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

Blanchard River: Marsh Run-Little Riley Creek 04100008 04 03

Version 1.0

Approved: September 26, 2018

Created by:
Blanchard River Watershed Partnership
PO Box 1237
Findlay, OH. 45839-1237
Phil Martin - Watershed Coordinator

This page intentionally left blank

Table of Contents

Table of Contents cont.

Acknowledgments

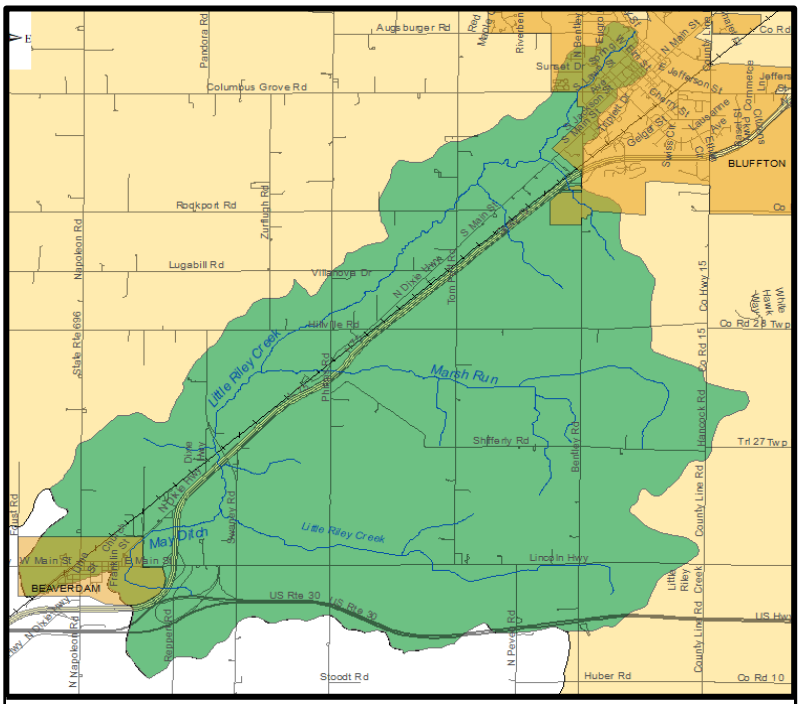
The Blanchard River Watershed Partnership would like to thank Freshwater Futures for providing a funding grant to fund the creation this NPS-IS Plan. The Partnership would also like to thank Allen County Soil and Water Conservation District, for their technical support and advise in developing the Best Management Practices outline in this NPS-IS Plan. The BRWP would also like to recognize the Allen County Public Health Department for their review. Finally, special thanks to Elaine Reynolds for all the GIS maps that she created and to Jane McCleary for her proofreading. This NPS-IS Plan will help to secure funding to address the nonpoint source impairments in the Marsh Run-Little Riley Creek HUC-12 watershed of the Blanchard River Watershed.

Chapter 1: Introduction

The **Marsh Run-Little Riley Creek HUC-12 (**04100008 04 03) watershed covers 10,405 acres or 16.3 square miles (Map 1-1). Agriculture cropland use is the largest land-use (69.3% or 7,208 acres). The upstream section starts in the Village of Beaverdam and flows downstream (northeast) towards the Village of Bluffton for about 6.5 miles before emptying into the Riley Creek in Bluffton. The upstream area includes two truck stops, a gas station and an Ohio Department of Transportation (ODOT) garage and storage area located at the intersection of I-75 and US 30 just east of Beaverdam. The entire watershed lies within the Eastern Corn Belt Plains (ECBP) region.

Picture 1.1: Mouth of Little Riley Creek

The federal and state nonpoint source funding opportunities require strategic watershed plans be *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 plan) for the Blanchard River Watershed based on the 2012 Report Card. The 2012 Report Card was developed using data from the 2009 TMDL study, *2010 Ohio Integrated Assessment Report* for the Blanchard River and ODNR's Earth Resources Information Network (ERIN). Each HUC-12 watershed was assigned a letter grade based on the data. The Marsh Run-Little Run Creek HUC-12 watershed received a letter grade of "D" in the report card.



Map 1.1: Marsh Run-Little 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 citizens, 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, as a result of these two WAPs to help with the restoration activities outlined in the action plans.

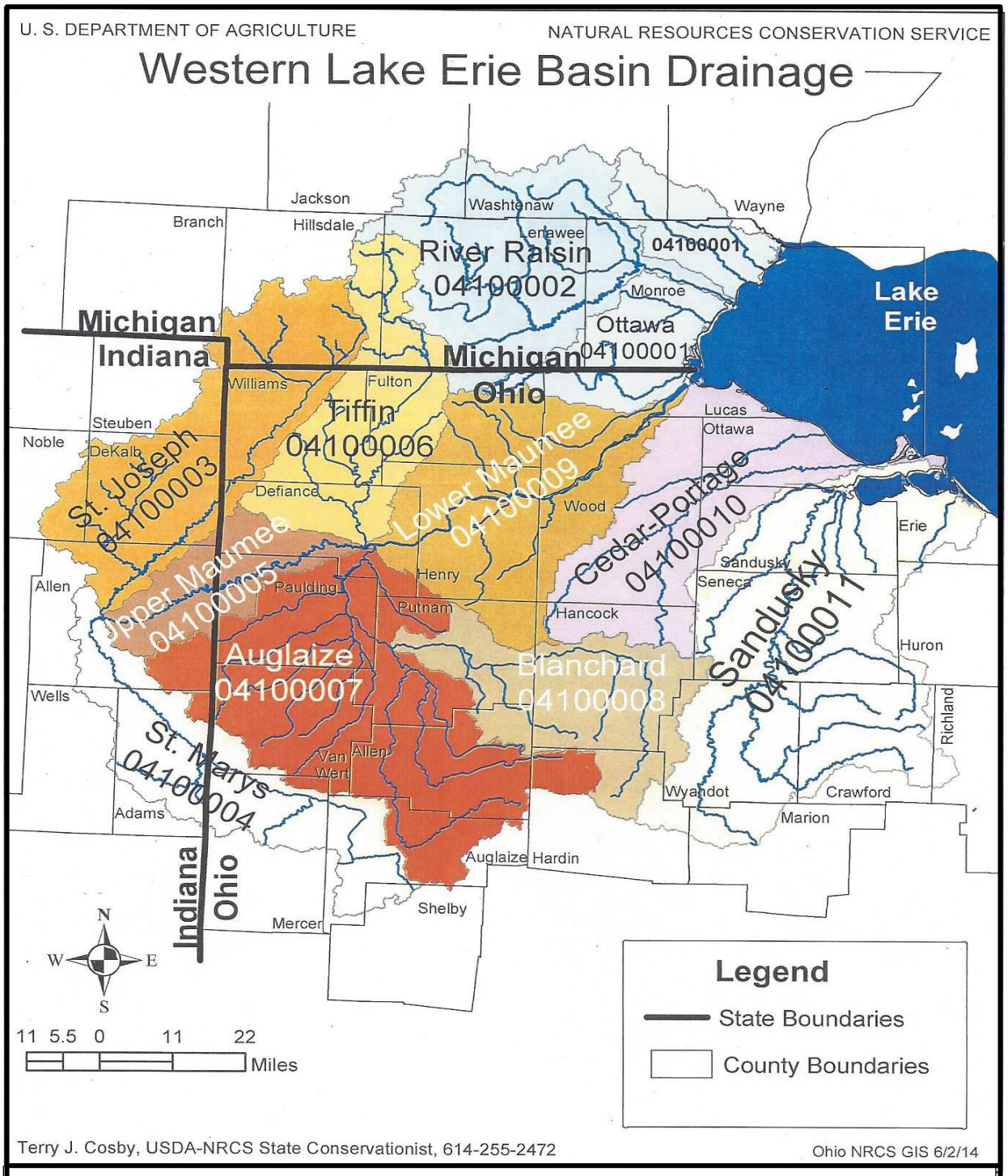
With the new requirement from the U.S. EPA to develop plans that align with the nine-element plans, focus is now on developing NPS-IS plans for individual HUC-12 based on their grade in the 2012 Report Card. This NPS-IS plan is being written for the **Marsh Run-Little Riley HUC-12 (04100008 04 03)** 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 **Marsh Run-Little Riley HUC-12** is 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 implementation of projects in this watershed will help to address Western Lake Erie Basin load reduction goals as described in the Ohio Domestic Action Plan for Ohio in accordance with the Annex 4 agreement.

