12** NPS-IS Plan align with the priorities of the H2Ohio initiative; a water quality initiative seeking to reduce phosphorus.

H2Ohio will provide cost-share incentives to producers who develop nutrient management plans and implement cost-efficient and effective BMPs that include: soil testing, variable rate (precision) fertilization, subsurface nutrient application, manure incorporation, cover crops, conservation crop rotation, water controlled structures, two-stage ditches, edge of field buffers, and headwaters and coastal wetlands that reduce agricultural runoff (H2Ohio, 2019).

Goals for Critical Area 1:

The OEPA has set phosphorus reduction goals for each associated source, based on springtime load estimates. To achieve the desired phosphorus reduction from agricultural land use in the **Upper Eagle Creek HUC-12**, the following goals have been created:

Goal 1: Reduce springtime phosphorus loading in Critical Area 1 to 7,200 lbs./yr. or below (40% reduction).
NOT ACHIEVED: Current estimated load contribution is 12,000 lbs./yr.

Goal 2: Raise the QHEI score at TR 27 (RM17.7) on Eagle Creek to at least 60.
NOT ACIEVED: QHEI score reported in the TMDL 2009 Report was 55.5.

Goal 3: Raise the QHEI score at TR 66 (RM 0.05) on Flat Branch to at least 60.
NOT ACIEVED: QHEI scorer reported in the TMDL 2009 Report was 54.0.

Objectives for Critical Area 1:

In order to improve the water quality enough to reach the goal of reducing springtime phosphorus loading by 4,800 lbs./yr. for the **Upper Eagle Creek HUC-12**, establishment of BMPs following the hierarchy proposed for Critical Area 1 will need to be followed. Establishing these BMPs should have both near-field and far-field effects in the WLEB. The following objectives proposed are:

Objective 1: Reduce soil and nutrient loss through the installation of grassed waterways that treat surface water from at least 500 acres.

Objective 2: Implement nutrient management plans on at least 2,000 acres.

Objective 3: Establish cover crops on at least 4,000 acres annually. 14% of farms are already using cover crops (USDA Ag Census, 2017).

Objective 4: Establish conservation tillage on at least 1,000 acres annually. 63% of farms are already using conservation tillage or no-till (USDA Ag Census, 2017).

Objective 5: Install phosphorus filters to treat at least 500 acres of cropland.

Objective 6: Install water-controlled drainage structures to manage water runoff through the tile on 200 acres. (10 structures installed, averaging 10 acres of drainage per structure)

Table 3.3: Estimated Nutrient Loading Reduction from Each Objective				
Objective Number	**Best Management Practice**	**Total Acreage Treated**	**Estimated Annual Phosphorus Load Reduction (lbs)**	**Estimated Spring Phosphorus Load Reduction (lbs)**
1	Grassed Waterway	500	245	102
2	Nutrient Management Plans	4,000	4,400	1,830
3	Cover Crops	6,000	2,400	1,000
4	Conservation Tillage	6,000	4,200	1,747
5	Phosphorus Filters	500	190	80
6	Water Controlled Structure	200	250	104
	Total	**16,200***	**11,685**	**4,863**

These objectives will be implemented following the prioritized hierarchy outlined above to reduce the springtime phosphorus loadings in the **Upper Eagle Creek HUC-12** to reach the 40% reduction goal. The implementation of the BMPs presented in these objectives, along with BMPs implemented through other state programs, federal programs, and voluntary efforts will be tracked to monitor progress towards reaching the phosphorus reduction goals.

3.3 Critical Area 2: Conditions, Goals & Objectives for Nutrient and Pathogen Reduction from Failing HSTS

3.3.1 Detailed Characterization

The 2009 TMDL Report noted that the unsewered Village of Williamstown could be impacting Eagle Creek due to organic enrichment (sewage) biological indicators that were found when sampling. Although no fecal coliform was found, the presence of ammonia, nitrate-nitrite, and phosphorus precludes that failing Home Septic Treatment Systems (HSTS) are probably the source. Data from the Hancock Public Health Departments shows there are 76 parcels with an address in Williamstown. From these 76 addresses, only 22 addresses have a registered septic system with the Hancock Public Health Department. The health department estimates 54 addresses could have an HSTS that is failing. In addition, data on the 22 sites that have a registered HSTS, shows that six of the sites have systems that are more than 30 years old and would be considered failing by the standards set by the Hancock Public Health Department.

