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

Blanchard River:
Tiderishi Creek 04100008 05 01
Version 1.0

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Acknowledgments
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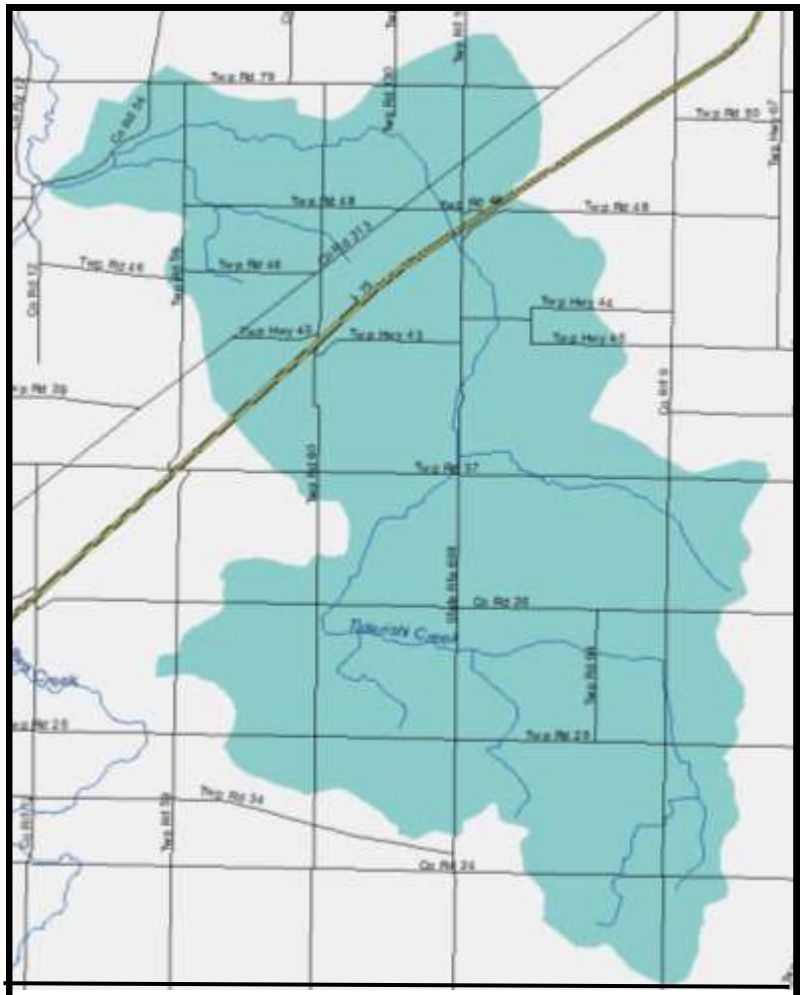
Chapter 1: Introduction

The **Tiderishi Creek HUC-12** (04100008 05 01) watershed is located in the central, southwest part of Hancock County, Ohio. Tiderishi Creek is a tributary of Ottawa Creek. Tiderishi Creek enters Ottawa Creek at RM 5.88 along CR 54 near CR 12 (Picture 1-1). Tiderishi Creek runs for about 12 miles in a northwest to southeast direction and covers approximately 19.21 mi^2 or 12,297.29 acres (Map 1-1). The entire watershed lies within the Eastern Corn Belt Plains (ECBP) region. Land use within the watershed is primarily for agricultural purposes (84.1%).

Picture 1.1: Mouth Tiderishi Creek

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 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 Tiderishi Creek HUC-12 received a letter of "F" in the report card.



Map 1.1: Tiderishi Creek Watershed

1.1 Report Background

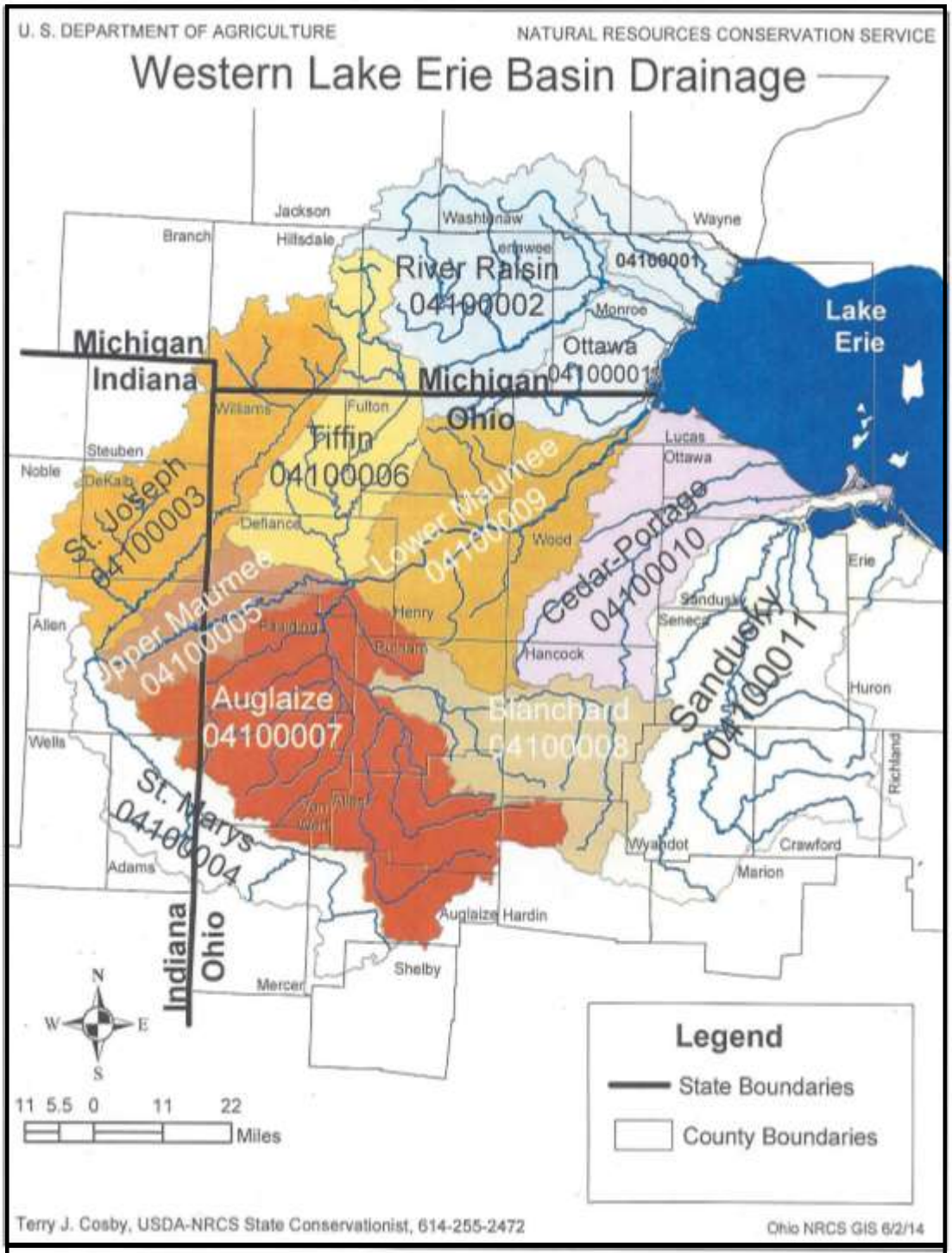
The Blanchard River Watershed Partnership is a community-based volunteer 501(c)(3) organization that seeks to address problems and concerns that affect the health of the Blanchard River Watershed and educate all citizens about the dynamics of the Blanchard River and its tributaries. The BRWP members 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 **Tiderishi Creek HUC-12 (04100008 05 01)** watershed to address nonpoint source causes and sources of impairments that have been specifically identified in the watershed.