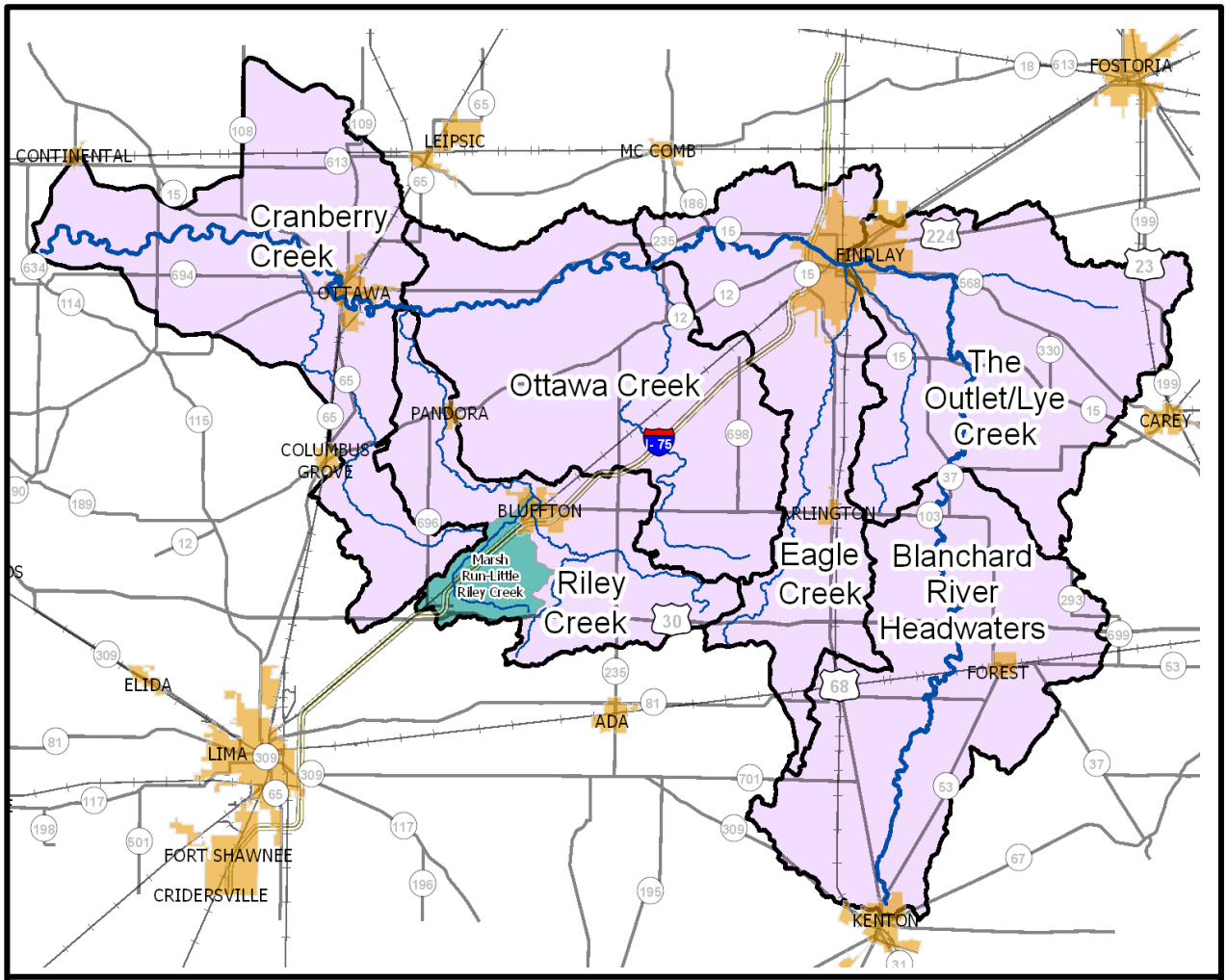
1.2 Watershed Profile & History

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 six smaller HUC-12 watersheds located in the Riley Creek watershed. Map 1-3, on page 1-4, shows the HUC-10 subwatersheds and the location of **Tidershi Creek HUC-12** watershed in the Blanchard River 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 1-2 on page 1-3 shows the location of the Blanchard River Watershed in the Western Lake Erie Basin. Over 80 percent 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: Location of the Blanchard River Watershed in the Western Lake Erie Basin



Map 1.3: The HUC-10 subwatersheds in the Blanchard River Watershed and the location of the Marsh Run-Little Riley Creek HIC-12 watershed in the Riley Creek 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 artificially drained. Wetlands, occurring in cropland, currently constitute less than 1 percent of the watershed and wooded wetlands constitute about 3.2 percent of the watershed.

In addition to addressing the impairments in the **Marsh Run-Little Riley 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 initial planning process for developing a Nine-Element Nonpoint Source Implementation Strategic Plan (NPS-IS) was conducted by the Blanchard River Watershed Partnership (BRWP). Partners were contacted to inform them of the plan. These partners included the Allen County Soil & Water Conservation District (HSWCD), the Village of Bluffton, Allen County Public Health, Ohio Department of Agriculture and Natural Resources Conservation Service (NRCS). The BRWP formed a Headwaters Community Advisory Committee this year. This group will provide input for the plan. This HUC-12 watershed was a part of the 2012 fully endorsed Watershed Action Plan for the Riley Creek watershed.

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 **Marsh Run-Little Riley Creek HUC-12 NPS-IS** plan.

Page Intentionally Left Blank

Chapter 2: Marsh Run-Little Riley Creek HUC-12 Watershed Characterization and Assessment Summary

2.1 Summary of Watershed Characterization for Marsh Run-Little Riley Creek HUC-12

2.1.1 Physical and Natural Features

Marsh Run-Little Riley is a HUC-12 watershed located in the Riley Creek watershed with its mouth located at RM 15.30 on Riley Creek in Bluffton, Ohio. Agriculture is the largest land-use within the watershed (75.2%) or 7,823.6 acres. Table 2-1 summarizes the land use in the watershed. The upstream section is located in the Village of Beaverdam. The upstream section includes two truck stops and a gas station. The downstream section in located on the east side of the Village of Bluffton. The Little Riley Creek flows into the Riley Creek at RM 15.1.

