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

Blanchard River
Lower Riley Creek 04100008 04 05

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The Blanchard River Watershed Partnership would like to thank Putnam Soil and Water Conservation District and Putnam County Health Department for their technical support and advice in developing the Best Management Practices outline in this NPS-IS Plan. Finally, special thanks to Elaine Reynolds for all the GIS maps. This NPS-IS Plan will help to secure funding to address the nonpoint source impairments in the **Lower Riley Creek HUC-12** watershed of the Blanchard River Watershed.

Chapter 1: Introduction

The **Lower Riley Creek HUC-12** (04100008 04 05) watershed is located on the northwest side of the Village of Bluffton and follows through the Village of Pandora until reaching the Blanchard River. Lower Riley Creek is a tributary of the Blanchard River at RM 30.08 north of road K-6. (Picture 1.1). Lower Riley Creek flows 15.30 miles in a southeast to northwest direction and drains an area of 25.15 mi² or 16,094.6 acres (Map 1-1). The watershed transitions from the Eastern Corn Belt Plains (ECBP) ecoregion to the Huron/Erie Lake Plains (HELP) ecoregion at about RM 15.0 but maintains many habitat characteristics of the ECBP. Land use within the watershed is primarily for agricultural purposes (83.38%).

Picture 1.1: Mouth of Riley Creek (Amstutz)

The federal and state nonpoint source funding opportunities require strategic watershed plans 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, has started to develop Nine-Element Nonpoint Source Implementation Strategic Plans (NPS-IS plans) for the Blanchard River Watershed based on the 2012 Report Card. The 2012 Report Card was developed using data from the 2009 TMDL Study and 2018 Ohio Integrated Assessment Report for the Blanchard River. Each HUC-12 watershed was assigned a letter grade based on the data. The Lower Riley Creek HUC-12 received a letter of "F" in the report card.

Map 1.1: Lower Riley Creek watershed

1.1 Report Background

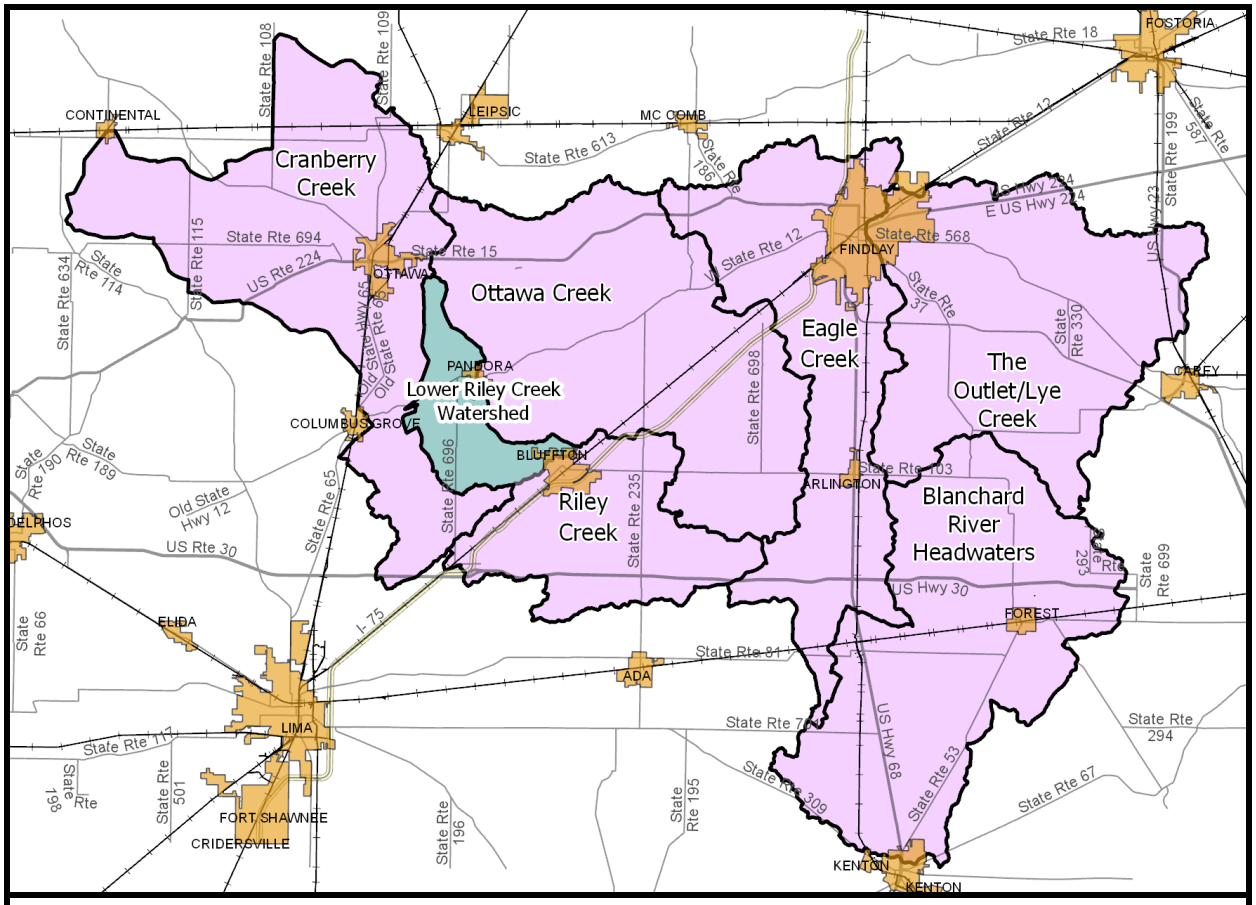
The Blanchard River Watershed Partnership is a community-based volunteer 501 (c)(3) organization that seeks to address problems and concerns that affect the health of the Blanchard River Watershed and educate all citizens about the dynamics of the Blanchard River and its tributaries. The BRWP members and Board of Directors include interested citizen local government agencies, educators, representatives of industry and other stakeholders that 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. The BRWP has either directly or indirectly brought in over $8,000,000 in grant money because of these two WAPs to help with the restoration activities outlined in the action plans.

With the new requirement from the U.S. EPA to develop plans that align with the nine-element plans, focus is now on developing NPS-IS plans for individual HUC-12 based on their grade in the 2012 Report Card. This NPS-IS plan is being written for the **Lower Riley Creek HUC-12 (04100008 04 05)** watershed to address non-point source causes and sources of impairments that have been specifically identified in the watershed.

Removal of nonpoint source impairments in the **Lower Riley Creek HUC-12** will address nonpoint source impairment and allow for step-wise improvement toward achieving attainment of water quality standards. In addition, nutrient load reductions achieved through implementations of projects in this watershed will address Western Lake Erie Basin load reduction goals.

1.2 Watershed Profile & History

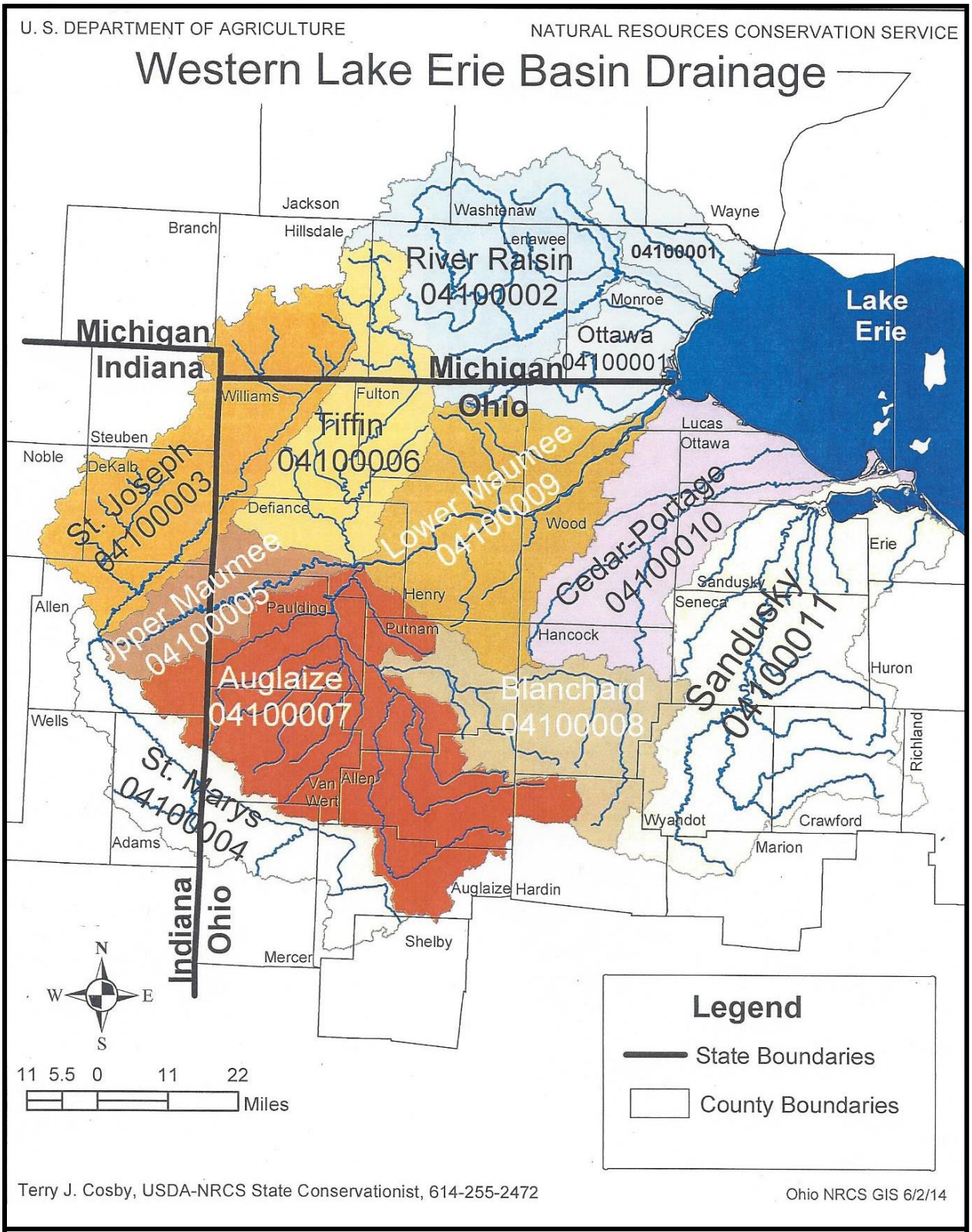
The Blanchard River Watershed is identified using an 8-digit Hydrological Unit Code (HUC); 04100008. There are six subwatersheds within the Blanchard River Watershed. Each of these subwatersheds is identified using an HUC-10. The Riley Creek watershed HUC-10 is 04100008 04. There are five smaller HUC-12 watersheds located in the Riley Creek watershed. Map 1.2 on page 1-3, shows the HUC-10 subwatersheds and the location of **The Lower Riley Creek HUC-12** watershed in the Blanchard River Watershed. The Blanchard River Watershed covers 493,413 acres (771 mi^2) 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 1.3 on page 1-4 shows the location of the Blanchard River Watershed in the Western Lake Erie Basin. Over 80% of the watershed is cropland. The topography shows a 2-percent slope or less. The largest city in the watershed is Findlay.