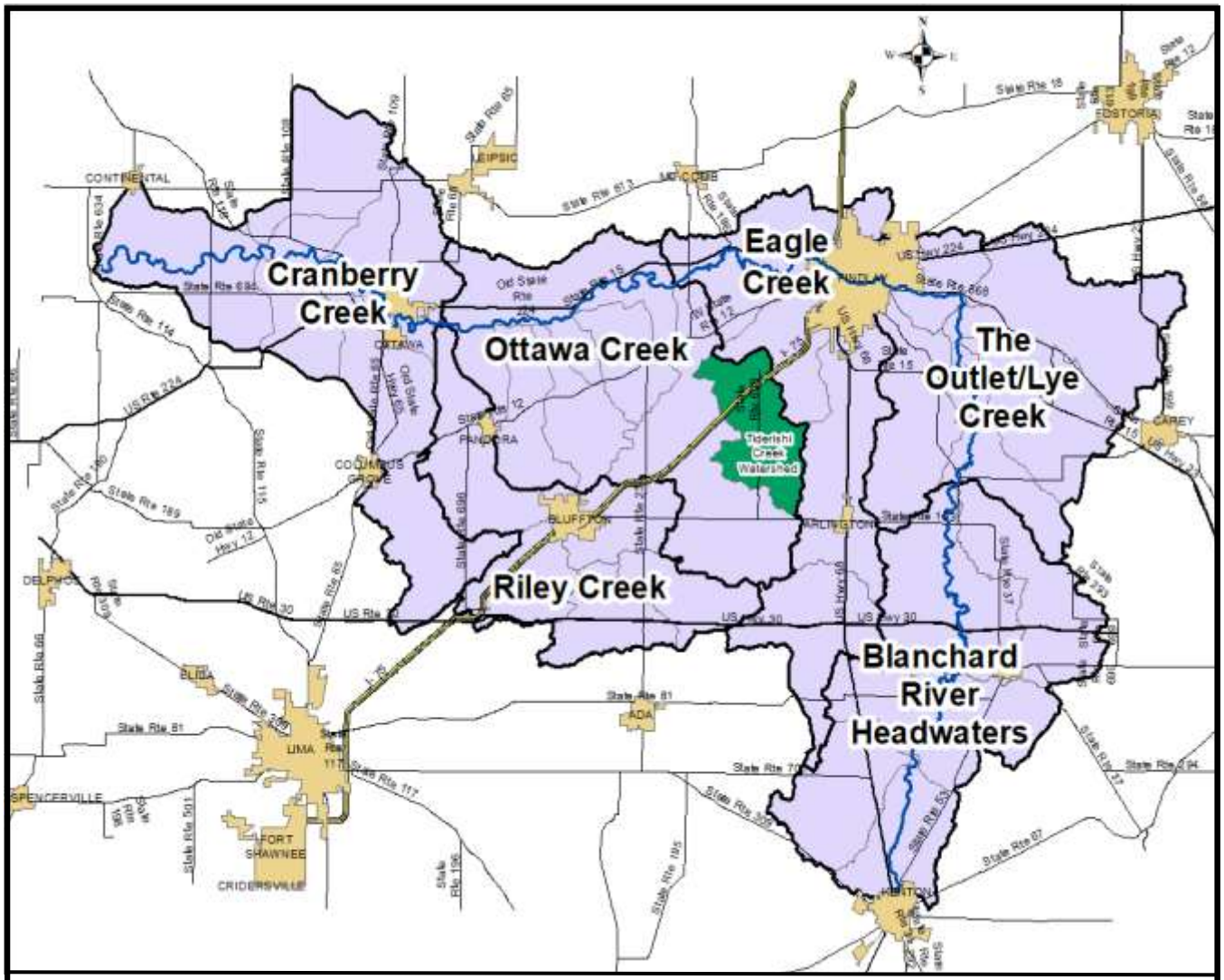
Removal of nonpoint source impairments in the **Tiderishi Creek HUC-12** will address nonpoint source impairment and allow for step-wise improvement toward achieving attainment of water quality standards. In addition, nutrient load reductions achieved through implementation of projects in this watershed 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 Ottawa Creek watershed HUC-10 is 04100008 05. There are six smaller HUC-12 watersheds located in the Ottawa 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 Tidershi Creek HUC-12 watershed in the Ottawa 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 **Tiderishi 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.

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 Hancock County Soil & Water Conservation District (HSWCD), the City of Findlay, Hancock Regional Planning Commission, Hancock Public Health Department, Ohio Department of Agriculture and Natural Resources Conservation Service (NRCS). The BRWP formed an East-Central Community Advisory Committee this year. This group will provide input for the plan. An article about **Tiderishi Creek HUC-12 NPS-IS** plan was included in the Summer Issue of the BRWP Times. 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 **Tiderishi Creek HUC-12 NPS-IS** plan. A picture of each bridge was taken.

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

2.1 Summary of Watershed Characterization for Tiderishi Creek HUC-12

2.1.1 Physical and Natural Features

Tiderishi Creek is a tributary of Ottawa Creek with its mouth located at RM 5.88 along CR 54 just east of the intersection with CR 12. The creek runs in a northwest to southeast direction for about 12 miles and drains about 19.21 square miles or 12,297.29 acres. Land use within the watershed is primarily for agricultural purposes (84.1%). Table 2-1 summarizes the land use in the watershed.