Marsh Run-Little Riley Creek (04100008 04 03)			
Land Use Classification	**Area (ac.)**	**Area (mi^2)**	**% Watershed Area**
Crop Land	7,209.1	11.67	69.3
Hay/Pasture	614.5	0.97	5.9
Deciduous Forest	847.6	1.32	8.1
Barren	18.7	0.03	0.2
Herbaceous Wetlands	12.9	0.02	0.1
Woody Wetlands	0.4	-	0.1
Developed, High Intensity	54.3	0.08	0.5
Developed, Medium Intensity	177.9	0.28	1.7
Developed, Low Intensity	421.2	0.66	4.0
Developed, Open Space	974.3	1.52	9.4
Water	74.1	0.12	0.7
Total	**10,405.0**	**16.26**	**100.0**

Table 2.1: Land Use Classification for the Marsh Run-Little Riley Creek Watershed (Reynolds)

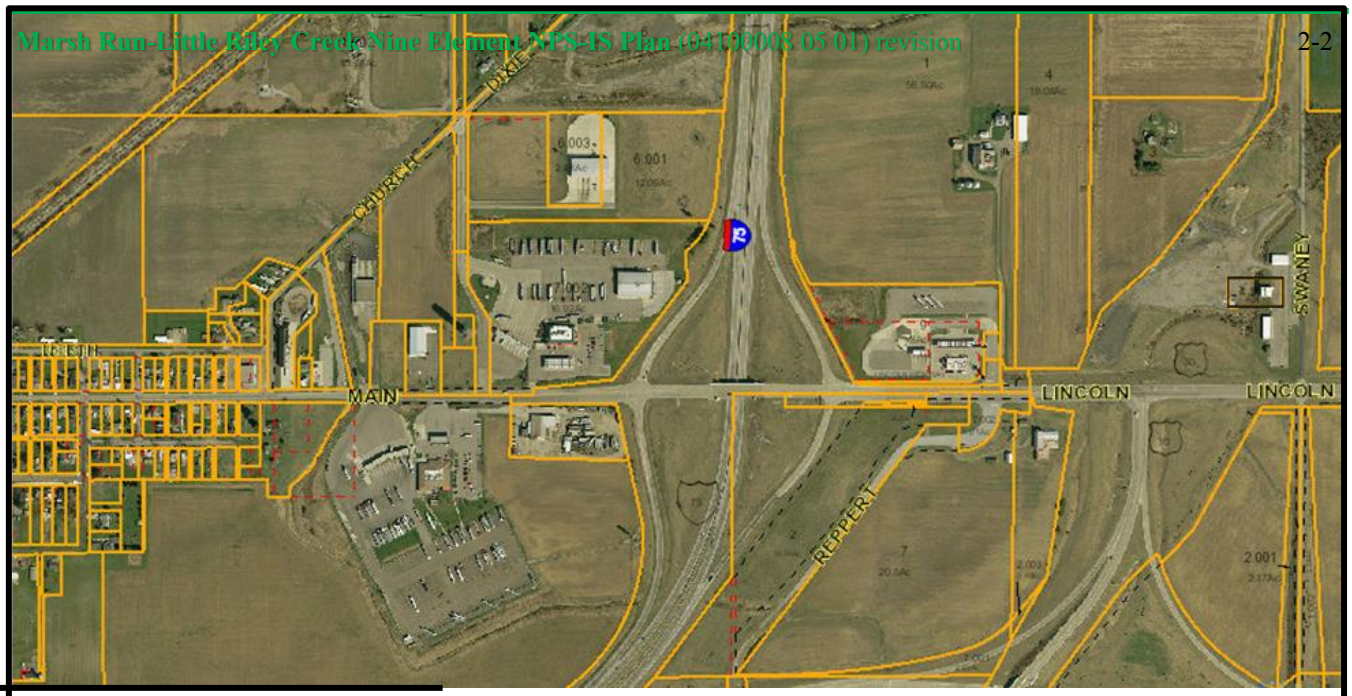
The entire watershed lies within the Eastern Corn Belt Plains (ECBP) ecoregion. In an ECBP ecoregion, the land surface is flat and smooth, soils are leached basic or slightly acid soils with a clay-enriched B horizon and the predominant land use is cropland. In addition, the predominant forest type is beech/maple forest and the primary land use is agriculture (Knowlton, OSU). The main stem of Little Riley Creek is under maintenance by the Allen County SWCD according to petition and maintenance procedures as described in ORC 940.17-30

Soil analysis shows that 7,838 of the 10,405 acres (75.3%) are of the Blount-Pewamo series with a slope of fewer than 5%. These two soil series are both silty clay loam that drain slowly. The parent material for both varieties is glacial till. The over-all Base Sediment Delivery for the soils in the watershed is 3,919.3 tons. /yr. or 0.3867 tons/ac./yr. The Phosphorus Associated with sediment is 7,784.6 lbs./yr. or 0.7680 lbs./ac/yr.

Specific landmarks and features in this watershed include:

- **Bluffton Country Club -** This 18 hole golf course is located west of Bluffton off Dixie Highway.
- **Pleasant Hill Cemetery -** The cemetery is located in Richland Township on North Pevee Road just south of US 30.
- **Woodland Cemetery -** The cemetery is located just east of Beaverdam on North Dixie Highway.

The EPA's National Pollution Discharge Elimination System (NPDES) requires a permit for all facilities discharging pollutants from a point source to a water of the state. There are several NPDES-permitted facilities in the **Marsh Run-Little Riley Creek HUC-12.** Most of these are located in the truck area at the intersection of I-75 and US 30 just east of Beaverdam. Picture 2.1 shows an aerial view of this area.



Picture 2.1: Aerial view of truck stop area at the intersection of I-75 and US 30 east of Beaverdam.

2.1.2 Land Use and Protection

As shown in Table 2-1 on page 2-1, 75.2% of the **Marsh Run-Little 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 a lesser amount of wheat.

There are no school buildings in the watershed. There is a Norfolk and Western railroad track that runs from Bluffton to Lima and along I-75. Both the interstate and the railroad tracks run parallel Little Riley Creek to the south. These transportation corridors present areas of potential stormwater pollution from normal spills and droppings. The east end of the watershed lies in an urban area of Bluffton and is subjected to effects of urban storm water runoff.

2.2 Summary of Biological Trends for Marsh Run-Little Riley Creek HUC-12

The **Marsh Run-Little 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, along with the Riley Creek Watershed Action Plan, were used extensively in preparation of the Marsh Run-Little Riley Creek HUC-12 NPS-IS Plan. The habitat and biological data presented in this plan is from those reports.

There had been no evaluation using habitat and biological data prior to the 2005 study. The entire stream had been designated as a Warm Water Habitat (WWH) in 1978 and 1985. Based on the 2005 TMDL Study, Marsh Run and the Little Riley (Lower) Creek from the upper reaches downstream to the confluence of Marsh Run at RM 4.74 was designated as a MWH. The remainder of Little Riley Creek from RM 4.74 downstream to the mouth was designated as WWH. All other streams and creeks were designated as MWH in the report. Most of the stream has been channelized for drainage to allow for agricultural use. Much of Little Riley Creek has been channelized and is under maintenance through the Allen SWCD.

Overall, **Marsh Run-Little Riley Creek HUC-12** is impaired by total phosphorus, direct habitat alteration, low flow alterations, organic enrichment (sewage) biological indicators, and sedimentation/siltation. The sources of these impairments are channelization, crop production and urban runoff/storm sewers. (TMDL)

2.2.1 Sediment and stream habitat

The 2005 TMDL Study did 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 two sites that were studied in 2005. These two sites were the only sites with either Aquatic Life Use (ALU) partial or nonattainment bedload and habitat. The impairments were caused by low channel morphology and substrate metrics and reported in Table 7.6 of the 2009 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 (percent)	Main Impairment category
		Substrate	Channel	Riparian			
Little Riley Creek (lower)	4.2	13.5	15	4.5	33	meets	riparian
Little Riley Creek (lower)	5.4	1	4	2.5	7.5	76.6	substrate
Target (WWH)		**> 13**	**> 14**	**> 5**	**> 32**		

~~**Table 2.3: Characterization of the Habitat TMDL using QHEI metrics. (Ohio EPA 2009)**~~

Table 2-3 shows the characterization of the habitat TMDL using QHEI metrics for the three sites having causes of either habitat alteration or flow alteration (or both) from Table 7.7 of the 2009 TMDL. The first two sites, RM 0.1 and RM 4.2, have both been designated as WWH. The third site at RM 5.4 has a MWH. The site at RM 4.2 meets the Total Habitat Score. In order for the RM 0.1 site to achieve the Total Habitat Score of 3 needed to meet the goal, the number of high influence attributes need to be lowered to at least 1 and the total number of modified attributes needs to be lowered to at least 4. The third site at RM 5.4 was designated as a MWH by the 2009 TMDL report and is no longer expected to meet a Total Habitat Score.