Map 1.2: The HUC-10 subwatersheds in the Blanchard River Watershed and the location of the Lower Riley Creek HUC-12

Prior to European immigrant settlement in the 1800's, wetlands were common and based on soil survey information. They made up about 42% of the watershed. Due to the clearing of swamp forest and the subsequent drainage of the land, most of the wetlands have been artificially drained. Wetlands, occurring in cropland, currently constitute less than 1% of the watershed and wooded wetlands constitute about 3.2% of the watershed.

In addition to addressing the impairments in the **Lower Riley Creek HUC-12**, this NPS-IS plan will have a cross-over benefit to meet phosphorus load reduction goals in the Western Lake Erie Basin.



Map 1.3: Location of the Blanchard River watershed in the Western Great Lakes Basin

1.3 Public Participation and Involvement

The initial planning process for developing a Nine-Element Nonpoint Source Implementation Strategic Plan (NPS-IS) was conducted by the Blanchard River Watershed Partnership (BRWP). The **Lower Riley Creek HUC-12** watershed is a subwatershed of the Riley Creek HUC-10 watershed. Thus, it was included in the fully endorsed 2012 Riley Creek Watershed Action Plan. The watershed action plan included a stakeholder's survey on what the problems were in the watershed. The BRWP held a phone meeting with the Putnam SWCD (PSWCD) asking them for their input before the NPS-IS Plan was written. The PSWCD contacted the Putnam Farm Bureau for addition input. The BRWP also contacted the Putnam County Health Department informing them the plan was being written. The BRWP formed a Western Community Advisory Committee in 2016. This group provided input for the plan. 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 **Lower Riley Creek HUC-12 NPS-IS** plan. A picture of each bridge was taken for reference.

Once the draft of the plan was completed, the plan was sent to the PSWCD and the Putnam County Health Department for their final approval. Any suggested changes were made to the plan before the plan was submitted to the OEPA.

Chapter 2: Lower Riley Creek HUC-12 Watershed Characterization and Assessment Summary

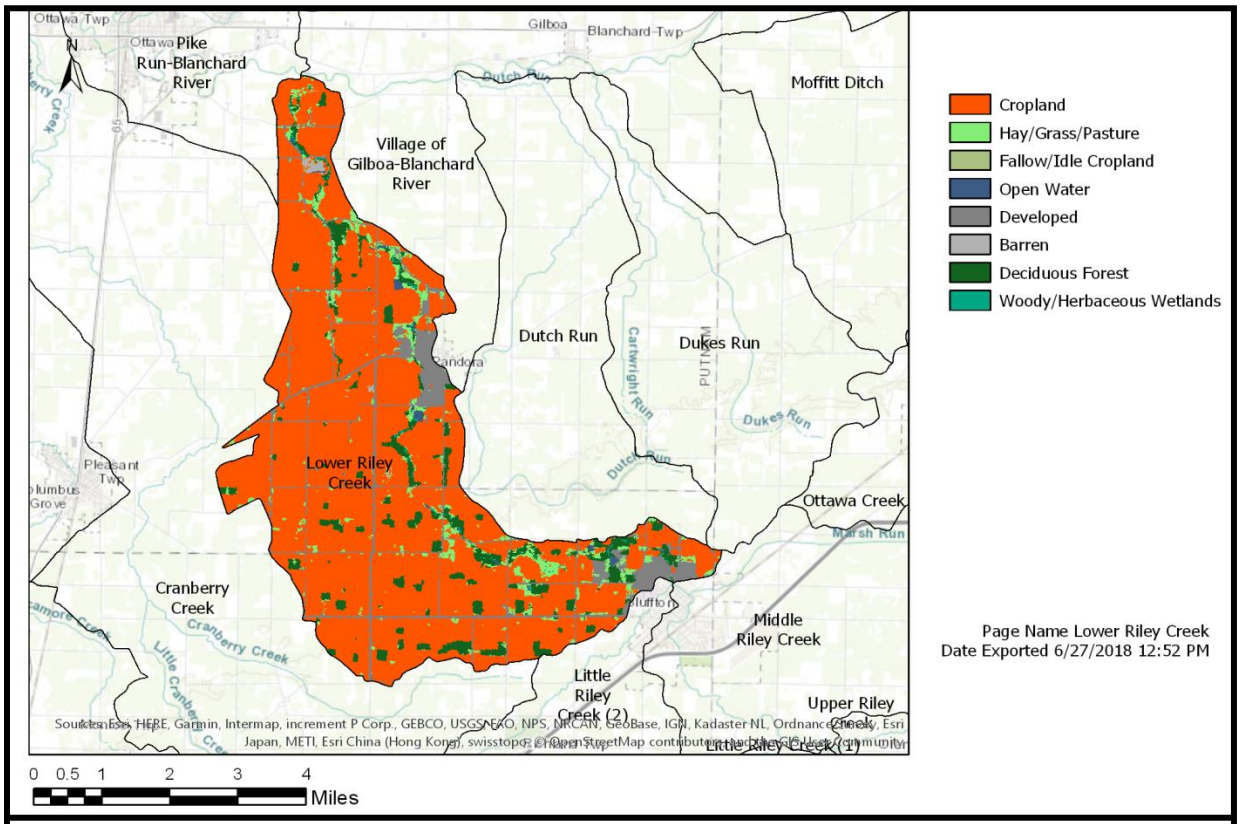
2.1 Summary of Watershed Characterization for Lower Riley Creek HUC-12

2.1.1 Physical and Natural Features

Lower Riley Creek is a tributary of the Blanchard River confluent at RM 30.08 located north of road K-6 in Putnam County. The creek flows in a south to north direction for 15.30 miles and drains an area of 25.12 mi² or 16,094.6 acres. Land use within the watershed is primarily for agricultural purposes (83.38%). Table 2.1 summarizes the land-use in the watershed.

Lower Riley Creek (04100008 04 05)			
Land Use Classification	**Area (ac.)**	**Area (mi^2)**	**% Watershed Area**
Crop Land	12,444	6.10	77.40
Hay/Pasture	961	1.09	5.98
Deciduous Forest	1,100	1.72	6.84
Fallow/Idle Cropland	25	0.04	0.16
Barren	39	0.06	0.24
Herbaceous Wetlands	68	0.12	0.42
Woody Wetlands	2	0.00	0.00
Developed, Low Intensity	322	0.50	2.00
Developed, Medium Intensity	74	0.12	0.46
Developed, High Intensity	22	0.03	0.14
Developed, Open Space	956	1.49	5.95
Open Water	65	0.10	0.40
Total	**16,078**	**25.12**	**100.00**

Table 2.1: Land Use Classification for the Lower Riley Creek Watershed (Reynolds)



Map 2.1: Lower Riley Creek Land-Use Map
(Reynolds)

The watershed transitions from the Eastern Corn Belt Plains (ECBP) ecoregion to the Huron/Erie Lake Plains (HELP) ecoregion at about RM 15.0 but maintains many habitat characteristics of the ECBP. Land use within the watershed is primarily for agricultural purposes (83.38%). 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 EPA 2009 TMDL Report states that most of the streams are channelized with narrow riparian corridors, if present. The lack of water in the tributaries becomes a problem for the aquatic habitat during summer months.

Soil analysis shows many different soils present in the Lower Riley Creek watershed. Lenawee soil covers nearly 1900 acres or 11.8% of the watershed. Lenawee soils are nearly level and poorly drained soils. Lenawee continues to be found north of the watershed into Michigan. Blount silt loam soils with a slop between 2-6% cover over 18.7% of the area. Pewamo soil can be found covering nearly 16% of the watershed. There are over 90 additional soil types found in the remaining 50% of the watershed. No type is greater than 4% with most cover consisting of approximately 0.5% of the watershed.

Specific landmarks and features in this watershed include:

- **Swiss Community Historical Society** – Homestead located northwest of Bluffton at 8350 Bixel Rd. and sets on a 7-acre property

- **Pandora Community Park** - Located off West Main Street (SR 12) Pandora, on the north side.