Tiderishi Creek (04100008 05 01)			
Land Use Classification	**Area (ac.)**	**Area (mi^2)**	**% Watershed Area**
Crop Land	9,783.10	15.29	79.56
Hay/Pasture	557.90	0.87	4.54
Deciduous Forest	1,105.90	1.73	8.99
Protected Wildlife Area	46.39	0.07	0.38
Fallow/Idle Cropland	3.10	0.00	0.03
Barren	4.00	0.01	0.03
Herbaceous Wetlands	3.50	0.01	0.03
Woody Wetlands	0.40	0.00	0.00
Developed, High Intensity	0.20	0.00	0.00
Developed, Medium Intensity	11.70	0.02	0.10
Developed, Low Intensity	125.00	0.20	1.02
Developed, Open Space	644.20	1.01	5.24
Water	12.10	0.02	0.10
Total	**12,297.29**	**19.21**	100.00

Table 2.1: Land Use Classification for the Tiderishi 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 EPA 2009 TMDL Report states that most of the streams are channelized with narrow riparian corridors, if present. Lack of water in the tributaries become a problem during summer months. The Hancock County SWCD maintains the creek above TR 64 to above CR 25 at CR 9 according to Ohio Drainage Law petition ditch and maintenance procedures.

Soil analysis shows that 10,330 of the 12,370 acres (83.5%) is of the Blount-Pewamo series with a slope of under 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 5,211.4 tns./yr or 0.4213 tns/ac./yr. The Nitrogen Associated with sediment is 14,360.0 tns./yr. or

1.1690 tns./ac./yr. The Phosphorus Associated with sediment is 5,583.3 lbs./yr. or 0.4514 lbs./ac./yr.

Specific landmarks and features in this watershed include:

- **Keller Cemetery** - Eagle Township - The cemetery is located along SR 698, north of TR 25. The cemetery covers 1.3 acres.
- **Powell Cemetery** - Eagle Township - The cemetery is located along SR 698, north of TR 48. The cemetery covers 2.42 acres.
- **ODNR Wildlife Production Area** - The area is located on CR 26 east of TR 60 and covers 46.39 acres. See Picture 2-1.

Picture 2.1 ODNR Wildlife Production Area

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. Only one NPDES-permitted facility (Permit #2PP0019) is located in the **Tiderishi Creek HUC-12.** The Ohio Department of Transportation (ODOT) maintains a package plant for park #1-26 that serves both north and south bound I-75 rest areas. The system is designed to treat 0.01 MGD and is equipped with sand filters and chlorine disinfection. (TMDL Report)

2.1.2 Land Use and Protection

As shown in Table 2-1 on page 2-1, 84.1% of the **Tiderishi 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 8,000 acres per year. Winter wheat averages over 900 acres a year with alfalfa and grass pasture covering another 500 plus acres. There is about one acre of sweet corn and tomatoes grown. (USDA2015)

The only area in the **Tiderishi Creek HUC-12** that is under any total conservation protection program is the 46.39 acres in **ODNR Wildlife Production** on CR 26**.** There are no school buildings, recreation areas or sewered areas in the watershed. The Keller and Powell Cemeteries are located along SR 698. Interstate 75 cuts across Tiderishi Creek near RM 5.2. There is a Norfolk and Western railroad track that runs from Findlay to Bluffton and crosses Tiderishi Creek at RM 2.90. These transportation corridors present areas of potential stormwater pollution from normal spills and droppings.

2.2 Summary of Biological Trends for Tiderishi Creek HUC-12

The **Tiderishi 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 Tiderishi Creek HUC-12 NPS-IS Plan. The habitat and biological data presented in this plan is from these two reports.

Most of the main stem of Tiderishi Creek has been channelized for drainage to allow for agricultural use. The riparian corridors are narrow where present, except for the locations where the creek passes through a woodlot. Water flow only occurs year round near the mouth. The rest of the creek can and does experience dry beds during some months of the year.

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. As a result of the 2005 TMDL Study, the stream designation was changed to a Modified Warmwater Habitat (MWH) above the Norfolk and Western railroad crossing (RM 2.90), while the warmwater habitat (WWH) designation remained from RM 2.9 to the mouth of Tiderishi Creek." (TMDL)

According to the 303(d) list in the OEPA Integrated Report, the causes of impairments are: total phosphorus, nitrate and nitrite, dissolved oxygen, low flow alterations, direct habitat alterations, sedimentation/siltation, nutrient/eutrophication biological indicators, organic enrichment (sewage). The sources are: crop production with subsurface drainage, channelization and urban runoff/storm sewers.

2.2.1 Sediment and stream habitat

The 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 only site that was study in 2005. The site studied is at the mouth of Tiderishi Creek with Ottawa Creek. 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 (percent)	Main Impairment category
		Substrate	Channel	Riparian			
Tiderishi Creek	0.1	13.5	11.5	4.5	29.5	7.8	channel
Target (WWH)		**≥ 13**	**≥ 14**	**≥ 5**	≥ 32		

Table 2-3 on the next page shows the characterization of the habitat TMDL using QHEI metrics for impaired sites having causes of either habitat alteration or flow alteration (or both) from Table 7.7 of the 2009 TMDL. The results show that neither site achieved an acceptable Total Habitat Score. The site at RM 0.1 was only 2 points short of attaining the minimum QHEI score. The QHEI score of 58 was one of the reason that part of the creek remained a WWH on the TMDL Report. The site at RM 7.3 was 18 points below the minimum QHEI score for being a WWH creek and was recommended to be changed to a MWH creek. Map 2-1, on the next page, shows the location of the three sites study during the 2005 TMDL Study.

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

Stream/River	River Mile	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	Subscore[1]			Total Habitat Score
					QHEI	High Influence	Modified	
Tiderishi Creek	0.1	58	2	7	0	0	0	0
Tiderishi Creek	7.3	40	3	9	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 **Tiderishi HUC-12** reflects an impaired aquatic resource. A poor collection of macroinvertebrates were found at RM 4.6 and 7.3. Both of these sites were located in the recommended MWH reach of the creek. The site at RM 7.3 showed decomposing cornstalks and other plant debris that likely contributed to a high oxygen demand and the channelized habitat presented significant obstacles for the site even meeting MWH use. The site at RM 4.6 only had macroinvertebrates during times of limited flow. Several times this location was dry. Even at limited flow the macroinvertebrate communities were in poor condition. Nutrient enrichment, algae growth and direct sunlight made the habitat at RM 4.6 very poor for macroinvertebrates. The site at RM 0.1 experiences a flow year round. This site showed a marginal good result for macroinvertebrate with 47 taxa being present. Excess nutrient and stream modifications that were done for row crop agricultural activities were the cause of the low macroinvertebrate populations. Additionally, the Technical Support Data reports on page 159, that "water chemical results demonstrated an excess of nutrients and a dissolved oxygen deficit which likely contribute to reduced numbers of pollution sensitive fish and/or macroinvertebrates within the middle of Ottawa Creek." See Table 2-4 on the next page for a summary of the macroinvertebrate data from the 2005 TMDL Study.

Map 2.1: Depiction of habitat scores at QHEI assessment sites for impaired sites having flow alteration or habitat alteration factors in Tiderishi Creek HUC-12 (TMDL)

Table 2.4: Macroinvertebrate Data Results for Tiderishi Creek.