There are an estimated 583 HSTS located in the **Upper Eagle Watershed HUC-12** outside of Williamstown. The Hancock Public Health Department estimated that roughly 50% of the systems are failing due to being unpermitted or more than 30 years old.

According to the 2009 TMDL Report, the organic enrichment and nutrient loading from failing Home Sewage Treatment Systems (HSTS) and the pathogens/bacteria being released from failing HSTS prevents Eagle Creek from reaching attainment for Recreation Use. Specifically, the one site located in the Upper Eagle Creek Watershed (CR 27) violated the Water Quality Standard (WQS) every time it was sampled. The TMDL noted that the probable source of the

pathogens/bacteria at CR 27 was failing HSTS. Failing HSTS will also contribute phosphorus and nitrate/nitrite loading to the creek which will have a far-field effect on Lake Erie. In addition, the phosphorus and nitrate/nitrite loading to Eagle Creek will have a near-field effect on the aquatic life downstream and in the Blanchard River.

3.3.2 Detailed Causes and Associated Causes

Critical Area 2 will include the homes and businesses in the **Upper Eagle Creek HUC-12 Watershed** that are using HSTS to handle human waste. Using data from the Hancock Public Health Department, there are an estimated 300 systems outside of the Village of Williamstown and 60 systems within the Village of Williamstown that are failing. The 2009 TMDL Report and 2018 Integrated Water Quality Report lists organic enrichment (sewage) biological indicators as a cause of impairment in the **Upper Eagle Creek HUC-12 Watershed**. The pathogens/bacteria being released from failing HSTS, on a near-field basis, are helping to prevent Eagle Creek from reaching attainment for Recreation Use. The estimated phosphorus loading reported in the Ohio EPA Landscape Loadings Report shows a springtime estimated HSTS Land loading of 220 pounds per year (See Table 2.8 on page 15). That would require a reduction of 88 pounds per year to meet the 40% reduction set by the Ohio Domestic Action Plan.

3.3.3 Outline Goals and Objectives for Critical Area 2

Goals for Critical Area 2:

- Goal 1: Reduce phosphorus from failing HSTS by 88 pounds per year.

Objectives for Critical Area 2:

- Objective 1: Replacement/repair of 17 failing HSTS systems per year in the Village of Williamstown until all systems are compliant. A feasibility study will be conducted to determine the best method to handle the human sewage problem in the Village of Williamstown. Once the feasibility study is completed, the Madison Township Trustees, Hancock Public Health Department and Hancock County Commissioners will decide which option for handling the human sewage would work best for the village.

- Objective 2: Replacement/repair of 17 failing HSTS systems per year which are located outside the Village of Williamstown.

Objective 1 will involve the replacement/repair of the HSTS in the Village of Williamstown based on the selected option(s) from the feasibility study. Funding for the project will be sought from appropriate sources.

Objective 2 will focus on replacing/repairing the failing HSTS systems located outside of the Village of Williamstown.

Chapter 4: Critical Area Conditions & Restoration Strategies

4.1 Projects and Implementation Strategy Overview Table(s) (Overview Table)

As noted in Chapter 2, **Upper Eagle Creek HUC-12** impairments are mainly due to agriculture activities, and to the incidence of failing HSTS within the watershed. This chapter will discuss the projects and evaluations required to restore the watershed as much as possible.