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	
Little Riley Creek (lower)	0.1	WWH	61	2	6	1	0	0	1
Little Riley Creek (lower	4.2	WWH	64.5	0	3	1	1	1	meets
Lower Riley Creek (lower)	5.4	MWH	25.5	5	10	0	0	0	0

[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; number of high influence modified attributes < 2. One point is assigned if these targets are met.

2.2.2 Macroinvertebrates (Invertebrate Community Index [ICI])

According to the 2009 TMDL report, the macroinvertebrate community in the **Marsh Run-Little Riley Creek HUC-12** reflects an impaired aquatic resource. Table 2-4 summarizes the data collected during the 2005 TMDL study. These sites were studied during July 2005. The Blanchard River Watershed Partnership (BRWP) has monitored the site at RM 0.03 and a site just downstream of RM 4.2 since 2008.

Table 2.4: Macroinvertebrate Results from 2005 TMDL Study

Macroinvertebrates in Marsh Run-Little Riley Creek HUC- 12 (04100008 04 03) 2009 TMDL Study				
RM (Drain. Area mi²)	**No. Qualitative Taxa**	**Total Taxa**	**ICI[b]**	**Quality EPT**
5.4 (5.5)	40	40	P*	4
4.2 (12.3)	30	30	F*	3
0.1 (16.0)	21	21	P*	1

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

Map 2.1 shows the status of each site studied during the 2005 TMDL study for aquatic life use. The site at RM 5.50 was in partial attainment, while the other two sites at RM 4.30 and RM 0.03 where in nonattainment.

Map 2.1: Map of the Attainment Status for Aquatic Life Use
(2016 Integrated Water Quality Report OEPA)

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

The Ohio EPA sampling teams collected data related to water quality and habitat characteristics during the 2005 study. As shown in Tables 2-2 and 2-3 on pages 2-3 and 2-4, the total habitat score at RM 0.1 had a score of 1, the site at RM 4.2 had a score of 3 and the site at RM 5.4 had a score of 0. The total habitat score is equal to the sum of the QHEI, high influence attributes and modified high influence attributes. A total habitat score of 3 is needed to meet the goal of the EPA.

The site at RM 4.2 had a Quality EPT score of 3 that met the threshold metric. The site at RM 0.1 had a Quality EPT score of 1.The QHEI score at this site was 61 exceeds the threshold metric the goal set by Ohio EPA. The reasons for RM 0.1 failing to meet the total habitat score was there was 1 more high influence modified attribute than allowed and 3 more other modified attributes than allowed. In order for this site to meet the established metric threshold, the number of attributes must be restored to the acceptable levels. Both RM 0.1 and 4.2 were designated WWH in the TMDL Study. RM 5.4 was assigned a MWH designation.

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

Since the size of the **Marsh Run-Little Riley Creek HUC-12** watershed is 16.3 square miles which is less than 20 square miles, no modified Index of Well-Being (Mlwb) was applicable and therefore not determined. The fish population was conducted on October 6, 2005 at RM 0.10 and RM 4.30 as a part of the TMDL Study. The sampling at RM 0.1 showed only seven species present. Pollution tolerant species comprised over 90% of the total collected. The sampling at RM 0.1 resulted in fourteen species being recorded with nearly 47% being pollution tolerant species. The Technical Support Data report noted on page 160 that, "the biological community structure at RM 0.1 was reflective of an excess of nutrients and a dissolved oxygen deficit in combination with historical stream modifications to benefit row crop agricultural activities."

2.3 Summary of NPS Pollution Causes and Associates Sources for Marsh Run-Little Riley Creek HUC-12

Table 2.5 below provides a summary of the IBI, ICI, Mlwb, status of each site, QHEI, causes and sources of impairment at each site studied during the 2005 TMDL study.

Table 2.5: Summary of Aquatic Assessment Score for Marsh Run-Little Riley Creek HUC - 12 (04100008 04 03

RM (Drain. Area mi^2)	IBI	Mlw-b[a]	ICI[b]	Status[c]	QHEI	Causes	Sources
5.4 (5.5)	26		P*	Partial	25.5	Direct habitat alteration, siltation	Ag related channelization, crop production
4.2 (12.3)	24*		F*	Non	64.5	Siltation, flow alteration, organic enrichment/DO, nutrients	Crop production
0.1 (16)	24*		P*	Non	61.0	Nutrients, organic en-richment/DO, flow alteration, bacteria (PCR)	Urban runoff, CSOs?

a - Mlwb is 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 data were not available or considered unreliable due to current velocities less than 0.3 fps flowing over artificial substrates.
c - Attainment status based on a single organism group is parenthetically expressed.
ns - Nonsignificant departure from biocriteria (≤4 IBI or ICI units, or ≤0.5 Mlwb units)
* - Indicates significant departure from applicable biocriteria (>4IBI or ICI units, or >0.5 Mlwb units. Underlined scores are in the Poor or Very Poor range.

The 2016 Integrated Water Quality Monitoring and Assessment Report published by the Ohio EPA reported that the aquatic life use impairments in the **Marsh Run-Little Riley Creek HUC-12** were total phosphorus, low flow alteration, direct habitat alterations, organic enrichment (sewage) biological indicators and sedimentation/siltation. The listed sources for the impairments were channelization, crop production with subsurface drainage and urban runoff/storm sewers. The sites at RM 0.1 and RM 4.2 are designated as WWH and both of the sites were in nonattainment. The site at RM 5.4 was designated as MWH and was in partial attainment.

Due to the watershed being less than 20 square miles in area, a modified index of well-being is not applicable.

The TMDL report indicates that Recreational Use Attainment in the watershed is impaired due to bacteria. There is no water currently being used in the watershed for a public drinking supply. Any drinking water is from water wells in Beaverdam and the rural area. The Village of Bluffton receives their drinking waters from the Village of Ottawa.

Page Intentionally Left Blank

Chapter 3: Conditions & Restoration Strategies for Marsh Run-Little Riley Creek HUC - 12 Critical Areas

3.1 Overview of Critical Areas

According to the EPA's TMDL Report, most of the **Marsh Run-Little Riley Creek HUC - 12** issues are related to agricultural use, except for commercial and residential developments in Beaverdam and Bluffton. There are several regulated point sources in the watershed. Map 3-1 below shows the location of the regulated point sources. Table 3-1 on the next page summarizes the data for each NPDES permit found in this watershed.