Macroinvertebrates in Tiderishi Creek HUC- 12 (04100008 05 01) 2005 TMDL Study				
RM (Drain. Area mi^2)	No. Qualitative Taxa	Total Taxa	ICI[b]	Quality EPT
7.3 (7.2)	26	26	P*	1
4.6 (12.2)	21	21	P*	1
0.1 (19.4)	47	47	MG[ns]	7

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.

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 page 2-3, the total habitat score was zero for the two sites studied, RM 0.1 and RM 7.3. RM 7.3 is located in the reach of the creek that was designated as MWH, while RM 0.1 is located in the area designated WWH. The final Total Habitat Score is based on the sum of the score for QHEI, high influence attributes and modified high influence attributes. Each site scored a zero in every category which resulted in the Total Habitat Score of zero for each site.

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

Since the size of the **Tiderishi HUC-12** watershed is 19.2 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 August 25, 2005 for the TMDL Study. No fish sampling was conducted at RM 4.6 because there was no flow on the date of the sampling. The only two sites sampled were at RM 7.3 and RM 0.1. The sampling at RM 7.3 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 Tiderishi 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 Tiderishi Creek HUC - 12 (04100008 05 01)

RM (Drain. Area mi^2)	IBI	Mlwb[a]	ICI[b]	Status[c]	QHEI	Causes	Sources
7.3 (7.2)	20*		P*	Non	40.0	Direct habitat alteration, low DO, nutrients, intermittent flow	Ag related channelization, crop production with subsurface drainage
4.6 (12.2)			P*			Direct habitat alteration, nutrients, pH, thermal modification, dry channel	Ag related channelization, crop production with subsurface drainage
0.1 (19.4)	34*		MG^{ns}	Partial	58.0	Direct habitat alteration, nutrients, siltation, organic enrichment	Ag related channelization, crop production with subsurface drainage Urban runoff/storm sewers

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 biological impairments in the **Tiderishi Creek HUC - 12** direct habitat alterations, total phosphorus, nutrient/eutrophication biological indicators, organic enrichment (sewage) biological indicators, nitrate/nitrite, low flow alterations, low dissolved oxygen, sedimentation/siltation. The listed sources for these impairments were channelization, crop production with subsurface drainage. and urban runoff/storm sewers. The site at RM 0.1 was in partial attainment and is in the reach of the creek listed as WWH for beneficial use. The site at RM 4.6 was not given a status. The other site at RM 7.3 was in non attainment is considered to be MWH.

Due to the watershed being less than 20 square miles in area, a modified index of well being does not apply and was not included in the 2005 TMDL study.

As far as Recreational Use Assessment, the report states that it 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.

Another potential non point source of pollution mentioned in the TMDL Report was the Cramer Duck Farm located along CR 54 near the mouth of Tiderishi Creek. The TMDL mentioned nutrient loadings from the overflow of the pond and from droppings. The duck farm was closed and all ducks removed sometime around 2007. The area of the farm is completely grassed over and the are no animals in the barn.

Although the TMDL Report did not specifically list failing Home Septic Treatments Systems (HSTS) as a source of pathogens and phosphorus, if did report organic (sewage) enrichment at RM 0.1. The Hancock Commissioners, in partnership with the Blanchard River Watershed Partnership and the Hancock Public Health Department, have received Water Pollution Control Loan Fund grants from the Ohio EPA since 2012. One of the first project done was the replacement of a failing HSTS just up-stream from RM 0.1 in 2012. The Hancock Public Health Department considers that as many as 50% of the systems are failing either due to their age and never being permitted. Restoration projects will focus on reducing the total phosphorus from entering the creek from crop production and replacing/repairing any HSTS in the watershed the is found to be failing.

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

3.1 Overview of Critical Areas

According to the EPA's TMDL Report, all of the **Tiderishi Creek HUC - 12** issues are related to agricultural use. The stream modifications in the watershed are related to agricultural use have removed a majority of the riparian buffer vegetation. These modifications 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 **Tiderishi Creek HUC - 12**. The sampling at these sites was done in 2005. The site at RM 0.1 was in partial attainment and was the only site that retained its WWH status after the study. The WWH status extends from the mouth of Tiderishi Creek to the Norfolk and Western railroad crossing at RM 2.90. The TMDL Report on page 56 states, "habitat conditions in the lower reach make WWH attainment a reasonable expectation with lessening of nutrient inputs to Tiderishi Creek." Map 3.1 on the next page provides an aerial view of this area. The aerial view is very representative of the entire watershed.

The site at RM 4.6 experienced periods of low to no flow. As a result, this site was given a MWH designation and was in nonattainment. The third site was located at RM 7.3. This site was also designated a MWH by the TMDL Study and was also in nonattainment. As a result, the entire area upstream from RM 2.90 was designated MWH by the TMDL study.

Specific restoration strategies and projects will focus on the reduction of the nutrients, especially phosphorus, and sediment loading along the entire Tiderishi 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 3.1 on page 3-4 shows the location of the critical area 1 with the priority areas. Critical Area 2 will include The main stem of Tiderishi Creek from the mouth to RM 2.90 and the 50 foot riparian area on both sides of the main stem. Map 3.2 on page 3-9 shows Critical Area 2.

The 2009 TMDL Report does not specifically list any goal for reduction of the amount of sediment and nitrogen reduction needed in the **Tiderishi Creek HUC - 12.** Therefore the specific restoration strategies and projects will focus on the reduction of the phosphorus loading in the entire Tiderishi Creek. The Best Management Practices (BMPs) suggested will focus on the reduction of the total phosphorus. However, these BMP's result in a reduction of the sediment and nitrogen loadings. These load reductions, along with other suggest BMPs should raise the QHEI at RM 0.1 to the goal of 60. Additional critical areas may be identified and will be addressed in future revisions of this NPS-IS

Picture 3.1: Aerial view of the area runs from RM 2.9 at the Norfolk & Western railroad crossing to the mouth with Ottawa Creek. This area was designated as a WWH by 2009 TMDL Report. The aerial view shows a view of what the land adjacent to Tiderishi Creek looks like through most of the creek.

Picture 3.2: The picture shows the typical buffer area along the Tiderishi Creek. The banks contain a combination of shrubs, trees and grassy vegetation.

In addressing the needed phosphorus load reduction in the **Tiderishi 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 **Tiderishi 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 3.1 also shows the 40% reduction goal established in the Domestic Action Plan created the International Joint Commission.