The EPA's National Pollutant Discharge Elimination System (NPDES) requires a permit for all facilities discharging pollutants from a point source to a water of the state. There are four NPDES-permitted facilities located in the **Lower Riley Creek HUC-12**. Putnam Stone (Permit # 2IJ00057) enters the Riley Creek at RM 1.94 and is designed to treat 0.15 MGD. Pandora Waste Water Treatment Plant (Permit #2PB00029) enters the Riley Creek at RM 5.35 and is designed to treat 0.335 MGD. Advanced Drainage Systems Inc. (Permit#2GR01927*DG) enters the Riley and has no design flow. Bluffton Waste Water Treatment Plant (Permit # 2PC00005) enters the Riley Creek at RM 15.40 and is designed to treat 1.90 MGD.

2.1.2 Land Use and Protection

As shown in Table 2.1 on page 2-1, 83.38% of the **Lower Riley Creek HUC-12** is used for agricultural purposes. As with most of the agricultural area in the Blanchard River Watershed, corn and soybeans are the two dominate crops being grown with cover averaging around 11,500 acres per year. Winter wheat averages over 700 acres a year with alfalfa and grass/pasture covering another 900 acres plus. There is roughly 26 acres of tomatoes, 8 acres of speltz and 2 acres of oats.

There are no areas in the **Lower Riley Creek HUC-12** that are under any permanent conservation protection programs. The Pandora-Gilboa Local School buildings are located in the watershed.

2.2 Summary of Biological Trends for the Lower Riley Creek HUC-12

The **Lower Riley Creek HUC-12** was sampled starting in 2005 and reported in 2007 and 2009 as a part of the Ohio EPA's *2007 Technical Support Data Report* and the *Total Maximum Daily Load Report (2009)* respectively. These two documents were used extensively in preparation of the Lower Riley Creek HUC-12 NPS-IS Plan.

The Lower Riley Creek transitions from the ECBP to the HELP ecoregion at about RM 15.0 but maintains many habitat characteristics of the ECBP. The stream is designated as a Warm Water Habitat (WWH), Primary Contact Recreation (PCR), agricultural water supply (AWS) and industrial water supply (IWS) based on a study done in 1991. It is not maintained for drainage but has a history of habitat and flow alterations. There are some areas where limestone bedrock was mined from the stream bed. Low head dams located at RM 7.5, 7.3, 4.6, and 1.3 have resulted in impounded sections. There are also small concrete dams at RM 6.0 and 5.0, but flow alteration is minimal. Some degree of water quality and habitat degradation was documented at

every site; which translated into biological impairment in most instances. Fish were in attainment in the lower 7.6 miles, but scores were generally poor to very poor above that point.

The WWH aquatic life use designation was based on biological sampling conducted in 1991 that began beyond the Lower Riley Creek at RM 17.9 and extended downstream through the Lower Riley Creek to the confluence with the Blanchard River.

According to the 2018 Integrated Water Quality Report of the **Lower Riley Creek HUC-12** watershed, the Ohio EPA lists the causes of impairments as direct habitat alterations, water temperature, nutrients/eutrophication biological indicators, organic enrichment (sewage) biological indicators, sediment/siltation, nitrate/nitrite and total phosphorus. The sources are crop production with subsurface drainage, municipal point sources, channelization, combined sewer overflows (CSO), urban runoff/storm sewers and dam or impoundment (low head dams).

2.2.1 Sediment and Stream Habitat

The TMDL Study included a quantification of sediment induced and habitat induced causes of impairment. Table 2.2 shows the characterization of the sediment TMDL using QHEI metrics for the only site that was studied in 2005. The site studied is at RM 4.4. This was the only site with either Aquatic Life Use (ALU) partial or nonattainment bedload and habitat. The impairments were caused by siltation and sedimentation and reported in Table 7.6 of the TMDL Report.

Table 2.2: Characterization of the Sediment TMDL using QHEI metrics. (Ohio EPA 2009)

Stream / River	River Mile	QHEI Categories			Total Sediment Score	Deviation from target (%)	Main Impairment Category
		Substrate	Channel	Riparian			
Lower Riley Creek	4.4	16.5	11	3.5	31	3.1	riparian
Target (WWH)		**≥ 13**	**≥ 14**	**≥ 5**	**≥ 32**		

Data from the 2005 TMDL Study reported no sampling site showing causes of either habitat alteration or flow alteration (or both) in the Lower Riley Creek. As a result, there was no characterization of the habitat TMDL using QHEI metrics for the watershed reported.

2.2.2 Macroinvertebrates (Invertebrate Community Index [ICI])

According to the 2009 TMDL report, the macroinvertebrate community in the **Lower Riley Creek HUC-12** reflects an impaired aquatic resource. See Map 2.2 for the attainment status.

Map 2.2: Lower Riley Creek Attainment Status

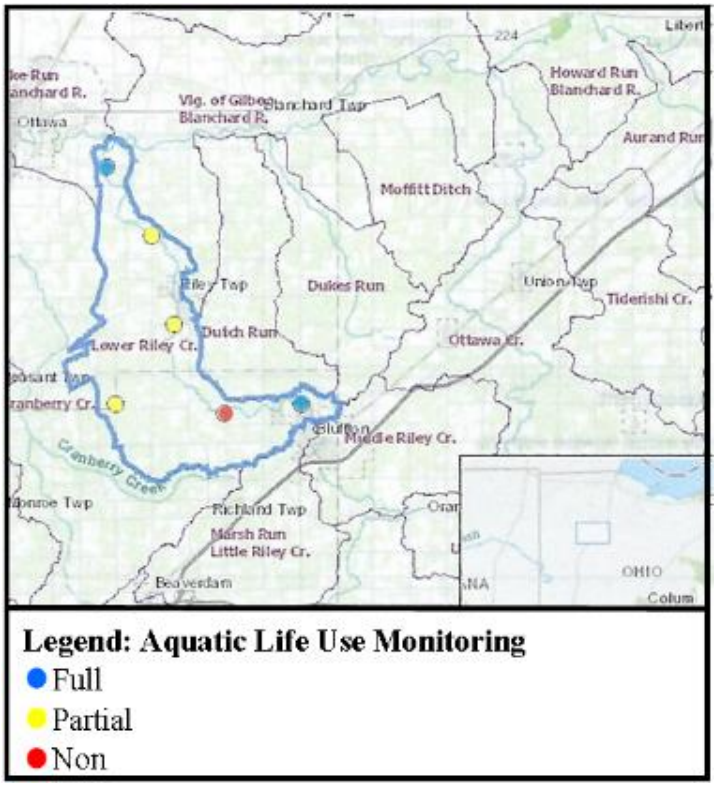


Table 2.3 below summarizes the macroinvertebrate data from the 2005 TMDL Study.

Table 2.3: Macroinvertebrates in Lower Riley Creek HUC-12 (04100008 04 05) 2005 TMDL Study

RM	No. Qualitative Taxa	Total Taxa	ICI	Quality EPT
1.20	31	48	40	8
4.40	37	43	22	7
7.40	37	52	26	9
14.40	39	57	32	6

At RM 1.20, the ICI score was 40 which are classified as good and meeting WWH expectations. At RM 4.40, the ICI score was 22 which are classified as fair and not meeting WWH expectations. At both RM 7.40 and RM 14.40, the ICI scores were 26 and 32, respectively, which classifies them as marginally good, just below WWH but still meeting expectations.

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

Data from the 2005 TMDL Study reported no sampling site showing causes of either habitat alteration or flow alteration (or both) in the Lower Riley Creek. As a result, there was no characterization of the habitat TMDL using QHEI metrics for the watershed reported and no total habitat score recorded.

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

The aquatic life use attainment status for station samples collected is based on data collected July - September 2005; the Index of Biotic Integrity (IBI) and the Modified Index of well Being (MIwb) were recorded and can be found in Table 2.4: Summary of Aquatic Assessment for Lower Riley Creek HUC-12. There were four sites sampled on the Lower Riley Creek at RM 11.5, RM 7.6, RM 4.3 and RM 1.2. The sampling at RM 11.5 showed only 13 species present. Pollution tolerant and moderately tolerant species comprised over 69% of the total collected. The sampling at RM 7.60 showed 18 species and 1 hybrid present. Pollution tolerant and moderately tolerant species comprised over 52% of the total collected. The sampling at RM 4.30 showed 24 species and 1 hybrid present. Pollution tolerant and moderately tolerant species comprised 60% of the total collected. The sampling at RM 1.20 showed 35 species and 3 hybrids present. Pollution tolerant and moderately tolerant species comprised over 55% of the total collected.

2.3 Summary of NPS Pollution Causes and Associates Sources

Table 2.4 on the next page, provides a summary of the IBI, ICI, MIwb, status of each site, QHEI and causes and sources of impairment at each site studied during the 2005 TMDL Study.

According to the 2018 Integrated Water Quality Report of the **Lower Riley Creek HUC-12** watershed, the Ohio EPA lists the causes of impairments as direct habitat alterations, water temperature, nutrients/eutrophication biological indicators, organic enrichment (sewage) biological indicators, sediment/siltation, nitrate/nitrite and total phosphorus. The sources are crop production with subsurface drainage, municipal point sources, channelization, combined sewer overflows (CSO), urban runoff/storm sewers and dam or impoundment (low head dams).

The site-specific recreation use assessment in Lower Riley Creek states that of the four sites tested, three of these sites violated the maximum criterion for the fecal coliform count and one violated the geometric mean criterion. Organic enrichment was also reported at RM 11.5, RM 7.6 and RM 4.

There are no waters currently being utilized as a water supply in the **Lower Riley Creek HUC-12** watershed.