Map 3.1: Location of NPDES Permits

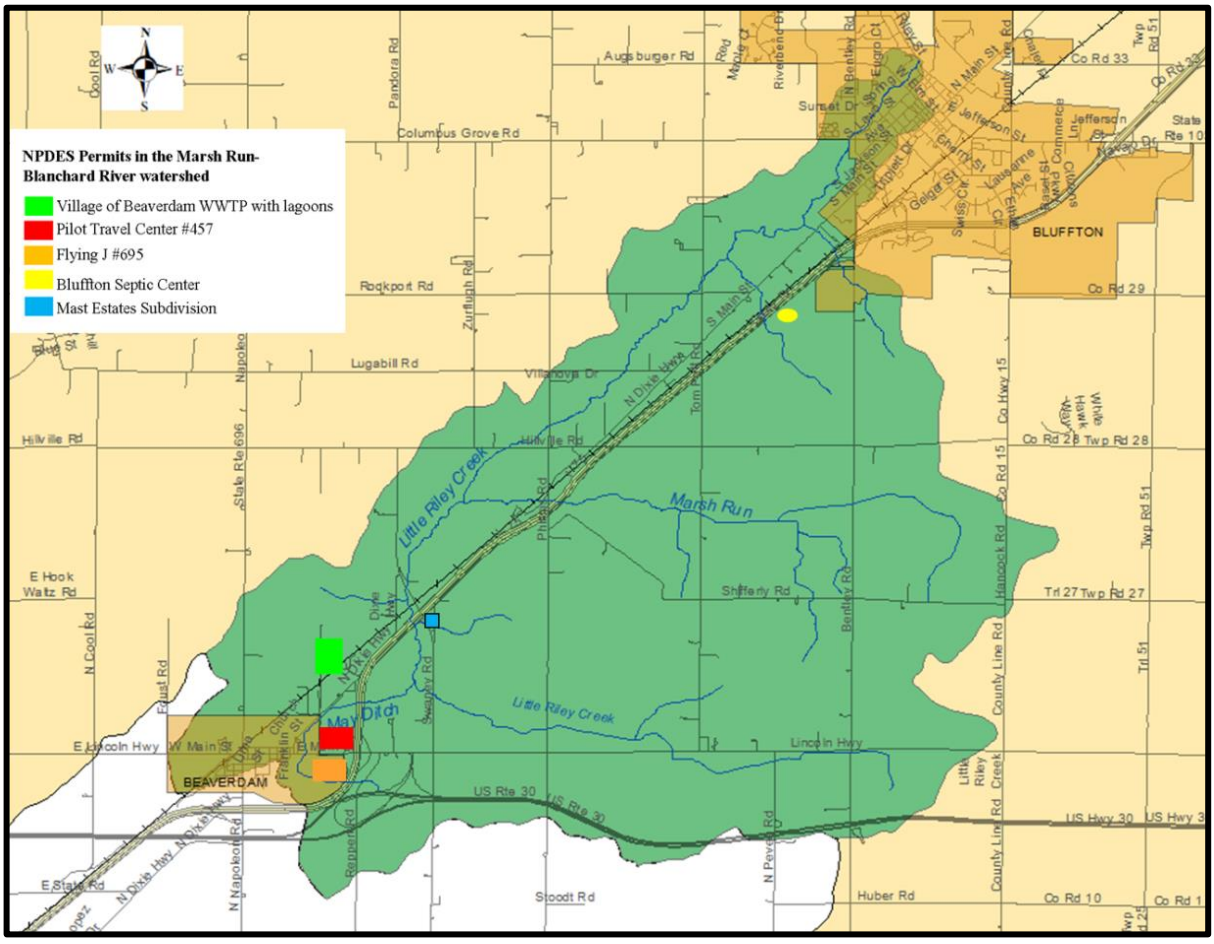


Table 3.1: Summary of the NPDES Permits

NPDES Permits - Marsh Run-Little Riley Creek Watershed					
		Permit	Issue	Average	Compliance
Applicant Name	Facility Name	Number	Date	Design Flow	History
Village of Beaverdam	WWTP	2PB00018*MD	3/1/2017	See #1 below	
Bluffton Septic Tank	Bluffton Septic Tank	2GR00118*DG	10/19/2007	Varies *	
Pilot Travel Centers, LLC	Flying J #695	2IN00241*BD	3/1/2017	Varies *	
Pilot Travel Centers, LLC	Pilot Travel Center #457	2IN00241*BD	6/1/2016	Varies *	See #2 below
Mast Estates Subdivision	Mast Estates	2PG00038*KD	3/1/2017	0.009 MGD	

1. Controlled discharge flows shall be limited to not more than 90 gallons per minute (gpm) for each cubic foot per second (cfs) stream flow measured upstream of the plant final effluent. This plant has a design flow of 0.225 MGD. That is not what they discharge however, since they on discharge when river flow is high. A controlled discharge lagoon is designed to have 180 days of detention time.
2. In the past this facility had compliance issues with discharges of diesel fuel. They had an enforcement action against them. No compliance issues in recent years.

*This is for Stormwater discharges. The GR permit is a general industrial stormwater permit, the IN permits are individual permits.

The modifications made to the streams in the watershed are related to agricultural use have removed a majority 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 reported on three sampling sites in the **Marsh Run-Little Riley Creek HUC-12**. The sampling at these sites was done in 2005. Both the sites at RM 0.1 and RM 4.2 were in nonattainment for aquatic life use. Both sites were designated as WWH status after the study. The site at RM 5.4 experienced periods of low to no flow. As a result, this site was given a MWH designation and was in partial attainment.

Specific restoration strategies and projects will focus on the reduction of the nutrients, especially phosphorus, and sediment loading along the entire Marsh Run-Little Riley Creek. Section 10.3.4 of the U.S 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 3-2 shows the location of the ***Critical Area 1*** with the priority areas.

The 2009 TMDL Report does not specifically list any goal for reduction of the amount of sediment and nitrogen needed in the **Marsh Run-Little Riley Creek HUC-12.** Therefore, the specific restoration strategies and projects will focus on the reduction of the phosphorus loading in the entire Marsh Run-Little Riley Creek. The Best Management Practices (BMPs) suggested will focus on the reduction of the total phosphorus. However, these BMPs 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 **Marsh Run-Little Riley Creek HUC-12,** there must be a baseline to start with in developing the reduction plan. Table 3.1 shows an Annualized Summary of seasonal phosphorus loadings into **Marsh Run-Little 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. Table 3.2 also shows the 40% reduction goal established in the Domestic Action Plan created the International Joint Commission.

Table 3.2: Annualized Summary of 2005 TMDL Seasonal Phosphorus Loading Table

Existing (2005) P Load -Annual (TMDL)	4,362 kg P/year
TMDL Target - Annual	1,683 kg P/year
Difference (Annual P Load -Target P Load) to meet watershed TMDL P-target	2,649 kg P/year (reduction of 60.7%)
Domestic Action Plan (reduce 40% of existing P load) to Western Lake Erie Basin	1,745 kg P/year (reduction of 40%)