Table 3.1 Annualized Summary of 2005 TMDL Seasonal Phosphorus Loading Table

Existing (2005) P Load -Annual (TMDL)	4526 kg P/year
TMDL Target - Annual	785 kg P/year
Difference (Annual P Load -Target P Load) to meet watershed TMDL P-target	3741 kg P/year (reduction of 82.7%)
Domestic Action Plan (reduce 40% of existing P load) to Western Lake Erie Basin	1810 kg P/year (reduction of 40%)

3.2 Critical Area 1: Conditions, goals and objectives for Tiderishi Creek HUC - 12

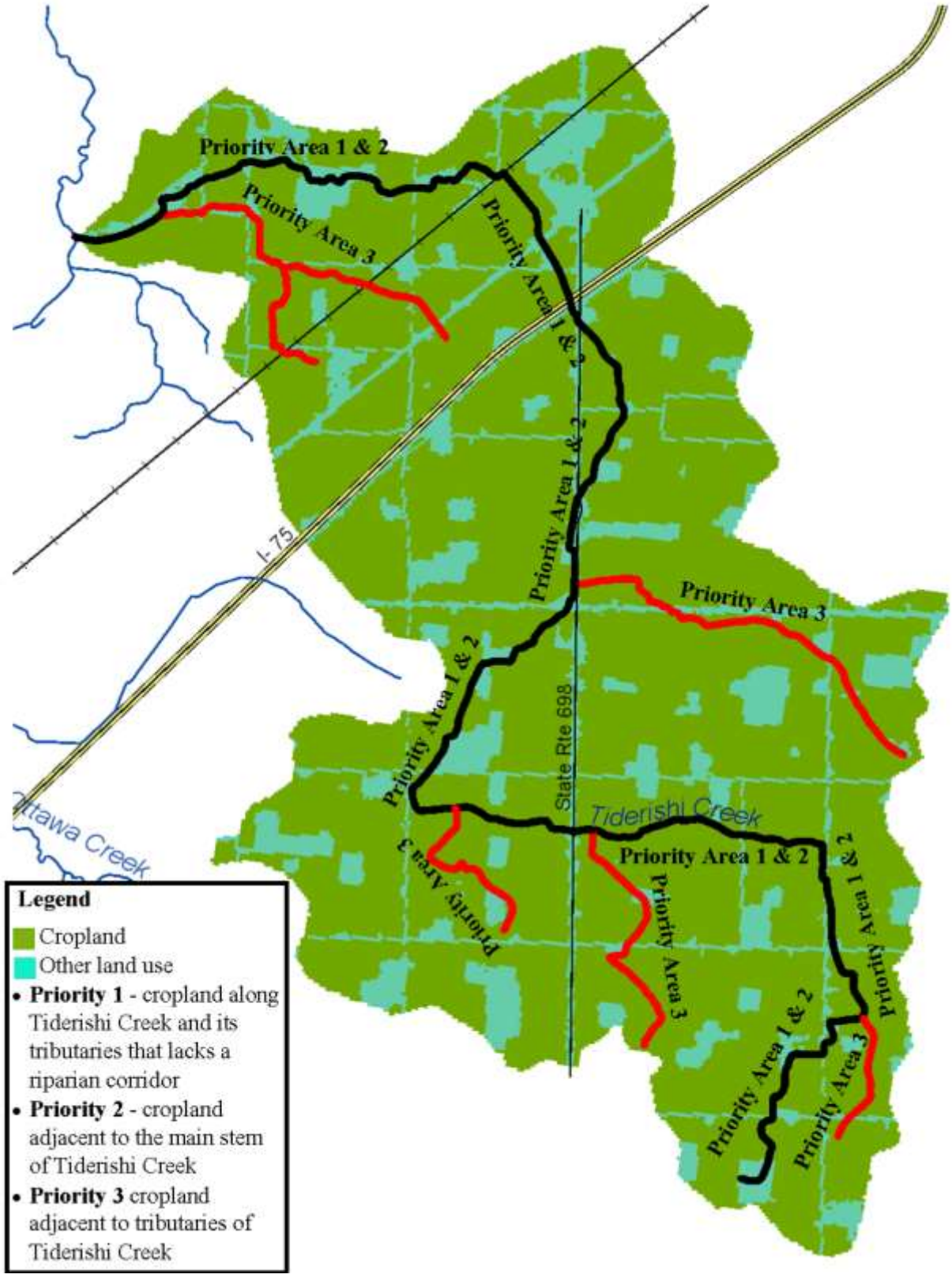
3.2.1 Detailed Characterization

The area defined in **Tiderishi Creek HUC - 12** as Critical Area 1 will include all the tile-drained crop land (9,783 acres). According to the 2009 TMDL report, the cropland acres of Tiderishi Creek are contributing the most significant load of phosphorus and sediment; and is 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:

- **Priority 1**: Crop parcels (fields) along Tiderishi Creek and its tributaries that lack a riparian corridor and edge-of-field conservation practice(s). (approximately 3,000 acres).
- **Priority 2:** Crop parcels (fields) adjacent to the main stem of Tiderishi Creek (approximately 5,000 acres).
- **Priority 3:** Crop parcels (fields) adjacent to tributaries of Tiderishi Creek (as shown in Map 3.1) — (approximately 3,800 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 shows that 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 Hancock 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 3-1: Critical Area 1 in the Tiderishi Creek HUC - 12



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 surface runoff,
- Reducing phosphorus loading from tile drainage,
- 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 **Tiderishi Creek HUC - 12** are related to agricultural uses. The contributing causes and sources associated with crop production in Critical Area 1 are:

Table 3-2: **Causes and Sources of Impairments in Critical Area 1**

Causes	Sources
• Nutrient loading • Sedimentation • Direct Habitat Alteration	Channelization - agriculture Removal of riparian vegetation & non irrigated crop production - agriculture Crop Production

3.2.3 Outline Goals and Objectives for Critical Area 1

Goals for Critical Area 1

- Goal 1: To reduce phosphorus loading from cropland in the watershed from 4,526 kg annually to 785 kg annually (a reduction of 3,741 kg per year).

- Goal 1a: To reduce total phosphorus loading from cropland in the watershed from 4,526 kg annually to 2,716 kg annually, a reduction of 1,810 kg per year, to achieve a 40% reduction goal consistent with Ohio's Domestic Action Plan.

- Goal 2: To achieve an IBI score of at least 24 at RM 7.3. Not achieved: IBI is currently 20.

- Goal 3: To achieve an IBI score of at least 24 at RM 4.6. Not achieved: There is not any current data at RM 4.6

3.2.3 Outline Goals and Objectives for Critical Area 1 cont.

- Goal 4: To raise narrative ICI to "Marginally Good" or "Good" at RM 7.3. Not achieved: The current narrative ICI is "Poor"

- Goal 5: To raise narrative ICI to "Marginally Good" or "Good" at RM 4.6. Not achieved: The current narrative ICI is "Poor"

Objectives for Critical Area 1

In order to achieve the goals listed above for nonpoint source load reduction for phosphorus in the **Tiderishi 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.

Objectives for Critical Area 1

- Objective 1: Enroll 3,000 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 2: Soil test 90% of the acres or 8,805 acres in Critical Area 1.