On the following pages are the projects and guidelines believed to be needed to improve the conditions in the **Upper Eagle Creek HUC - 12 watershed**. These projects will allow for the nutrient reduction goals of the TMDL Study to be met for the springtime phosphorus loadings recommended by the OEPA. It will be necessary to periodically reevaluate the status of the critical areas to determine if the projects are reaching the goals for the 40% reduction of phosphorus in the Ohio DAP, and the water quality score for QHEI outlined in the TMDL Report.

There are two Critical Areas identified in the **Upper Eagle Creek HUC-12**. Project and Implementation Strategy Overview Tables have been created for each area (subsections 4.2 and 4.3). Project Summary Sheets (PSS) provide the nine elements adopted by the OEPA for the projects that have been developed that are short term (1-3 years). Any longer-term projects will have a project summary sheet created and sent to the OEPA for approval when the project becomes short term. If during implementation additional problems are identified, additional tables/projects will be developed. Any new PSS will be submitted to the OEPA for verification and funding eligibility.

4.1.1 Project Summary Sheet(s)

Table 4.1 on the next page summarizes the Project and Implementation Strategy Overview Table for Critical Area 1. The table summarizes the projects needed for restoration of the nonpoint source impairments identified in the TMDL Report and the 2018 Ohio Integrated Water Quality Report for the **Upper Eagle Creek HUC-12**. Only the projects listed in the Project Summary Sheets will be eligible for state and federal funding.

4.1 Critical Area 1 Project and Implementation Strategy Overview Tables

Table 4.1: Critical Area 1 – Project Overview Table for the Upper Eagle Creek-HUC-12 (04100008 03 01)							
Goal	**Objectives**	**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 Nutrition Reduction Strategies							
Altered Stream and Habitat Restoration Strategies							
Agricultural Nonpoint Source Reduction Strategies							
1, 2, 3	1	1	Install grassed waterways	Hancock SWCD, Hardin SWCD	Short Term (1-3 years)	$20,000	OEPA 319, H2Ohio, GLC, NRCS-USDA, GLRI
1, 2, 3	2	2	Create Nutrient Management Plans	Hancock SWCD, Hardin SWCD	Short Term (1-3 years)	$1.220,000	H2Ohio, GLC, NRCS-USDA, GLRI
1, 2, 3	3	3	Establish Cover crops	Hancock SWCD, Hardin SWCD	Short Term (1-3 years)	$300,000	OEPA 319, H2Ohio, GLC, NRCS-USDA, GLRI
1, 2, 3	4	4	Establish Conservation Tillage	Hancock SWCD, Hardin SWCD	Short Term (1-3 years)	$120,000	OEPA 319, H2Ohio, GLC, NRCS-USDA, GLRI
1, 2, 3	5	5	Install Phosphorus Filters	Hancock SWCD, Hardin SWCD	Short Term (1-3 years)	$50-80,000	OEPA 319, H2Ohio, GLC, NRCS-USDA, GLRI
1, 2, 3	6	6	Install Water Control Drainage Structures	Hancock SWCD, Hardin SWCD	Short Term (1-3 years)	$50,000	OEPA 319, H2Ohio, GLC, NRCS-USDA, GLRI
High Quality Water Production Strategies							
Other NPS Causes and Associated Sources of Impairment							

4.2 Project Summary Sheet Critical Area 1

Table 4.2: Project Summary Sheet Critical Area 1 Project 1: Grassed Waterways		
Nine Element Criteria	**Information needed**	**Explanation**
n/a	**Title**	Establishing Grassed Waterways to reduce phosphorus loading
criteria d	**Project Lead Organization & Partners**	Hancock SWCD, Hardin SWCD, NRCS, USDA, BRWP
criteria c	**HUC-12 and Critical Area**	Upper Eagle Creek HUC-12 (04100008 03 01) – Critical Area 1
criteria c	**Location of Project**	Southwest of Arlington, OH on cropland
n/a	**Which strategy is being addressed by this project?**	Agricultural Nonpoint Source Reduction
criteria f	**Time Frame**	Short term (1-3 years)
criteria g	**Short Description**	Over the course of three years, 500 acres minimum of grassed waterways will be installed. During the first year, 150 acres of grassed waterways will be installed. During the second year, an additional 150 acres of grassed waterways will be installed. In the third year, a minimum of 50 acres of grassed waterways will be installed.
criteria g	**Project Narrative**	The lead organizations will work with local landowners who have expressed interest in installing grassed waterways on their cropland fields that show gully erosion from surface runoff during rain or snow melting events. The grassed waterways will be designed by the organization in charge to receive/treat surface water runoff. The installed grassed waterways will treat at least 500 acres of cropland.
criteria d	**Estimated Total Cost**	$20,000
criteria d	**Possible Funding Source(s)**	OEPA 319, GLC, NRCS-USDA, GLRI
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?**	To meet the goal of reducing springtime phosphorus loading by 40%, as recommended by the Ohio DAP, a reduction of 4,800 pounds per year would be required.