3.2 Critical Area 1: Conditions, goals and objectives for Marsh Run-Little Riley Creek HUC - 12

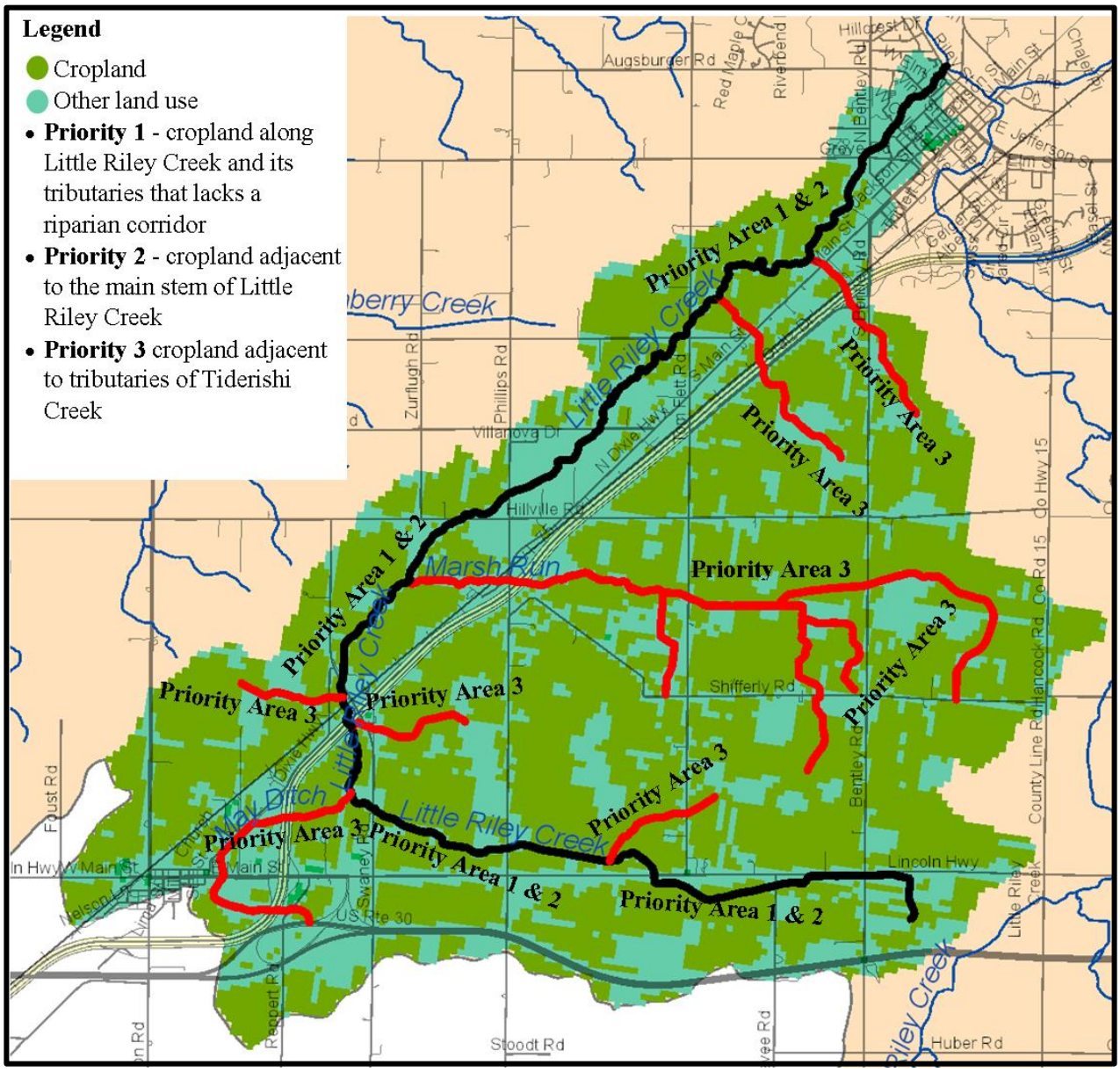
3.2.1 Detailed Characterization

The area defined in Marsh Run-Little Riley Creek HUC-12 as Critical Area 1 will include all the tile-drained crop land (7,209 acres). (See Map 3.2 on the next page.) According to the 2009 TMDL report, the cropland acres of Marsh Run-Little Riley Creek are contributing the most significant load of phosphorus and sediment; and are causing most of the document 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:

Picture 3-1: Typical fields along a waterway in Critical Area 1

- **Priority 1**: Crop parcels (fields) along Little Riley Creek and its tributaries that lack a riparian corridor and edge-of-field conservation practice(s). (approximately 2,500 acres).
- **Priority 2:** Crop parcels (fields) adjacent to the main stem of Little Riley Creek (approximately 4,000 acres).
- **Priority 3:** Crop parcels (fields) adjacent to tributaries of Little Riley Creek (as shown in Map 3.1) — (approximately 2,500 acres).
- **Priority 4:** Fields with documented high Soil Test Phosphorus levels (e.g., above 150 ppm. Mehlich-3).

Map 3.2: Critical Area 1



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 to farmers will be used to help meet the phosphorus reduction needed to meet the TMDL goal. This approach will allow the Allen 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.

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, and
- Soil test for phosphorus reduction.

3.2.2 Detailed Causes and Associated Sources

The 2009 TMDL Report reports that impairments in the **Marsh Run-Little Riley Creek HUC-12** watershed are related to agricultural uses. The contributing causes and sources associated with crop production in Critical Area 1 are:

Table 3.3: Causes and Sources of Impairments in Critical Area 1

River Mile	Causes	Sources
5.4	Direct habitat alteration and siltation	Ag related Channelization and crop production
4.2	Siltation, flow alteration, nutrients	Crop production

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. 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 4,362 kg annually to 1,683 kg annually (a reduction of 2,649 kg per year).

- Goal 1a: To reduce total phosphorus loading from cropland in the watershed from 4,526 kg annually to 2,2,617 kg annually, a reduction of 1,745 kg per year, to achieve a 40% reduction goal consistent with Ohio's Domestic Action Plan.

Objectives for Critical Area 1

In order to achieve the goals listed above for nonpoint source load reduction for phosphorus in the **Marsh Run-Little 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 300 acres. (15 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 2,500 acres of cropland in a precision nutrient management plan that includes cover crops, conservation tillage, soil test for phosphorus and SOM and proper placement of fertilizer. (NRCS 590)

- Objective 4: Soil test 90% of the acres or 6,488 acres in Critical Area 1.

- Objective 5: Enroll 1,250 acres per year of cropland in cover crops. (NRCS 340)

- Objective 6: Enroll 2,000 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 300 acres of drainage area. An estimated 15 structures will be installed average 20 acres per structure. By controlling base flow conditions and water management the BMPs will result in a load reduction of 95.3 kg./year or 210 lbs./year of phosphorus and 150 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 Tiderishi 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. Assuming that each filter is draining a 40 acre field, the estimated reduction of phosphorus will be 400 pounds per year.

Objective 3 will focus on getting the 2,500 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 plan on 2500 acres of cropland in Critical Area 1, there will be a loading reduction an estimated 1,275 lbs./year of phosphorus, 1,065 tons/year of sediment and 1,450 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 1,250 acres of cropland that are not enrolled in a Precision Nutrient Management Plan. By establishing cover crops on 1,250 acres, there will be an estimated loading reduction of 710 lbs./year of phosphorus, 375 tons/year of sediment and 1,100 lbs./year of nitrogen.

Objective 6 will focus on establishing 2,000 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 340 lbs./year of phosphorus, 200 tons/year of sediment and 520 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 **Marsh Run-Little 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 Marsh Run-Little Riley Creek HUC - 12

3.3.1 Detailed Characterization

Critical Area 2 will be defined as homes in the **Marsh Run-Little Riley Creek HUC-12** watershed that has 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 Marsh Run-Little Riley Creek watershed. The pathogens/bacteria being released from failing HSTS prevents the Little Riley Creek from reaching attainment for Recreation Use. According to the 2010 Ohio Lake Erie Phosphorus Task Force Final Report failing HSTS also contributes 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 Bluffton has completely separated the storm sewers and sanitary sewers in the area of this watershed being serviced by the Village of Bluffton. The Allen County Public Health Department feels there are probably failing home septic treatment systems (HSTS) in the watershed contributing to the problem. Based on Allen County Board of Health (ACBH) data there is an estimated 260 home septic systems in this area. 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 50% and a phosphorus loading estimate of 16.4 lbs./year/system, the estimated loading of phosphorus from failing HSTS would be 2,132 lbs./year.

3.3.3 Outline Goals and Objectives for Critical Area 3

Goals for Critical Area 3

- 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/100ml and at the 90th percentile will be lowered from 7,600 CFU/100 ml. to 2,000 CFU/100 ml In Little Riley Creek.

- Goal 2: Reduce phosphorus from failing HSTS by 74.4 kg./year or 164 pounds per year.

Objectives for Critical Area 2

- Objective 1: Repair/replace 10 identified failing HSTS in the watershed per year until all HSTS 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 Systems 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 HSTS located within the ¼ area mile area will be inspected to see if any are failing and in need of repair or replacement.
4. All other HSTS located in the watershed will be inspected to see if any are failing and in need of repair or replacement.