Table 2.4: Summary of Aquatic Assessment Score for Lower Riley Creek HUC-12 (04100008 04 05)

RM (Drain Area mi^2)	IBI	MIwb[a]	ICI [b]	QHEI	Status	Causes	Sources
11.5 (64)	20*	4.3*		52.0	NON	Nutrients, siltation, organic enrichment/DO, bacteria (PCR)	Crop production, CSO, urban runoff, municipal point sources
7.4/7.6 (68)	34*	8.0^{ns}	MG^{ns}	77.5	Partial	Nutrients, organic enrichment/DO, bacteria (PCR)	Crop production
4.4/4.3 (70)	40	9.3	F*	67.0	Partial	Nutrients, siltation, organic enrichment/DO, thermal modification	Crop production, municipal point sources, low head dam
1.2 (85)	42	10.6	40	78.0	Full		

a - MIwb is not applicable to headwater streams with drainage areas ≤ 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 quantitative date were not available or considered unreliable due to current velocities less than 0.3 fps flowing over the artificial substrates.
ns - Nonsignificant departure from biocriteria (≤ 4 IBI or ICI units, or ≤ 0.5 MIwb units).
* - Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).
_ - Underlined scores are in the Poor or Very Poor range.

Chapter 3: Conditions & Restoration Strategies for Lower Riley Creek HUC-12 Critical Areas

3.1 Overview of Critical Areas

According to the EPA's TMDL Report, most of the Lower Riley Creek HUC-12 impairments are related to agricultural use. Additional impairments listed in the TMDL Report included municipal point sources, combined sewer overflows (CSOs) and urban runoff/storm sewers. Since the TMDL Report, all the CSOs in Pandora and Bluffton have been separated. There are an estimated 400 home septic treatment systems (HSTS) in the Lower Riley Creek. The Putnam County Health Department estimates that 30% of the HSTS are failing. This would amount to an estimated 120 systems. There are four NPDES permitted regulated point sources in the watershed. Map 3.1 shows the location of the regulated point sources. Table 3.1 summarizes the data for each NPDES permit found in this watershed.

Map 3.1: Location of NPDES Permits

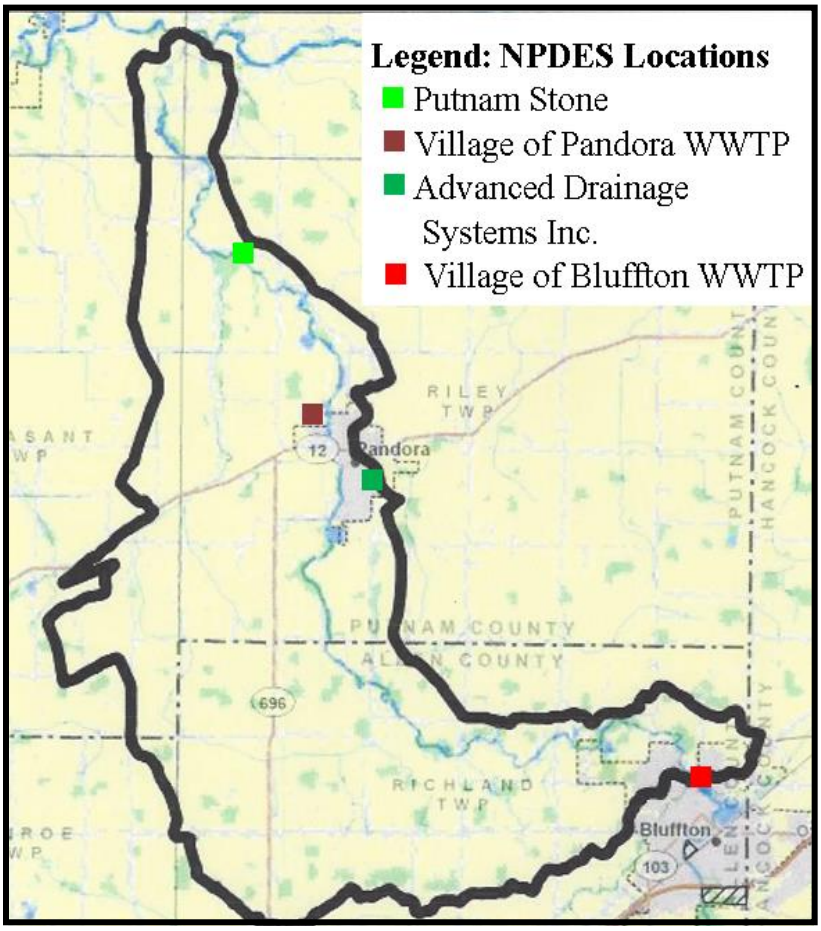


Table 3.1: Summary of the NPDES Permits – Lower Riley Creek Watershed					
Applicant Name	Facility Name	Permit Number	Issue Date	Average Design Flow (MGD)	Compliance History
Putnam Stone		2IJ00057	11/30/2015	0.15	No Violations
Village of Pandora	WWTP	2PB00029	6/6/2014	0.335	Numerous violations due to high total Phosphorus
Village of Bluffton	WWTP	2PC00005	2/8/2017	1.90	Numerous violations due to high E.coli
Advanced Drainage Systems Inc.	ADS Inc-Pandora Facility	2GR01927*DG	11/14/2012	No Design Flow	No Violations

According to the 2009 TMDL Study, agricultural modifications made to the streams in the watershed include removal of the riparian buffer vegetation. Farmers are establishing their row crops close to the edge of the stream resulting in potential stream bank destabilization and the removal of any buffer between the field and the stream.

The 2009 Ohio EPA TMDL Study includes evaluation of four sampling sites in the **Lower Riley Creek HUC-12**. The sampling at these sites was done in 2005. The site at RM 11.5 was in nonattainment for aquatic life use, RM 7.6 and RM 4.3 were in partial attainment and RM 1.2 was in full attainment. All sites were given a WWH designation.

Specific restoration strategies and projects will focus on the reduction of the nutrients, especially phosphorus, and sediment loading along the entire Lower Riley Creek. Section 10.3.4 of the US EPA's 2008, *Handbook for Developing Watershed Plans to Restore and Protect Our Water*, states that, "In general, management practices are implemented immediately adjacent to the waterbody or upland to address the source of pollutant loads." Using this rationale, Critical Area 1 will include cropland acreage within the HUC-12 according to a hierarchy of priorities. Map 3.2 on page 3-4 shows the location of the **Critical Area 1** with the priority areas.

The 2009 TMDL Report does not specifically list any goal reduction of the amount of sediment and nitrogen needed in the **Lower Riley Creek HUC-12**. Therefore, the specific restoration strategies and projects will focus on the reduction of the phosphorus loading in the entire Lower Riley Creek. The Best Management Practices (BMPs) suggested will focus on the reduction of the total phosphorus, however, these BPMs will also result in a reduction of sediment and nitrogen loadings in the waterways in the watershed.

In addressing the needed phosphorus load reduction in the **Lower Riley Creek HUC 12**, there must be a baseline to start with in developing the reduction plan. Table 3.2 shows an Annualized Summary of seasonal phosphorus loadings into **Lower Riley Creek HUC 12** based on data from the 2005 TMDL Study. The table also includes the suggested seasonal and annual reduction needed to meet the reduction goal for the entire watershed as well as the 40% reduction goal established in the Domestic Action Plan created by the International Joint Commission.

Table 3.2: Annualized Summary of 2005 TMDL Seasonal Phosphorus Loading	
Existing (2005) P Load – Annual TMDL	6,692.9 kg
Target P Load – Annual TMDL	3,377.1 kg
Difference (Existing P Load – Target P Load) to meet watershed TMDL P Target	3,315.8 kg
Domestic Action Plan (reduce 40% of existing P load) to Western Lake Erie Basin	2,677.2 kg

3.2 Critical Area 1: Conditions, Goals and Objectives

3.2.1 Detailed Characterization

The area defined in the **Lower Riley Creek HUC-12** as Critical Area 1 will include all the cropland (12,444 acres). According to the 2009 TMDL report, the row crop agriculture of Lower Riley Creek is contributing to most of the total phosphorus loading and is causing most of the documented water quality impairment in the watershed. Since the phosphorus loading will not be equal throughout the watershed, critical area 1 will be prioritized as follows:

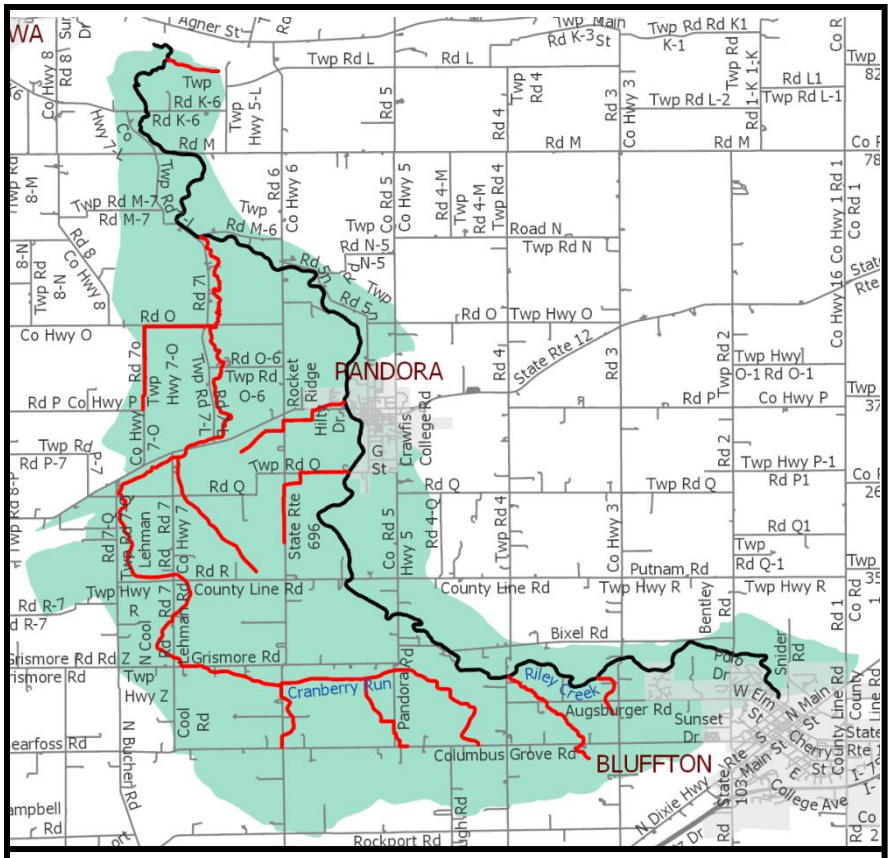
- Priority 1: Crop parcels (fields) along Lower Riley Creek and its tributaries that lack a riparian corridor and / or edge-of-field conservation practice(s) (approximately 6,200 acres).