- Objective 3: Enroll 1,500 acres of cropland in cover crops. (NRCS 340)

- Objective 4: Enroll 2,500 acres of cropland in conservation tillage. (NRCS 329)

- Objective 5: To implement Controlled drainage water management systems to manage water draining 400 acres. (20 structures averaging 20 acres drainage per structure. (NRCS 554)

- Objective 6: 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)

Narrative of Objectives

Objective 1 will focus on getting the 3000 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 3000 acres of cropland in Critical Area 1, there will be a loading reduction an estimated 1,530 lbs./year of phosphorus, 1,275 tons/year of sediment and 1,740 lbs./year of nitrogen.

Objective 2 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 3 will focus on establishing cover crops on 1,500 acres of cropland that are not enrolled in a Precision Nutrient Management Plan. By establishing conservation tillage and cover crops on 1,500 acres, there will be an estimated loading reduction of 850 lbs. of phosphorus, 450 tons of sediment and 1,320 lbs. of nitrogen.

Objective 4 will focus on establishing 2,500 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 425 lbs. of phosphorus, 250 tons of sediment and 650 lbs. of nitrogen.

NOTE: Objectives 3 & 4 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.

Objective 5 will involve controlling water from surface and tile runoff by establishing control drainage management systems to manage 400 acres of drainage area. An estimated 20 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 275 lbs./year of phosphorus and 210 lbs./year of nitrogen.

Objective 6 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.

As these objectives are implemented, chemical testing will be conducted near the mouth of **Tiderishi 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 toward meeting the listed goals. All objectives will be reevaluated yearly to see if any modifications are needed.

When reevaluating, 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 2013) as a reference for possible modifications.

3.3 Critical Area 2: Conditions, goals and objectives for Tiderishi Creek HUC - 12

3.3.1 Detailed Characterization

Critical Area 2 will include the main stem of Tiderishi Creek from the mouth to RM 2.90 at the Norfolk-Western railroad track just north of I-75. (See Map 3.2 on next page) This area will also include a 50 ft. riparian corridor on both sides of Tiderishi Creek. This area was assigned a Warmwater Habitat (WWH) for Aquatic Life Use designation in the 2009 TMDL study. Table 3.3 summarizes the Aquatic Assessment score for Critical Area 2 based on the TMDL Study.

3.3.2 Detailed Causes and Associated Sources

The 2009 TMDL Report reports that most impairments in **Tiderishi Creek-HUC-12** are related to agricultural uses. Table 3.3 on page 3-8 summarizes the causes and related sources for Critical Area 2 based of the RM 0.01 study site.

Table 3.3: Summary of Aquatic Assessment Score at RM 0.1 in Tiderishi Creek HUC - 12 (04100008 05 01)

RM (Drain. Area mi^2)	IBI	Mlw-b[a]	ICI[b]	Status[c]	QHEI	Causes	Sources
0.1 (19.4)	34*		MG[ns]	Partial	58.0	Direct habitat alteration, nutrients, siltation, organic enrichment	Ag related channelization, crop production with subsurface drainage Urban runoff/storm sewers

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.

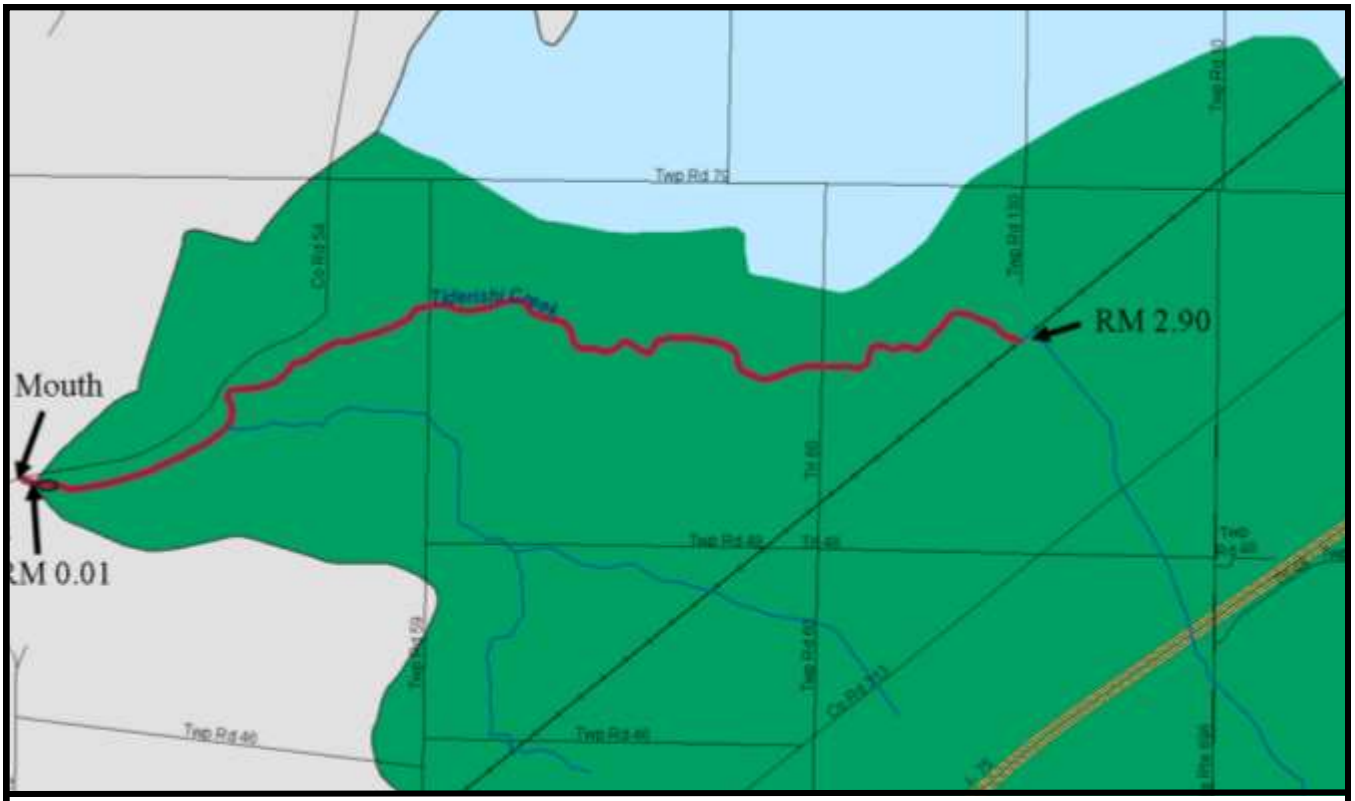
3.3.3 Outline Goals and Objectives for Critical Area 2

Goal(s) for Critical Area 2

- Goal 1: To raise the QHEI score at RM 0.1 to at least 60 to meet the standard set by the OEPA. Not Achieved: QHEI is currently 58.