Chapter 4: Projects and Implementation Strategy for the Marsh Run-Little Riley Creek HUC-12

4.1 Overview Tables and Project Sheets for Critical Areas

As noted in Chapter 2, the **Marsh Run-Little 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 **Marsh Run-Little 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 **Marsh Run-Little 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 (PSS) 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 Marsh Run-Little Riley Creek HUC-12

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 for the **Marsh Run-Little 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 Marsh Run-Little Riley Creek HUC - 12 (04100008 04 03)							
Goal	**Objective**	**Project #**	**Project Title** (EPA Criteria g)	**Lead Organization** (Criteria d)	**Time Frame** (EPA Criteria f)	**Estimated Cost** (EPA Criteria d)	**Potential/Actual Funding Source** (EPA Criteria d)
Urban Sediment and Nutrient Reduction Strategies							
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	Allen SWCD	Short Term (1-3 yr.)	$70,000	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	Allen SWCD	Short Term (1-3 yr.)	$40,000	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4, 5	3	3	Precision Nutrient Management Plan	Allen SWCD	Short Term (1-3 yr.)	$650,000	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4, 5	4	4	Soil Testing for Phosphorus, Nitrogen and SOM	Allen SWCD	Short Term (1-3 yr.)	$91,000	EQIP, USDA, GLB
1, 1a, 2, 3, 4, 5	5	5	Establishing Cover Crops to reduce P, N and sediment loading	Allen SWCD	Short Term (1-3 yr.)	$131,250	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4	6	6	Establishing Conservation Tillage to reduce P, N and sediment loading	Allen SWCD	Short Term (1-3 yr.)	$90,000	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

The 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 **Marsh Run-Little Riley Creek HUC-12** watershed. These projects are the logical next steps or priority/short term projects needed to be accomplished in order 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 longer 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

Nine Element Criteria	Information needed	Explanation
n/a	Title	Controlled Drainage Water Management
criteria d	Project Lead Organization & Partners	Allen County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Marsh Run-Little Riley Creek HUC-12 (04100008 04 03) Cropland areas
criteria c	Location of Project	Marsh Run-Little Riley Creek HUC-12, southwest of Bluffton, OH - Cropland areas
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategy
criteria f	Time Frame	Short Term (1-3years)
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 Marsh Run-Little 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 field which prevents the nutrients from entering the creek. The goal is to install 15 water control structures to control 300 acres of cropland.
criteria d	Estimated Total Cost	$70,000
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 a	Identified Causes & Sources	Cause(s): Nutrient & Sediment loading Sources(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 phosphorus loading needs to be reduced 2,649 kilograms annually 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?	Controlled drainage water management will be established on 300 acres. The estimated reduction of dissolved reactive phosphorus (DRP) will be 92.5 kg. or 210 lbs./yr., or 3.5% of the goal. In addition, there will be an estimated 150 lbs./yr. of nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: 92.5 kg. or 221 lbs. P/year and 150 lbs./year 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 releases articles, social media and personal contacts from the Allen 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

Nine Element Criteria	Information needed	Explanation
n/a	Title	Phosphorus Filter
criteria d	Project Lead Organization & Partners	Allen County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Marsh Run-Little Riley Creek HUC-12 (04100008 04 03) Cropland areas
criteria c	Location of Project	Marsh Run-Little Riley Creek HUC-12, southwest of Bluffton, OH - Cropland areas
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategy

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

criteria f	Time Frame	Short Term (1-3 years)
criteriag	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.
criteria g	Project Narrative	The TMDL Report for the Blanchard River watershed states that The Outlet-Blanchard River HUC-12 impairments are related to Agricultural uses in growing crops. DRO 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	$25-40,000
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 Sources(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 2,649 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?	The use of two Phosphorus Filters will reduce the DRP by an estimated 181 kg. or 400 pounds per year. This would be 1.5% of the goal.
criteria b & h	Part 3: Load Reduced?	Estimated: 181 kg or 400 lbs. of P/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 releases articles, social media and personal contacts from the Allen 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

Nine Element Criteria	Information needed	Explanation
n/a	Title	Precision Nutrient Management Plan
criteria d	Project Lead Organization & Partners	Allen County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Marsh Run-Little Riley Creek HUC-12 (04100008 04 03) Cropland areas
criteria c	Location of Project	Marsh Run-Little Riley Creek HUC-12 (04100008 04 03), Southwest of Bluffton, Ohio - Cropland areas
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 Marsh Run-Little Riley Creek HUC-12 impairments are related to the agricultural uses in growing crops. Precision Nutrient Management Plans (PNMP) (NRCS 590) for each field in the watershed would be the ultimate goal. During the first three years of this NPS-IS plan, the objective is to get approximately 2,500 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 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."
criteria d	Estimated Total Cost	$625,000 The Precision Nutrient Management Plan includes soil testing ($10 ac, yr 1&3), Precision Fertilizer Application $20/ac, Cover Crops $30/ac and Conservation Tillage $15/ac). This totals $215/ac over three years. With goal to enroll 2,500 acres this is $537,500. The remaining $87,500 if for development of nutrient management plan by a qualified professional at ~$35/ac.
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 Sources(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 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 2,649 kg. 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 and conservation tillage on the 2,500 acres for a three year period. The estimated reduction of phosphorus will be 580 kg./yr. or 1,272 lbs./yr., or 21.9% of the goal. In addition, there will be an estimated sediment reduction of 710 tons/year and a reduction of 967 lbs./yr. of Nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: Phosphorus - 580 kg./yr. or 1,272 lbs./yr.; 710 tons/year of sediment and Nitrogen - 967 lbs./yr.
criteria i	How will the effectiveness of this project in addressing the NPS impairment to 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 releases articles, social media and personal contacts from the Allen SWCD, NRCS and the BRWP to eligible producers. The overall reduction and improvements with be shared with the public as well.

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	Allen County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Marsh Run-Little Riley Creek HUC-12 (04100008 04 03) - Cropland areas
criteria c	Location of Project	Marsh Run-Little Riley Creek HUC-12, southwest of Bluffton, OH - Cropland areas
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 1 Project 4: Soil Testing cont.

criteria g	Project Narrative	Soil testing at least 90% or 6,488 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 a 2.5 acre grid method. The sampling data will be collected and shared with the producer and the agencies involved.
criteria d	Estimated Total Cost	$91,000
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 Sources(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 2,649 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?	The phosphorus associated with sediment in the watershed based on RUSLE II is 0.4514 lbs./acre/year. 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 a estimated load reduction of 578 kg. or 1,272 lbs. phosphorus/year or 48% of the goal. In addition, there will be an estimated sediment reduction of 1,141 tons/year and a reduction of 43,141 lbs./yr. of Nitrogen.
criteria b & h	Part 3: Load Reduced?	None
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 releases articles, social media and personal contacts from the Allen 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

Nine Element Criteria	Information needed	Explanation
n/a	Title	Cover Crops
criteria d	Project Lead Organization & Partners	Allen County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Marsh Run-Little Riley Creek HUC-12 (04100008 04 03) Cropland areas
criteria c	Location of Project	Marsh Run-Little Riley Creek HUC-12, southwest of Bluffton, OH - Cropland areas
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategy
criteria f	Time Frame	Short Term (1-3years)
criteria g	Short Description	Cover crops keep the soil in place and help to prevent nutrients from being lost from the field by tying the nutrients up in the plant material.
criteria g	Project Narrative	The TMDL Report for the Blanchard River watershed states that the Marsh Run-Little 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 1,250 acres, 3,750 total, in addition to the acres of cover crops in Nutrient Management Plans.
criteria d	Estimated Total Cost	$131,250
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 Sources(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 2,649 kg. per year from the watershed

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

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 710 lbs./yr., or 26.8 % of the goal. In addition, there will be an estimated sediment reduction of 375 tons/year and a reduction of 1,100 lbs./yr. of nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: 710 lbs. P/year, 375 tons/year sediment and 1,100 lbs./ year 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 releases articles, social media and personal contacts from the Allen 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

Nine Element Criteria	Information needed	Explanation
n/a	Title	Conservation Tillage
criteria d	Project Lead Organization & Partners	Allen County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Marsh Run-Little Riley Creek HUC-12 (04100008 04 03) Cropland areas
criteria c	Location of Project	Marsh Run-Little Riley Creek HUC-12, southwest of Bluffton, OH - Cropland areas
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategy
criteria f	Time Frame	Short Term (1-3years)
criteria g	Short Description	Conservation Tillage is a BMP that a producer can use to reduce nutrient and sediment loadings by minimizing tillage.
criteria g	Project Narrative	The TMDL Report for the Blanchard River watershed states that the Marsh Run-Little 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 Allen SWCD, NRCS and the BRWP will work with the watershed landowners and farmers to enroll cropland in conservation tillage. The goal is to establish 2,000 acres, besides the acres in conservation tillage.