Table 4.2: Project Summary Sheet Critical Area 1 Project 1: Grassed Waterways cont.		
Nine Element Criteria	**Information needed**	**Explanation**
	Part 3: Load Reduced?	Estimated annual reduction: 245 pounds of phosphorus and 7,564 pounds Nitrogen
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	It is unrealistic to monitor load reduction from individual agricultural practices. Several organizations, such as the OEPA, NCWQR, USGE, and NOAA, are conducting monitoring throughout the WLEB.
criteria e	**Information and Education**	Project information will be shared by the Hancock SWCD and the BRWP at their annual meeting and in their newsletter to inform stakeholders of progress and accomplishments. The information will also be available on their websites and Facebook pages.

Table 4.3: Project Summary Sheet Critical Area 1 Project 2: Nutrient Management Plans		
Nine Element Criteria	**Information needed**	**Explanation**
n/a	**Title**	Nutrient Management Plans
criteria d	**Project Lead Organization & Partners**	Hancock SWCD, Hardin SWCD, NRCS, USDA, BRWP
criteria c	**HUC-12 and Critical Area**	Upper Eagle Creek HUC-12 (04100008 03 01) – Critical Area 1
criteria c	**Location of Project**	Southwest of Arlington, OH on cropland
n/a	**Which strategy is being addressed by this project?**	Agricultural Nonpoint Source Reduction
criteria f	**Time Frame**	Short term (1-3 years)
criteria g	**Short Description**	Create nutrient management plans
criteria g	**Project Narrative**	The lead organizations will work with local landowners to create nutrient management plans for fields that total 2,000 acres in the prioritized areas. The plans will use soil testing (1st & 3rd year), precision fertilization, cover crops, and conservation tillage over a three-year period to meet the load reduction goals. The goal of the project is to involve at least 4,000 acres that will reduce the loading of spring phosphorus by an estimated 1,830 pounds per year.
criteria d	**Estimated Total Cost**	$1,220,000

Table 4.3: Project Summary Sheet Critical Area 1 Project 2: Nutrient Management Plans cont.		
Nine Element Criteria	**Information needed**	**Explanation**
criteria d	**Possible Funding Source(s)**	GLC, NRCS-USDA, GLRI
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?**	To meet the goal of reducing springtime phosphorus loading by 40%, as recommended by the Ohio DAP, a reduction of 4,800 pounds per year would be required.
	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	Implementing nutrient management plans to treat 4,000 acres should reduce spring phosphorus loading by 1,830 pounds, which would be 38.1% of the goal.
	Part 3: Load Reduced?	Estimated annual reduction: 4,400 pounds of phosphorus and 141,900 pounds Nitrogen
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	It is unrealistic to monitor load reduction from individual agricultural practices. Several organizations, such as the OEPA, NCWQR, USGE, and NOAA, are conducting monitoring throughout the WLEB.
criteria e	**Information and Education**	Project information will be shared by the Hancock SWCD and the BRWP at their annual meeting and in their newsletter to inform stakeholders of progress and accomplishments. The information will also be available on their websites and Facebook pages.