- Goal 2: To raise IBI score to 40 at RM 2.90. Not Achieved: IBI score is currently 34

- Goal 3: To raise ICI evaluation to "Good" from Mouth to RM 2.90. Not Achieved: ICI is currently listed as "Marginally Good"



Map 3.3 Critical Area 2: Critical Area 2 extends from the mouth of Tiderishi Creek to the Norfolk-Western railroad tracks at RM 2.9. The red line shows the 50 foot buffer on both sides of the main stem of the creek that outlines the boundary of Critical Area 2.

Picture 3.3: The picture shows the sedimentation of the substrate that is common throughout Critical Area 2. The sediment has impaired the habitat of substrate causing the aquatic use to be limited.

Objectives for Critical Area 2

- Objective 1: To retire 1.75 acres of cropland along both sides the main stem Tiderishi Creek between the mouth an RM 2.90 using buffer and/or filter strips (NRCS 393 or 327)

- Objective 2: To use in-stream sediment removal technology to remove sediment that has collected on the substrate in 2,500 linear feet of the main stem of Tiderishi Creek. (see picture 3.1 on page 10)

Narrative of Objectives

Objective 1 will focus on establishing at least 50 foot wide riparian buffers and/or filter strips on cropland along the main stem of Tiderishi Creek. The riparian buffers and filter strips will be installed to strategically prevent sediment and nutrients from being carried into the main stem of Tiderishi Creek from surface run-off.

Objective 2 will involve using in-stream sediment removal technology to remove the sediment that has accumulated in the substrate the main stem of Tiderishi Creek in critical area 2. Removal of this sediment will improve the condition of the substrate increasing the QHEI, IBI and ICI scores. Removal of this sediment will take a significant planning process the must include lowering the bedload sediment from upstream entering this area. Therefore, this objective will become a medium term (3-7 years) project. Once a plan is developed, a Project Summary sheet will be developed and submitted to the Ohio EPA for approval. ***Note: This BMP is not listed as an eligible §319 practice in Ohio Non-point Source Management Plan (June 2014)***

Evaluation of these objectives will be done by the agencies and individuals involved on a yearly basis. The review could result in a modification of the goals and/or objectives. The group will use the Ohio EPA Nonpoint Source Management Plan Update (Ohio EPA June 2014) as a reference for possible modifications.

Chapter 4: Projects and Implementation Strategy for Tiderishi Creek HUC - 12

4.1 Overview Tables and Project Sheets for Critical Areas

As noted in Chapter 2, **Tiderishi 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. The best site for improving the biological condition to meet attainment is the WWH habitat stem from RM 2.9 downstream to the mouth. The QHEI score of 58 needs to improve 2 points to reach the threshold for attainment.

On the following pages are the projects and guidelines believed to be needed to improve the conditions in the **Tiderishi 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 **Tiderishi 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 Tables and Project Sheets for Tiderishi 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 **Tiderishi 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 Tiderishi Creek HUC - 12 (04100008 05 02)							
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, 5	1, 2	1	Precision Nutrient Management Plan	Hancock SWCD	Short Term (1-3 yr.)	$780,000	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4, 5	1, 2	2	Soil Testing for Phosphorus, Nitrogen and SOM	Hancock SWCD	Short Term (1-3 yr.)	$103,000	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4, 5	3	3	Establishing Cover Crops to reduce P, N and sediment loading	Hancock SWCD	Short Term (1-3 yr.)	$157,500	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4	4	4	Establishing Conservation Tillage to reduce P, N and sediment loading	Hancock SWCD	Short Term (1-3 yr.)	$112,500	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4	5	5	Implementing Controlled drainage management systems to reduce DRP and N	Hancock SWCD	Short Term (1-3 yr.)	$70,000	EQIP, USDA, EPA 319, GLB
1, 1a, 2, 3, 4	6	6	Installing phosphorus filters on the main tile leading to the creek from upland fields	Hancock SWCD	Short Term (1-3 yr.)	$30,000	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 **Tiderishi 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 raise the QHEI at RM 0.1 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: Precision Nutrient Management Plan

Nine Element Criteria	Information needed	Explanation
n/a	Title	Precision Nutrient Management Plan
criteria d	Project Lead Organization & Partners	Hancock County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Tiderishi Creek HUC-12 (04100008 05 01) Cropland areas
criteria c	Location of Project	Tiderishi Creek HUC-12, southwest of Findlay, 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 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 Tiderishi 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 seven years of this NPS-IS plan, the objective is to get approximately 3,000 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

Table 4.2 Project Summary Sheet Critical Area 1 Project 1 cont.

criteria d	Estimated Total Cost	$780.000
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 raise the QHEI from 58 to at least 60 in the lower reach (RM 2.9 to mouth) and to reduce the phosphorus loading by 3,741 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 3,000 acres for a three year period. The estimated reduction of phosphorus will be 694 kg./yr. or 1,530 lbs./yr., or 18.6% of the goal. In addition, there will be an estimated sediment reduction of 850 tons/year and a reduction of 1,160 lbs./ yr. of Nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: Phosphorus - 694 kg./yr. or 1,530 lbs./yr.; sediment - 850 tons/year and Nitrogen - 1,160 lbs./yr.
criteria i	How will the effectiveness of this project in addressing the NPS impairment to be measured?	A QHEI will be conducted at RM 0.1 after the three years. At the TR 59 bridge, water will be tested during high flow daily and monthly during average flow. 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 Hancock SWCD, NRCS and the BRWP to eligible producers. The overall reduction and improvements with be shared with the public as well.

Table 4.3 Project Summary Sheet Critical Area 1: Project 2: 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	Hancock County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Tiderishi Creek HUC-12 (04100008 05 01) Cropland areas
criteria c	Location of Project	Tiderishi Creek HUC-12, southwest of Findlay, 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.
criteria g	Project Narrative	Soil testing at least 90% or 8,805 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	$103,000
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 for this project is to determine the nutrient levels and per cent of SOM in the soil at the start and after three years. Increasing the SOM will allowing the soil to hold water which will reduce the sediment loading.
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 748 kg. or 1,650 lbs. phosphorus/year or 44.4% of the goal. In addition, there will be an estimated sediment reduction of 1,548 tons/year and a reduction of 4,263 lbs./yr. of Nitrogen.

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

criteria b & h	Part 3: Load Reduced?	Estimated: 748 kg or 1,650 lbs. of P/year, 1,548 tons of sediment/ year and 4,263 lbs. of nitrogen/year.
criteria i	How will the effectiveness of this project in addressing the NPS impairment be measured?	A QHEI will be conducted at RM 0.1 after the three years. 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 Hancock 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: Establishing Cover Crops

Nine Element Criteria	Information needed	Explanation
n/a	Title	Cover Crops
criteria d	Project Lead Organization & Partners	Hancock County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Tiderishi Creek HUC-12 (04100008 05 01) Cropland areas
criteria c	Location of Project	Tiderishi Creek HUC-12, southwest of Findlay, 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
criteria g	Project Narrative	The TMDL Report for the Blanchard River watershed states that the Tiderishi Creek HUC-12 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 1,500 acres, 4,500 total, in addition to the acres of cover crops in Nutrient Management Plans.