- Priority 2: Crop parcels (fields) adjacent to the main stem of Lower Riley Creek (approximately 4,000 acres).

- Priority 3: Crop parcels (fields) adjacent to tributaries of Lower Riley Creek (approximately 2,244 acres).

- Priority 4: Fields with documented high Soil Test Phosphorus levels (e.g., above 150 ppm. Mehlich-3)

Both The Ohio State University and Heidelberg University have conducted studies that show incorporation of nutrients can reduce phosphorus runoff by 90%. Based on these results, a performance-based incentive for incorporation of nutrients could be paid to farmers to help meet the phosphorus reduction needed to meet the TMDL goal. This approach will allow the Putnam Soil & Water Conservation District (SWCD) and other agencies working in the watershed to help the farmers conduct a more thorough analysis of how nutrients are being applied to and lost from their fields.



Map 3.2: Critical Area 1 - Priority Areas 1 & 2 are in black and Priority Area 3 is in red

In addition to the performance-based incentive for incorporation of nutrients, other NPS pollution leaving the cropland from surface run-off and/or subsurface drainage will also be addressed using appropriate Best Management Practices (BMPs).

These BMPs will focus on:

- Reducing the rate and amount of surface runoff
- Reducing phosphorus loading from tile drainage, via treatment, volume reduction, and discharge controls
- Drainage management systems
- Soil test for phosphorus reduction

3.2.2 Detailed Causes and Associated Sources

The 2009 TMDL Report states that the impairments in the **Lower Riley Creek HUC-12** watershed are related to agricultural uses. The contributing causes and sources associated with crop production in Critical Area 1 are reported in Table 3.3 on pg. 3-5.

Table 3.3: Causes and Sources of Impairments in Critical Area 1		
RM	**Causes**	**Sources**
11.5	Nutrients, siltation, organic enrichment/DO, bacteria (PCR)	Crop production, CSO, urban runoff, municipal point sources
7.4/7.6	Nutrients, organic enrichment/DO, bacteria (PCR)	Crop production
4.4/4.3	Nutrients, siltation, organic enrichment/DO, thermal modification	Crop production, municipal point sources, low head dam

3.2.3 Outline Goals and Objectives for Critical Area 1

As noted above, Critical Area 1 is mainly impaired by sediment, nutrient loading, flow alteration and direct habitat alteration due to agriculture uses. Therefore, the focus in addressing these impairments in Critical Area 1 will be to:

1. Soil test fields that have not been tested within the last two years and are directly adjacent to a waterway.
2. Once the results of the soil tests are known, those fields with the highest phosphorus levels will be addressed first using acceptable Best Management Practices (BMPs).
3. The remaining fields in Critical Area 1 will be soil tested and acceptable BMPs will be used to reduce phosphorus loads.
   NOTE: Soil testing is not eligible for funding under the EPA 319 program. Funding will be sought from other sources.
4. Crop land and edge of field conservation practices, such as cover crops, conservation tillage, filter strips and buffers, will be used to reduce sediment loading during runoff and drainage events.
5. Soluble phosphorus loading that occurs through drainage tile will be addressed using phosphorus filters.

Goals for Critical Area 1: Phosphorus Load reduction from cropland

- Goal 1: To reduce phosphorus loading from cropland in the watershed from 6,692.9 kg annually to 3,377.1 kg annually (a reduction of 3,315.8 kg per year).

- Goal 1a: To reduce total phosphorus loading from cropland in the watershed from 6,692.9 kg annually to 4,015.74 kg annually, a reduction of 2,677.2 kg per year, to achieve a 40% reduction goal consistent with Ohio's Domestic Action Plan.

Objectives for Critical Area 1

To achieve the goals listed above for nonpoint source load reduction for phosphorus in the **Lower Riley Creek HUC-12**, the following objectives that address nutrient loading need to be achieved in Critical Area 1. These objectives are prioritized to achieve the greatest results in Critical Area 1.

- Objective 1: To implement Controlled drainage water management systems to manage water draining 500 acres. (25 structures averaging 20 acres drainage per structure. (NRCS 554)

- Objective 2: To install a phosphorus filter on two main drain outlets tile leading from fields that are more than 1000 feet from the main stem or a tributary to capture dissolved reactive phosphorus (DRP). (NRCS 782)

- Objective 3: Enroll 4,500 acres of cropland in a precision nutrient management plan that includes cover crops, conservation tillage, soil test for phosphorus and soil organic materials (SOMs) and proper placement of fertilizer. (NRCS 590)

- Objective 4: Soil test 90% of the acres or 11,200 acres in Critical Area 1.

- Objective 5: Enroll 3,500 acres per year of cropland in cover crops. (NRCS 340)

- Objective 6: Enroll 3,500 acres per year of cropland in conservation tillage. (NRCS 329)

Narrative of Objectives

Objective 1 will involve controlling water from surface and tile runoff by establishing control drainage management systems to manage 500 acres of drainage area. An estimated 25 structures will be installed with an average of 20 acres per structure. By controlling base flow conditions and water management, the BMPs will result in a load reduction of 154 kg./year or 350 lbs./year of phosphorus and 250 lbs./year of nitrogen.

Objective 2 will involve the installation of a phosphorus filter on two main drain outlets leading from fields that are more than 1000 feet from the main stem of Lower Riley Creek or a tributary to capture dissolved reactive phosphorus (DRP). Dr. Chad Penn, from USDA-ARS, reports the estimated load reduction of DRP has been projected to be between 30 - 50% based on available information. If each filter is draining a 40-acre field, the estimated reduction of phosphorus will be 181 kilograms per or 400 pounds per year.

Objective 3 will focus on getting the 4,500 acres closest to a waterway enrolled in a Precision Nutrient Management Plan (PNMP). The Natural Resource Conservation Service (NRCS) offers an incentive under their Environmental Quality Incentives Program (EQIP) program. This ***Nutrient Management (590)*** plan allows a "producer to be able to improve efficiency and effectiveness of nutrients by utilizing precision techniques and tools, maintain or increase yields, and minimize nutrient losses from fields, thus helping protect surface and ground water supplies. Precision nutrient management techniques ensure that the 4 R's (Right rate, Right source, Right application method, and Right application timing) provide proper amount of nutrients to the crop where it is needed." (NRCS 2014) By developing precision nutrient management plans on 4,500 acres of cropland in Critical Area 1, there will be a loading reduction an estimated 1045 kg./year or 2,300 lbs./year of phosphorus, 1,920 tons/year of sediment and 2,610 lbs./year of nitrogen.

Objective 4 will focus on soil testing 90% of the acres in Critical Area 1. Only by soil testing can we know the level of phosphorus and soil organic matter present in the soil. The results of each soil will allow the farmer to meet the "Right Rate" of the 4 R's program.

Objectives 5 will focus on establishing cover crops on 3,500 acres of cropland that are not enrolled in a Precision Nutrient Management Plan. By establishing cover crops on 3,500 acres, there will be an estimated loading reduction of 903 kg./year or 1,990 lbs./year of phosphorus, 1,050 tons/year of sediment and 3,080 lbs./year of nitrogen.

Objective 6 will focus on establishing 3,500 acres of cropland in conservation tillage that are not enrolled in a Precision Nutrient Management Plan. By establishing conservation tillage, there will be an estimated loading reduction of 595 kg./year or 1,312 lbs./year of phosphorus, 350 tons/year of sediment and 910 lbs./year of nitrogen.

NOTE: Objectives 5 & 6 are one-year Best Management Practices. Although cover crops and conservation tillage are easy BMPs to get farmers to use when there is a cost share payment involved, there is a concern in whether the farmers will do these practices without the payment. Additional outreach and education to the farmer will be needed to get the farmer to continue the practices.

As these objectives are implemented, chemical testing will be conducted near the mouth of **Lower Riley Creek HUC-12** during rain events and/or at least once a month to measure the phosphorus and nitrogen levels. The data will provide an idea of the progress towards meeting the listed goals. All objectives will be reevaluated yearly to see if any modifications are needed.

When reevaluating the restoration efforts, the participating agencies and individuals will look at the BMPs being used, the interest of the farmers, and the data that has been collected to see if there should be a modification to the goals and/or objectives. The group will use the Ohio EPA Nonpoint Source Management Plan Update (Ohio EPA 2014) as a reference for possible modifications.

3.3 Critical Area 2: Conditions, Goals and Objectives for Lower Riley Creek HUC - 12

3.3.1 Detailed Characterization

Critical Area 2 will be defined as homes in the **Lower Riley Creek HUC-12** watershed that have a Home Sewage Treatment System (HSTS) to handle human waste that are unpermitted or more than 25 years old. The 2009 TMDL Report lists organic enrichment (sewage) biological indicators as a cause of impairment in the Lower Riley Creek watershed. The pathogens/bacteria being released from failing HSTS prevents the Lower Riley Creek from reaching attainment for Recreation Use. According to the 2010 Ohio Lake Erie Phosphorus Task Force Final Report, failing HSTSs also contribute phosphorus to waterways.