Table 4.4: Project Summary Sheet Critical Area 1 Project 3: Conservation Tillage		
Nine Element Criteria	**Information needed**	**Explanation**
n/a	**Title**	Establishing Conservation Tillage
criteria d	**Project Lead Organization & Partners**	Hancock SWCD, Hardin SWCD, NRCS, USDA, BRWP
criteria c	**HUC-12 and Critical Area**	Upper Eagle Creek HUC-12 (04100008 03 01) – Critical Area 1
criteria c	**Location of Project**	Southwest of Arlington, OH on cropland
n/a	**Which strategy is being addressed by this project?**	Agricultural Nonpoint Source Reduction
criteria f	**Time Frame**	Short Term (1-3 years)
criteria g	**Short Description**	Enroll 3,000 acres in conservation tillage. 1,000 acres of cropland will be enrolled in conservation tillage per year over the course of a three-year period.
criteria g	**Project Narrative**	The lead organizations will work with local landowners to establish conservation tillage on cropland that is not enrolled under a nutrient management plan. When funding is acquired, landowners who have expressed interest in utilizing conservation tillage practices will be contacted by the BRWP. Each landowner will enroll at least 100 acres in conservation tillage per year over the course of a three-year period.
criteria d	**Estimated Total Cost**	$120,000
criteria d	**Possible Funding Source**	OEPA 319, H2Ohio, GLC, GLRI, NRCS-USDA CRP
criteria a	**Identified Causes and Sources**	Cause: Nutrient loadings, leading to far-field impacts Source: Agricultural land use activities
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	To meet the goal of reducing springtime phosphorus loading by 40%, as recommended by the Ohio DAP, a reduction of 4,800 pounds per year would be required.
	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	By establishing conservation tillage on 3,000 acres, there will be an estimated reduction of 873.5 pounds on spring phosphorus, or 18% of the spring loading reduction goal of 4,800 pounds.

Table 4.4: Project Summary Sheet Critical Area 1 Project 3: Conservation Tillage cont.		
Nine Element Criteria	**Information needed**	**Explanation**
criteria b & h	**Part 3: Load Reduced?**	Estimated annual reduction: 2,100 pounds of phosphorus and 103,800 pounds Nitrogen
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	It is unrealistic to monitor load reduction from individual agricultural practices. Several organizations, such as the OEPA, NCWQR, USGE, and NOAA, are conducting monitoring throughout the WLEB.
criteria e	**Information and Education**	Project information will be shared by the Hancock SWCD and the BRWP at their annual meeting and in their newsletter to inform stakeholders of progress and accomplishments. The information will also be available on their websites and Facebook pages.

Table 4.5: Project Summary Critical Area 1 Project 4: Phosphorus Filter		
Nine Element Criteria	**Information needed**	**Explanation**
n/a	**Title**	Installing Phosphorus Filters
criteria d	**Project Lead Organization & Partners**	Hancock SWCD, Hardin SWCD, NRCS, USDA, BRWP
criteria c	**HUC-12 and Critical Area**	Upper Eagle Creek HUC-12 (04100008 03 01) – Critical Area 1
criteria c	**Location of Project**	Southwest of Arlington, OH on cropland
n/a	**Which strategy is being addressed by this project?**	Agricultural Nonpoint Source Reduction
criteria g	**Short Description**	Install at least four phosphorus filters on tile or in a waterway to treat water flowing from at least 500 acres of cropland.
criteria g	**Project Narrative**	The BRWP in partnership with the lead organizations, will work with local landowners who are interested in installing phosphorus filters on tile or in a waterway on their property, to treat water flowing from cropland. Landowners with cropland closest to Upper Eagle Creek and its main tributaries will be prioritized. These phosphorus filters will be installed over the course of 1-3 years. Runoff from the cropland with installed filters will be tested by the BRWP to monitor phosphorus levels.