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

criteria d	Estimated Total Cost	$90,000
criteria d	Possible Funding Source	Ohio EPA 319, Great Lakes Sediment and Nutrient Reduction Program, NRCS EQIP, USDA-CIG
criteria b & h	Part 3: Load Reduced?	Estimated: 340 kg. or 750 lbs. P/year, 200 tons/year sediment and 520 lbs./year nitrogen
criteria a	Identified Causes & Sources	Cause(s): Nutrient & Sediment loading Sources(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 2,649 kg./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 2,000 acres for a three year period. The estimated reduction of phosphorus will be 340 kg. or 750 lbs./ yr., or 12.8 % of the goal. In addition, there will be an estimated sediment reduction of 200 tons/year and 520 lbs./yr. of nitrogen.

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

Table 4.8 on page 4-12 summarizes the Project and Implemenation Strategy Overview Table for Critical Area 2. The table summarizes the projects needed for restoration of the nonpoint source impairments identified in the TMDL Report for the **Marsh Run-Little Riley Creek HUC-12** 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 Sheet(s)

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 **Marsh Run-Little Riley Creek HUC-12** watershed. Since the Combined Sewer Overflows (CSO) have been completely separated in Bluffton, the only 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 4 is a short term projects and ready for funding. There are no medium tem 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 Marsh Run-Little Riley Creek HUC - 12 (04100008 04 03)							
Goal	**Objective**	**Project #**	**Project Title** (EPA Criteria g)	**Lead Organization** (Criteria d)	**Time Frame** (EPA Criteria f)	**Estimated Cost** (EPA Criteria d)	**Potential/Actual Funding Source** (EPA Criteria d)
Urban Sediment and Nutrient Reduction Strategies							
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	Allen County Board of Health	Short Term (1-3 yr.)	$300,000	WPCLF, RCAP

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	Allen County Board of Health Department
criteria c	HUC-12 and Critical Area	Marsh Run-Little Riley Creek HUC-12 (04100008 04 03)
criteria c	Location of Project	Marsh Run-Little Riley Creek HUC-12, southwest 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 impairments in the Marsh Run-Little Riley Creek HUC-12 was organic enrichment (sewage) biological indicators from CSOs in Bluffton 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 HSTS. ***NOTE: Bluffton 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 1/4 mile of a waterway. The Allen County Board of Health will seek funding to help homeowners repair/replace a failing system.
criteria d	Estimated Total Cost	$300,000
criteria d	Possible Funding Source	WPCLF, RCAP
criteria a	Identified Causes & Sources	Cause(s): organic enrichment (sewage) biological indicators Sources(s): failing HSTS
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/100ml. The level at the 90th percentile needs to be lowered from 7,600 CFU/100 ml. to 2,000 CFU/100 ml. In addition, the phosphorus reduction needed is 2,649 kg/year.

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

criteria b & h	Part 2: How much of the needed improvement for the whole Critical Area is estimated to be accomplished by this	Repair/Replacement of the 10 HSTS will lowered the Fecal Coliform by an estimated 12% and the Phosphorus by an estimated 74.4 kg/ year or 164 pounds per year or 2.8% of the goal. Replacement of 30 HSTS over the three years will reduce the Phosphorus by 222kg or 492 pounds which would be 8.4% of the goal.
criteria b & h	Part 3: Load Reduced?	Estimated: 74.4 kg/year per year or 222 kg of phosphorus over the three years.
criteria i	How will the effectiveness of this project in addressing the NPS impairment to 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 homeowners and other stakeholders with news releases articles, social media and personal contacts from the Allen County Board of Health and the BRWP to homeowners. The overall reduction and improvements with be shared with the public as well.

References and Works Cited

AgBMPs, The Ohio State University Extension, https://agbmps.osu.edu/bmp

Biological and Water Quality Study of the Blanchard River, TSD Report, Ohio EPA, 2009, http://www.epa.state.oh.us/portals/35/documents/BlanchardRiverTSD2005.pdf

Funderburg, Edward, Organic matter serves important role in soil health, 2016, https://www.noble.org/news/publications/ag-news-and-views/2016/february/organic-matter-is-important/

Heidelberg University, (2015), Research on Water Quality: http://ocj.com/2016/10/research-yielding-some-clear-answers-to-murky-water-quality-questions/

King, Kevin and N. R. Fausey, "Tile Drainage Contribution to Hydrology and Phosphorus Transport ppt." 2013, http://www.awra.org/meetings/Spring2013/doc/ppoint/Tuesday/Session%2012/0830%20Tile%20Drainage%20K%20King.pdf

Knowlton, Eastern Cornbelt Plains Ecoregion, tycho.knowlton.ohio-state.edu/ecbp.html

Maumee River Watershed, Lake Erie Water Keepers, http://www.lakeeriewaterkeeper.org/save-maumee)

NRCS Blanchard River Assessment Report, NRCS, wleb.org/watersheds/Assessments/Blanchard_1-17-08.pdf

Ohio 2016 Integrated Water Quality Monitoring and Assessment Report, http://www.epa.oh.us/dsw/tmdl/OhiointegratedReport.aspx#1766910016-report

Ohio Nonpoint Source Management Plan (June 2014), http://www.epa.ohio.gov/portals/35/nps/nps_mgmt_plan.pdf

Penn, Chad, etal, Evaluation of a universal flow-through model for predicting and designing phosphorus removal structures, Chemosphere 151 (2016) 345e355, www.elsevier.com/locate/chemosphere

Soil Health Key Points - NRCS - USDA
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1082147.pdf

Strock, etal., Drainage Water Management for Water Quality Protection, Journal of Soil and Water Conservation Society, Nov/Dec 2010—vol. 65, no. 6
https://naldc.nal.usda.gov/download/49248/PDF

Total Maximum Daily Loads for the Blanchard River Watershed, Ohio EPA, 2009,
http://www.epa.state.oh.us/portals/35/tmdl/BlanchardRiverTMDL_final_may09_wo_app.pdf

Appendices

Page Intentionally Left Blank

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 Uses

B

BMP	Best Management Practice
BRWP	Blanchard River Watershed Partnership

C

CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CWA	Clean Water Act

D

DRP	Dissolved Reactive Phosphorus

E

ECBP	Eastern Corn Belt Plains
EPT Index	Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies)
EQIP	Environmental Quality Incentives Program
ERIN	Earth Resources Information Network

G

GIS	Geographic Information System
GLB	Great Lakes Basin (Commission)
GLRI	Great Lakes Restoration Initiative

H

HRPC	Hancock Regional Planning Commission
HSWCD	Hancock County Soil & Water Conservation District
HSTS	Home Septic Treatment System
HUC	Hydrological Unit Code

I

IBI	Index of Biological Integrity
ICI	Invertebrate Community Index

M

MGD	Million Gallons per Day
Mlwb	Modified Index of Well Being
MWH	Modified Warmwater Habitat

N

NCWQR	National Center for Water Quality Research (located at Heidelberg University)
NPS-IS	Nonpoint Source Implementation Strategy
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service

O

ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
OEPA	Ohio Environmental Protection Agency

Q

QHEI	Qualitative Habitat Evaluation Index

R

RM	River Mile

T

TMDL	Total Maximum Daily Load
TSD	Technical Support Document (from OEPA)

U

USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

W

WAP	Watershed Action Plan
WWH	Warmwater Habitat

Appendix B

LIST OF MAPS

LIST OF PICTURES

LIST OF TABLES