3.3.2 Detailed Causes and Associated Sources

The TMDL Report suggested urban runoff/storm sewers were a probable source for the impairment. Since the 2009 TMDL study, the Village of Pandora has completely separated the storm sewers and sanitary sewers in this watershed being serviced by the Village of Pandora. The Putnam County Public Health Department estimates there are 401 home septic systems in the Lower Riley Creek watershed. The health department estimates that 30% of the home septic treatment systems (HSTSs) in the watershed are failing and contributing to the problem. This would amount to an estimated 120 systems. Due to the unknown types of sewage systems in this area, it is possible that the existing systems do not have proper secondary systems, which could be adding nutrients and pathogens to the waterways. Based on estimated failure rate of 30% and a phosphorus loading estimate of 16.4 lbs./year/system, the estimated loading of phosphorus from failing HSTSs would be 1,968 lbs./year.

3.3.3 Outlined Goals and Objectives for Critical Area 2

Goals for Critical Area 2

- Goal 1: To reduce the pathogen/bacteria loading so the Fecal Coliform will be lowered at the 75th percentile from the 2,200 CFU/100 ml. to 1,000 CFU/100 ml. and at the 90th percentile will be lowered from 7,600 CFU/100 ml. to 2,000 CFU/100 ml. in the Lower Riley Creek.

- Goal 2: Reduce phosphorus from failing HSTSs by 164 pounds per year.

Objectives for Critical Area 2

- Objective 1: Repair/replace 10 identified failing HSTSs in the watershed per year until all HSTSs are working properly.

Narrative of Objectives

Objective 1 will focus on repairing/replacing at least 10 failing systems in the watershed per year using the following criteria:

1. A Home Septic Treatment System inventory of systems that are located within ¼ mile of a waterway will be conducted to identify the type, age and location of each system.
2. Using the data collected above, those systems that are not permitted or more than 25 years old will be inspected to see if they are working properly.
3. The remaining HSTSs located within the ¼ mile area will be inspected to see if any are failing and in need of repair or replacement.
4. All other HSTSs located in the watershed will be inspected to see if any are failing and in need of repair or replacement.

3.4 Critical Area 3: Conditions, goals and objectives for Lower Riley Creek HUC - 12

3.4.1 Detailed Characterization

The 2009 TMDL Report noted that there were several low head dams located in the **Lower Riley Creek HUC-12** watershed. There are dams located at RM 1.3, RM 4.6, RM 7.3 and RM 7.5. Each of these low head dams is located on private property. Each dam will be studied to see what affect the removal of that dam will have on the flow and aquatic habitat. The owner will be contacted, presented with any data collected, and determine his/her willingness to have the dam removed. If removal of a dam proves to be beneficial, grant money will be pursued to cover the cost of the removal.

Chapter 4: Projects and Implementation Strategy for the Lower Riley Creek HUC-12 watershed

4.1 Overview Tables and Project Sheets for Critical Areas

As noted in Chapter 2, the **Lower Riley Creek HUC-12** impairments are mainly due to the agriculture activities in the watershed. This chapter will discuss the projects and evaluations needed to be done 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 **Lower Riley Creek HUC-12** watershed to meet the goals of the TMDL Study for nutrient reduction and for removing the impairment status for the watershed. It will be necessary to periodically reevaluate the status of the critical areas to determine if the projects are sufficient to reach the goals outlined by the TMDL Report. There may be a need to use other Best Management Practices (BMPs) than those listed in the projects when the need for a specific BMP is found.

For the **Lower Riley Creek HUC-12** watershed, there are two Critical Areas identified. Project and Implementation Strategy Overview Tables have been created for each area (subsections 4.2 and 4.3).

Project Summary Sheets (PSSs) provide the nine elements adopted by the OEPA for the projects that have been developed and in need of funding. 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.

4.2 Critical Area 1: Overview Table and Project Sheets for the Lower Riley Creek HUC-12

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

Table 4.1: Critical Area 1: Project Overview Table for Lower Riley Creek HUC-12 (04100008 04 05)							
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, 1a, 2, 3, 4	1	1	Implementing controlled drainage management systems to reduce DRP and N	Putnam SWCD	Short Term (1-3 years)	120,000	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4	2	2	Installing phosphorus filters on the main tile leading to the creek from upland fields	Putnam SWCD	Short Term (1-3 years)	45,000	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4, 5	3	3	Precision Nutrient Management Plan	Putnam SWCD	Short Term (1-3 years)	1,170,000	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4, 5	4	4	Soil testing for Phosphorus, Nitrogen and SOM	Putnam SWCD	Short Term (1-3 years)	156,800	EQIP, USDA, GLB
1, 1a, 2, 3, 4, 5	5	5	Establishing cover crops to reduce P, N and sediment loading	Putnam SWCD	Short Term (1-3 years)	367,500	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4	6	6	Establishing conservation tillage to reduce P, N and sediment loading	Putnam SWCD	Short Term (1-3 years)	157,500	EQIP, USDA, EPA 319, GLB
High Quality Waters Production Strategies							
Other NPS Causes and Associated Sources of Impairment							

4.2.1 Critical Area 1 Project Summary Sheets

This section presents the Project Summary Sheets that were developed based on the actions needed to minimize the nutrient and sediment loadings from cropland in the **Lower Riley Creek HUC-12** watershed. These projects are the logical next steps or priority/short-term projects needed to be accomplished to begin the restoration activities needed to address the impairments and to prevent the transport of the sediment and nutrients further down the watershed and eventually to Lake Erie. Medium and long-term projects will not have a project summary sheet, as these projects are not ready for implementation. As a project comes to an end, an evaluation of the progress will be done to see if the project needs to be continued.

Table 4.2 Project Summary Sheet Critical Area 1 Project 1: Controlled Drainage Management

Table 4.2 Project Summary Sheet Critical Area 1 Project 1: Controlled Drainage Management		
Nine Element Criteria	**Information Needed**	**Explanation**
n/a	Title	Controlled Drainage Water Management
criteria d	Project Lead Organization & Partners	Putnam SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas
criteria c	Location of Project	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas; northwest of Bluffton, OH
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategy
criteria f	Time Frame	Short Term (1-3 years)
criteria g	Short Description	Controlled drainage water management is the practice of using a water control structure on the tiles in a field to raise the depth of the drainage outlet holding water in the field.
criteria g	Project Narrative	The TMDL Report for the Blanchard River watershed states that the Lower Riley Creek HUC-12 watershed impairments are related to the agricultural uses in growing crops. Controlled drainage water management uses a water control structure on the tiles in a field to raise the depth of the drainage outlet, holding water in the filed which prevents the nutrients from entering the creek. The goal is to install 25 water control structures to control 500 acres of cropland.
criteria d	Estimated Total Cost	$120,000
criteria d	Possible Funding Source	Ohio EPA 319, Great Lakes Sediment and Nutrient Reduction Program, NRCS, EQIP USDA-CIG

Table 4.2 Project Summary Sheet Critical Area 1 Project 1: Controlled Drainage Management, cont.

criteria b & h	Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?	The goal is to reduce the phosphorus loading by 3,315.8 kilograms annually.
criteria b & h	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	Controlled drainage water management will be established on 500 acres. The estimated reduction of dissolved reactive phosphorus (DRP) will be 154 kg. or 350 lbs./yr., or 4.6% of the goal. In addition, there will be an estimated 250 lbs./yr. of nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: Phosphorus - 154 kg. or 350 lbs. per year and 250 lbs./year of nitrogen.
criteria i	How will the effectiveness of this project in addressing the NPS impairment be measured?	OEPA watershed-wide monitoring is expected to be conducted again in the summer of 2020 with the TMDL being scheduled for 2023.
criteria e	Information and Education	This project will be promoted to the producers and other stakeholders with public meetings, news release articles, social media and personal contacts from the Putnam SWCD, NRCS and the BRWP to eligible producers. The overall reduction and improvements will be shared with the public as well.

Table 4.3 Project Summary Sheet Critical Area 1 Project 2: Phosphorus Filter

Table 4.3 Project Summary Sheet Critical Area 1 Project 2: Phosphorus Filter		
Nine Element Criteria	**Information Needed**	**Explanation**
n/a	Title	Phosphorus Filter
criteria d	Project Lead Organization & Partners	Putnam County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas
criteria c	Location of Project	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas; northwest of Bluffton, OH
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategy
criteria f	Time Frame	Short Term (1-3 years)
criteria g	Short Description	Dissolved Reactive Phosphorus (DRP) from Critical Area 1 fields that are more than 1000 feet from the main stem will be the greatest source of P loading to the waterways.