Table 4.5: Project Summary Critical Area 1 Project 5: Phosphorus Filter cont.		
Nine Element Criteria	**Information needed**	**Explanation**
criteria d	**Estimated Total Cost**	$80,000
criteria d	**Possible Funding Source**	OEPA 319, GLC, GLRI, NRCS-USDA CRP
criteria a	**Identified Causes and Sources**	Cause: Nutrient loadings, leading to far-field impacts Source: Agricultural land use activities
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	To meet the goal of reducing springtime phosphorus loading by 40%, as recommended by the Ohio DAP, would require a reduction of 4,800 pounds per year.
	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	By installing phosphorus filters to treat at least 500 acres, there will be an estimated 80 pounds of spring phosphorus loading reduction, or 1.7% of the spring reduction goal of 4,800 pounds per year.
	Part 3: Load Reduced?	Estimated annual reduction: 190 pounds of phosphorus
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	It is unrealistic to monitor load reduction from individual agricultural practices. Several organizations, such as the OEPA, NCWQR, USGE, and NOAA are conducting monitoring throughout the WLEB.
criteria e	**Information and Education**	Project information will be shared by the Hancock SWCD and the BRWP at their annual meeting and in their newsletter to inform stakeholders of progress and accomplishments. The information will also be available on their websites and Facebook pages.

Table 4.6: Project Summary Critical Area 1 Project 6: Water Controlled Structure		
Nine Element Criteria	**Information needed**	**Explanation**
n/a	**Title**	Installing Water Controlled Structures
criteria d	**Project Lead Organization & Partners**	Hancock SWCD, Hardin SWCD, NRCS, USDA, BRWP
criteria c	**HUC-12 and Critical Area**	Upper Eagle Creek HUC-12 (04100008 03 01) – Critical Area 1
criteria c	**Location of Project**	Southwest of Arlington, OH on cropland
n/a	**Which strategy is being addressed by this project?**	Agricultural Nonpoint Source Reduction
criteria g	**Short Description**	Install a maximum of 20 Water-Controlled Drainage Structures to manage water runoff through the tile on 200 acres of cropland.
criteria g	**Project Narrative**	The BRWP will work with landowners who are interested in installing water-controlled drainage structures on their cropland. H2Ohio is looking for a minimum of 10 acres to be managed by each structure. This means that if 200 acres are to be managed, a maximum of 20 structures will need to be installed.
criteria d	**Estimated Total Cost**	$50,000
criteria d	**Possible Funding Source**	OEPA 319, H2Ohio, GLC, GLRI, NRCS-USDA CRP
criteria a	**Identified Causes and Sources**	Cause: Nutrient loadings, leading to far-field impacts Source: Agricultural land use activities
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	To meet the goal of reducing springtime phosphorus loading by 40%, as recommended by the Ohio DAP, a reduction of 4,800 pounds per year would be required.
	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	By installing phosphorus filters to treat at least 200 acres, there will be an estimated 48- pound reduction on spring phosphorus loading, or 1.0% of the spring reduction goal of 4,800 pounds per year.
	Part 3: Load Reduced?	Estimated annual reduction: 190 pounds of phosphorus

Table 4.6: Project Summary Critical Area 1 Project 6: Water Controlled Structure Cont.		
Nine Element Criteria	**Information needed**	**Explanation**
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	It is unrealistic to monitor load reduction from individual agricultural practices. Several organizations, such as the OEPA, NCWQR, USGE, and NOAA, are conducting monitoring throughout the WLEB.
Criteria e	**Information and Education**	Project information will be shared by the Hancock SWCD and the BRWP at their annual meeting and in their newsletter to inform stakeholders of progress and accomplishments. The information will also be available on their websites and Facebook pages.

4.3 Critical Area 2 Project and Implementation Strategy Overview Table

Table 4.7: Critical Area 2 – Project Overview Table for the Upper Eagle Creek-HUC-12 (04100008 03 01)							
Goal	**Objectives**	**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 Nutrition Reduction Strategies							
Altered Stream and Habitat Restoration Strategies							
Agricultural Nonpoint Source Reduction Strategies							
High Quality Water Production Strategies							
Other NPS Causes and Associated Sources of Impairment							

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