Table 4.3 Project Summary Sheet Critical Area 1 Project 2: Phosphorus Filter, cont.

criteria a	Identified Causes & Sources	Cause(s): Nutrient & Sediment Loading Source(s): Channelization, removal of riparian vegetation & non-irrigated crop production
criteria g	Project Narrative	The TMDL Report for the Blanchard River watershed states that the Lower Riley Creek HUC-12 watershed impairments are related to the agricultural uses in growing crops. DRP has been identified as the main source of P flowing into Lake Erie. The cropland fields in Critical Area 1 that are more than 1000 feet from the main stem will have their greatest loss of P from field tile in the form of DRP. The goal is to install two Phosphorus Filters in the drainage system of two fields. The filters will control 80 acres of cropland.
criteria d	Estimated Total Cost	$25,000 - $40,000
criteria d	Possible Funding Source	Ohio EPA 319, Great Lakes Sediment and Nutrient Reduction Program, NRCS, EQIP USDA-CIG
criteria a	Identified Causes & Sources	Cause(s): Nutrient & Sediment Loading Source(s): Channelization, removal of riparian vegetation & non-irrigated crop production.
criteria b & h	Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?	The goal is to reduce phosphorus loading by 3,315.8 kilograms annually.
criteria b & h	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accom-plished by this project?	The use of two Phosphorus Filters will reduce the DRP by an estimated 181 kg. or 400 lbs. per year. This would be 5.5% of the goal.
criteria b & h	Part 3: Load Reduced?	Estimated: Phosphorus - 181 kg. or 400 lbs. per year.
criteria i	How will the effectiveness of this project in addressing the NPS impairment be measured?	OEPA watershed-wide monitoring is expected to be conducted again in the summer of 2020 with the TMDL being scheduled for 2023.
criteria e	Information and Education	This project will be promoted to the producers and other stakeholders with public meetings, news release articles, social media and personal contacts from the Putnam SWCD, NRCS and the BRWP to eligible producers. The overall reduction and improvements will be shared with the public as well.

Table 4.4 Project Summary Sheet Critical Area 1 Project 3: Precision Nutrient Management Plan

Table 4.4 Project Summary Sheet Critical Area 1 Project 3: Precision Nutrient Management Plan		
Nine Element Criteria	**Information Needed**	**Explanation**
n/a	Title	Precision Nutrient Management Plan
criteria d	Project Lead Organization & Partners	Putnam SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas
criteria c	Location of Project	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas; northwest of Bluffton, OH
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategy
criteria f	Time Frame	Short Term (1-3 years)
criteria g	Short Description	By using Precision Nutrient Management Plans, a farmer will be able to better fertilize, grow the crop, and be most cost efficient.
criteria g	Project Narrative	The TMDL Report for the Blanchard River watershed states that the Lower Riley Creek HUC-12 watershed impairments are related to the agricultural uses in growing crops. Precision Nutrient Management Plans (PNMPs) (NRCS 590) for each field in the watershed would be the goal. During the first three years of this NPS-IS plan, the objective is to get at least 4,500 acres enrolled in the plan. According to the NRCS, "by implementing a precision nutrient management plan, producers will be able to improve efficiency and effectiveness of nutrients by utilizing the precision techniques and tools, maintain or increase yields, and minimize nutrient losses from fields, thus helping protect surface and ground water supplies. Precision nutrient management techniques ensure that the 4 R's (Right rate, Right source, Right application method and Right application timing) provide proper amount of nutrients to the crop where is it needed."
criteria d	Estimated Total Cost	$1,170,000 The Precision Nutrient Management Plan includes soil testing ($10/ac. 1st and third year), Precision Fertilizer Application $20.00/ac., Cover Crops $30/ac. and Conservation Tillage $15/ac.). This totals $225/acre over the three years. With a goal have enrolling 2,500 acres that would equal $1,012,500. The remaining $157,500 is an estimated cost of $35/acre to have the plan written by a qualified person.
criteria d	Possible Funding Source	Great Lakes Sediment and Nutrient Reduction Program, NRCS, EQIP USDA-CIG
criteria a	Identified Causes & Sources	Cause(s): Nutrient & Sediment Loading Source(s): Channelization, removal of riparian vegetation & non-irrigated crop production.

Table 4.4 Project Summary Sheet Critical Area 1 Project 3: Precision Nutrient Management Plan page 2

criteria b & h	Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?	The goal is to reduce the phosphorus loading by 3,315.8 kilograms per year from the watershed.
criteria b & h	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	The Nutrient Management Plan will include cover crops, conservation tillage, and precision fertilizer on the 4,500 acres years. The estimated reduction of phosphorus will be 1,045 kg./yr. or 2,300 lbs./yr., or 31.5% of the goal. In addition, there will be an estimated sediment reduction of 1,920 tons/ year and a reduction of 2,610 lbs./year of nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: Phosphorus – 1,045 kg./yr. or 2,300 lbs./yr.; sediment – 1,920 tons/year; nitrogen – 2,610 lbs./yr.
criteria i	How will the effectiveness of this project in addressing the NPS impairment be measured?	OEPA watershed-wide monitoring is expected to be conducted again in the summer of 2020 with the TMDL being scheduled for 2023.
criteria e	Information and Education	This project will be promoted to the producers and other stakeholders with public meetings, news release articles, social media and personal contacts from the Putnam SWCD, NRCS and the BRWP to eligible producers. The overall reduction and improvements will be shared with the public as well.

Table 4.5 Project Summary Sheet Critical Area 4: Soil Testing

Table 4.5 Project Summary Sheet Critical Area 1 Project 4: Soil Testing		
Nine Element Criteria	**Information Needed**	**Explanation**
n/a	Title	Soil Testing for Phosphorus, Nitrogen & Solid Organic Material (SOM)
criteria d	Project Lead Organization & Partners	Putnam County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas
criteria c	Location of Project	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas; northwest of Bluffton, OH
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategy
criteria f	Time Frame	Short Term (1-3 years)
criteria g	Short Description	By soil testing the fields, the producer will be able to apply nutrients at the right rate and create a baseline for the SOM.

Table 4.5 Project Summary Sheet Critical Area 4: Soil Testing, cont.

criteria g	Project Narrative	Soil testing at least 90% or 11,200 acres of the cropland, the producer will know exactly where and how much of each nutrient needs to be applied to achieve his yield goal for each field. In addition, by testing for the SOM in each field, baseline data will be gathered to measure the amount of increase in SOM from use of BMPs. The soil testing will be conducted using either a 2.5-acre grid method or zone testing. The sampling data will be collected and shared with the producer and the agencies involved.
criteria d	Estimated Total Cost	$156,800
criteria d	Possible Funding Source	Great Lakes Sediment and Nutrient Reduction Program, NRCS, EQIP, USDA-CIG
criteria a	Identified Causes & Sources	Cause(s): Nutrient & Sediment Loading Source(s): Channelization, removal of riparian vegetation & non-irrigated crop production
criteria b & h	Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?	The goal is to reduce the phosphorus loading by 3,315.8 kilograms per year from the watershed.
criteria b & h	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	The phosphorus associated with sediment in the watershed based on RUSLE II is 0.4514 lbs./acre/yr. If the SOM is raised by 1%, there would be 16,500 more gallons of water held by the soil, instead of running off. This would result in an estimated load reduction of 998 kg. or 2,200 lbs. of phosphorus/year, or 30.1% of the goal. In addition, there will be an estimated sediment reduction of 1,970 tons/year and a reduction of 74,473 lbs./year of nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: Phosphorus - 998 kg./yr. or 2,200 lbs./yr.; sediment – 1,970 tons/year; nitrogen – 74,473 lbs./yr.
criteria i	How will the effectiveness of this project in addressing the NPS impairment be measured?	OEPA watershed-wide monitoring is expected to be conducted again in the summer of 2020 with the TMDL being scheduled for 2023.
criteria e	Information and Education	This project will be promoted to the producers and other stakeholders with public meetings, news release articles, social media and personal contacts from the Putnam SWCD, NRCS and the BRWP to eligible producers. The overall reduction and improvements will be shared with the public as well.

Table 4.6 Project Summary Sheet Critical Area 1 Project 5: Cover Crops

Table 4.6 Project Summary Sheet Critical Area 1 Project 5: Cover Crops		
Nine Element Criteria	**Information Needed**	**Explanation**
n/a	Title	Cover Crops
criteria d	Project Lead Organization & Partners	Putnam SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas
criteria c	Location of Project	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas; northwest of Bluffton, OH
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategy
criteria f	Time Frame	Short Term (1-3 years)
criteria g	Short Description	Cover crops keep the soil in place and help to prevent nutrients from being lost from the filed by tying the nutrients up in the plant material.
criteria g	Project Narrative	The TMDL Report for the Blanchard River watershed states that the Lower Riley Creek HUC-12 watershed impairments are related to the agricultural uses in growing crops. Cover crops provide a Best Management Practice that keeps growing vegetation on the cropland during the non-growing season. Cover crops also help to prevent erosion and increase nutrient assimilation. Cover crops also help to increase the SOM in the soil which will further prevent water runoff. The goal is to establish 3,500 acres, 10,500 acres total, in addition to the acres of cover crops in Cover Crops.
criteria d	Estimated Total Cost	$367,500
criteria d	Possible Funding Source	Ohio EPA 319, Great Lakes Sediment and Nutrient Reduction Program, NRCS, EQIP USDA-CIG
criteria a	Identified Causes & Sources	Cause(s): Nutrient & Sediment Loading Source(s): Channelization, removal of riparian vegetation & non-irrigated crop production

Table 4.6 Project Summary Sheet Critical Area 1 Project 5: Cover Crops, cont.

criteria b & h	Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?	The goal is to reduce the phosphorus loading by 3,315.8 kilograms per year from the watershed.
criteria b & h	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	The estimated reduction of phosphorus will be 903 kg./yr. or 1,990 lbs./yr. or 27.2% of the goal. In addition, there will be an estimated sediment reduction of 1,050 tons/year and a reduction of 3,080 lbs./year of nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: Phosphorus – 903 kg./yr. or 1,990 lbs./yr.; sediment - 1,050 tons/year; nitrogen – 3,080 lbs./yr.
criteria i	How will the effectiveness of this project in addressing the NPS impairment be measured?	OEPA watershed-wide monitoring is expected to be conducted again in the summer of 2020 with the TMDL being scheduled for 2023.
criteria e	Information and Education	This project will be promoted to the producers and other stakeholders with public meetings, news release articles, social media and personal contacts from the Putnam SWCD, NRCS and the BRWP to eligible producers. The overall reduction and improvements will be shared with the public as well.

Table 4.7 Project Summary Sheet Critical Area 1 Project 6: Conservation Tillage

Table 4.7 Project Summary Sheet Critical Area 1 Project 6: Conservation Tillage		
Nine Element Criteria	**Information Needed**	**Explanation**
n/a	Title	Conservation Tillage
criteria d	Project Lead Organization & Partners	Putnam SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas
criteria c	Location of Project	Lower Riley Creek HUC-12 (04100008 04 05) Cropland areas; northwest of Bluffton, OH
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategy
criteria f	Time Frame	Short Term (1-3 years)
criteria g	Short Description	Conservation Tillage is a BMP that a producer can use to reduce nutrient and sediment loadings by minimizing tillage.

Table 4.7 Project Summary Sheet Critical Area 1 Project 6: Conservation Tillage, cont.

criteria g	Project Narrative	The TMDL Report for the Blanchard River watershed states that the Lower Riley Creek HUC-12 watershed impairments are related to the agricultural uses in growing crops. Conservation tillage leaves the crop residue on the field before and after planting the next crop thus keeping the soil in place and helping to prevent nutrients from being lost from the field. The Putnam SWCD, NRCS and the BRWP will work with the watershed landowners and farmers to enroll cropland in conservation tillage. The goal is to establish 3,500 acres, besides the acres in conservation tillage.
criteria d	Estimated Total Cost	$157,500
criteria d	Possible Funding Source	Ohio EPA 319, Great Lakes Sediment and Nutrient Reduction Program, NRCS, EQIP USDA-CIG
criteria a	Identified Causes & Sources	Cause(s): Nutrient & Sediment Loading Source(s): Channelization, removal of riparian vegetation & non-irrigated crop production
criteria b & h	Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?	The goal is to reduce the phosphorus loading by 3,315.8 kilograms per year from the watershed.
criteria b & h	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	Conservation tillage will be established on the 3,500 acres for a three-year period. The estimated reduction of phosphorus will be 595 kg. or 1,312 lbs./yr., or 17.9% of the goal. In addition, there will be an estimated sediment reduction of 350 tons/year and a reduction of 910 lbs./year of nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: Phosphorus – 595 kg./yr. or 1,312 lbs./yr.; sediment – 350 tons/year; nitrogen – 910 lbs./yr.
criteria i	How will the effectiveness of this project in addressing the NPS impairment be measured?	OEPA watershed-wide monitoring is expected to be conducted again in the summer of 2020 with the TMDL being scheduled for 2023.
criteria e	Information and Education	This project will be promoted to the producers and other stakeholders with public meetings, news release articles, social media and personal contacts from the Putnam SWCD, NRCS and the BRWP to eligible producers. The overall reduction and improvements will be shared with the public as well.

4.3 Critical Area 2: Overview Table and Project Sheets for Lower Riley Creek HUC-12

Table 4.8 on page 4-13 summarizes the Project and Implemenation Strategy Overview for Critical Area 2. The table summarizes the projects needed for restoration of the nonpoint source impairments identified in the TMDL Report for the **Lower Riley Creek HUC-12 (04100008 04 05)** watershed. Only the projects listed in the Project Summary Sheets will be eligible for state and federal funding.

4.3.1 Critical Area 2 Project Summary Sheets

This section presents the Project Summary Sheets that were developed based on the actions needed to address the impairment of organic enrichment (sewage) biological indicators noted in the TMDL Report for the **Lower Riley Creek HUC-12 (04100008 04 05)** watershed. Since the Combined Sewer Overflows (CSO) have been completely separated in Pandora, the main remaining source of the bacteria and pathogens noted in the creek must be failing HSTS in the rural area. The only project in Critical Area 2 is a short-term project and is ready for funding. There are no medium-term or long-term projects in this plan. As projects come to an end, an evaluation of the progress will be done to see if the project needs to be continued or adjusted.

Table 4.8: Critical Area 2: Project Overview Table for Lower Riley Creek HUC-12 (04100008 04 05)							
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 Production Strategies							
Other NPS Causes and Associated Sources of Impairment							
1,2	1	1	Failing HSTS	Putnam County Board of Health	Short Term (1-3 years)	$450,000	WPCLF, RCAP

Table 4.9: Project Summary Sheet Critical Area 2 Project 1: Failing HSTS

Table 4.9: Project Summary Sheet Critical Area 2 Project 1: Failing HSTS		
Nine Element Criteria	**Information Needed**	**Explanation**
n/a	Title	Failing HSTS
criteria d	Project Lead Organization & Partners	Putnam County Board of Health Department
criteria c	HUC-12 and Critical Area	Lower Riley Creek HUC-12 (04100008 04 05)
criteria c	Location of Project	Lower Riley Creek HUC-12 (04100008 04 05) northwest of Bluffton, OH
n/a	Which strategy is being addressed by this project?	Other NPS Causes and Associated Sources of Impairment
criteria f	Time Frame	Short Term (1-3 years)
criteria g	Short Description	The failing HSTS in the rural area of the watershed are contributing bacteria, pathogens and phosphorus to the waterways.
criteria g	Project Narrative	The TMDL Report for the Blanchard River watershed states that one of the impairments in the Lower Riley Creek HUC-12 watershed was organic enrichment (sewage) biological indicators from CSOs in Pandora and HSTS in the rural area of the watershed. During the first three years of this NPS-IS plan, the objective is to repair/replace 30 HSTSs. ***Note: Pandora has completed separation of the CSOs since the TMDL Report.*** The project will involve repairing/replacing at least 10 failing systems in the watershed per year starting with those systems within a ¼ mile of a waterway. The Putnam County Board of Health will seek funding to help homeowners repair/replace a failing system.
criteria d	Estimated Total Cost	$450,000
criteria d	Possible Funding Source	WPCLF, RCAP
criteria a	Identified Causes & Sources	Cause(s): Organic enrichment (sewage) biological indicators Source(s): Failing HSTS

Table 4.9: Project Summary Sheet Critical Area 2 Project 1: Failing HSTS, cont.

criteria b & h	Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?	Fecal Coliform needs to be lowered at the 75th percentile from the 2,200 CFU/100 ml. to 1,000 CFU/100 ml. The level at the 90th percentile needs to be lowered from 7,600 CFU/100 ml. to 2,000 CFU/100ml. In addition, the phosphorus reduction needed is 3,315.8 kg./year.
criteria b & h	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this project?	Repair/Replacement of the 30 HSTS will lower the Fecal Coliform by an estimated 24% and the phosphorus by an estimated 223 kg./yr. or 492 lbs./yr. or 6.7% of the goal.
criteria b & h	Part 3: Load Reduced?	Estimated: Phosphorus – 222 kg./yr.
criteria i	How will the effectiveness of this project in addressing the NPS impairment be measured?	OEPA watershed-wide monitoring is expected to be conducted again in the summer of 2020 with the TMDL being scheduled for 2023.
criteria e	Information and Education	This project will be promoted to the producers and other stakeholders with public meetings, news release articles, social media and personal contacts from the Putnam SWCD, NRCS and the BRWP to eligible producers. The overall reduction and improvements will be shared with the public as well.

4.4 Critical Area 3: Overview Table and Project Sheets for Lower Riley Creek HUC-12

Critical Area 3 involves several low head dams located in the **Lower Riley Creek HUC-12** watershed. Presently, none of this dams have been studied about the removal and no landowners have been contacted. As a result, there are no projects that are shovel ready. If and when a project to remove one of the low head dams is shovel ready, a project sheet(s) for the dam removal will be created and submitted to the Ohio EPA for their approval.

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Appendices

Appendix A: Acronyms and Abbreviations

The following acronyms and abbreviations were used in this NPS-IS Plan and are commonly used by agencies working to restore Ohio's watersheds.

A

ALU	Aquatic Life Use
AWS	Agricultural Water Supply

B

BMP	Best Management Practice
BRWP	Blanchard River Watershed Partnership

C

CRP	Conservation Reserve Program
CSO	Combined Sewer Overflow

D

DO	Dissolved Oxygen
DRP	Dissolved Reactive Phosphorus

E

ECBP	Eastern Corn Belt Plains
EPA	Environmental Protection Agency
EPT	Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies)
EQIP	Environmental Quality Incentives Program

G

GIS	Geographic Information System

H

HELP	Huron/Erie Lake Plains
HSTS	Home Septic Treatment System
HUC	Hydrological Unit Code

I

IBI	Index of Biological Integrity
ICI	Invertebrate Community Index
IWS	Industrial Water Supply

M

MGD	Million Gallons per Day
MIwb	Modified Index of Well Being

N

NPS	NonPoint Source
NPS-IS	NonPoint Source - Implementation Strategy
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service

O

OEPA	Ohio Environmental Protection Agency

P

PCR	Primary Contact Recreation
PNMP	Precision Nutrient Management Plan
PSS	Project Summary Sheets

Q

QHEI	Qualitative Habitat Evaluation Index

R

RCAP	Rural Community Assistance Program
RM	River Mile
RUSLE II	Revised Universal Soil Loss Equation 2

S

SOM	Soil Organic Materials
SWCD	Soil & Water Conservation District

T

TMDL	Total Maximum Daily Load

U

USDA-ARS	United States Department of Agriculture – Agricultural Research Service
USDA-CIG	United States Department of Agriculture – Conservation Innovation Grant

W

WAP	Watershed Action Plan
WPCLF	Water Pollution Control Loan Fund
WWH	Warm Water Habitat
WWTP	Waste Water Treatment Plant

X

Z

Appendix B:

List of Maps

List of Pictures

Tables