Table 4.4 Project Summary Sheet Critical Area 1: Project 3 cont.

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 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 raise the QHEI from 58 to 60 in the lower reach (RM 2.9 to mouth) and to reduce the phosphorus loading by 52.6 % 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 650 lbs./yr., or 17.4 % of the goal. In addition, there will be an estimated sediment reduction of 450 tons/year and a reduction of 1,200 lbs./yr. of nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: 650 lbs. P/year, 450 tons/year sediment and 1,200 lbs./ year nitrogen
criteria i	How will the effectiveness of this project in addressing the NPS impairment be measured?	A QHEI will be conducted at RM 0.1 after the three years. 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 Hancock 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 1: Project 4: Establishing Conservation Tillage

Nine Element Criteria	Information needed	Explanation
n/a	Title	Conservation Tillage
criteria d	Project Lead Organization & Partners	Hancock County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Tiderishi Creek HUC-12 (04100008 05 01) Cropland areas
criteria c	Location of Project	Tiderishi Creek HUC-12, southwest of Findlay, 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 Tiderishi Creek HUC-12 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 Hancock SWCD, NRCS and the BRWP will work with the watershed landowners and farmers to enroll cropland in conservation tillage. The goal is to establish 2,500 acres, besides the acres in conservation tillage.
criteria d	Estimated Total Cost	$112,500
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 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 raise the QHEI from 58 to 60 in the lower reach (RM 2.9 to mouth) and to reduce the phosphorus loading by 3,741 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 2,500 acres for a three year period. The estimated reduction of phosphorus will be 454 kg. or 1,000 lbs./ yr., or 26.7 % of the goal. In addition, there will be an estimated sediment reduction of 400 tons/year and 1,275 lbs./yr. of nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: 454 kg. or 1,000 lbs. P/year, 400 tons/year sediment and 1,275 lbs./year nitrogen

Table 4.5 Project Summary Sheet Critical Area 1: Project 4: cont.

criteria i	How will the effectiveness of this project in addressing the NPS impairment be measured?	A QHEI will be conducted at RM 0.1 after the three years. 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 Hancock 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: Control Drainage Management

Nine Element Criteria	Information needed	Explanation
n/a	Title	Controlled Drainage Water Management
criteria d	Project Lead Organization & Partners	Hancock County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Tiderishi Creek HUC-12 (04100008 05 01) Cropland areas
criteria c	Location of Project	Tiderishi Creek HUC-12, southwest of Findlay, 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 Tiderishi Creek HUC-12 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 20 water control structures to control 400 acres of cropland.

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

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
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 raise the QHEI from 58 to 60 in the lower reach (RM 2.9 to mouth) and to reduce the phosphorus loading by 3,741 kg. 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 400 acres. The estimated reduction of phosphorus will be 125 kg. or 275 lbs./yr., or 7.4% of the goal. In addition, there will be an estimated 200 lbs./yr. of nitrogen.
criteria b & h	Part 3: Load Reduced?	Estimated: 125 kg. or 275 lbs. P/year and 200 lbs./year nitrogen
criteria i	How will the effectiveness of this project in addressing the NPS impairment be measured?	A QHEI will be conducted at RM 0.1 after the three years. 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 Hancock 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: Phosphorus Filter

Nine Element Criteria	Information needed	Explanation
n/a	Title	Phosphorus Filter
criteria d	Project Lead Organization & Partners	Hancock County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Tiderishi Creek HUC-12 (04100008 05 01) Cropland areas
criteria c	Location of Project	Tiderishi Creek HUC-12, southwest of Findlay, 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	Dissolved Reactive Phosphorus 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 Tiderishi Creek HUC-12 impairments are related to the agricultural uses in growing crops. DRP has been identified 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 filter in the drainage system of a field. The filters will control 200 acres of cropland.
criteria d	Estimated Total Cost	$20,000 - 30,000
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 raise the QHEI from 58 to 60 in the lower reach (RM 2.9 to mouth) and to reduce the phosphorus loading by 3,741 kg. from the watershed.

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

criteria i	How will the effectiveness of this project in addressing the NPS impairment to be measured?	A QHEI will be conducted at RM 0.1 after the three years. 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 Hancock SWCD, NRCS and the BRWP to eligible producers. The overall reduction and improvements with be shared with the public as well.

4.3 Critical Area 2: Overview Tables and Project Sheets for Tiderishi Creek HUC-12

Table 4.8 on page 4-113 summarizes the Project and Implementation 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 **Tiderishi 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)

The section presents the Project Summary Sheets that were developed based on the actions needed to restore the QHEI, IBI and ICI scores in Critical Area 2. Critical Area 2 includes the main stem of Tiderishi Creek from RM 2.9 starting at the Norfolk Western railroad track and extending downstream to the mouth of the creek where it empties into Ottawa Creek. The area will include Tiderishi Creek and a 50 foot riparian area on both sides of the creek. The section of Tiderishi creek was designated as a WWH during the 2009 TMDL Study. Project 1 is a short term project and Project 2 is a medium term project. Both projects are ready to implement. There are longer term projects in this plan. As project 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 Tiderishi Creek HUC - 12 (04100008 05 02)							
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							
1, 2, 3	1	2	Sediment Removal Technology will be used to remove areas of high sedimentation from the creek	Hancock SWCD	Medium Term (3-7 yr.)	$160,000	EQIP, USDA, EPA 319, GLB
Agricultural Nonpoint Source Reduction Strategies							
1, 2, 3	2	1	Riparian Buffers and/or filter strips will be established along 1,500 linear feet of the main stem from the mouth to RM 2.90	Hancock SWCD	Short Term (1-3 yr.)	$15,000	EQIP, USDA, EPA 319, GLB
High Quality Waters Production Strategies							
Other NPS Causes and Associated Sources of Impairment							

Table 4.9: Project Summary Sheet Critical Area 2 Project 1: Riparian Buffer/Filter Strips

Nine Element Criteria	Information needed	Explanation
n/a	Title	Riparian Buffer / Filters Strips along Tiderishi Creek
criteria d	Project Lead Organization & Partners	Hancock County SWCD, NRCS, USDA, BRWP
criteria c	HUC-12 and Critical Area	Tiderishi Creek HUC-12 (04100008 05 01) main stem from RM 2.9 to mouth
criteria c	Location of Project	Tiderishi Creek HUC-12, southwest of Findlay, OH
n/a	Which strategy is being addressed by this project?	Agricultural Nonpoint Source Reduction Strategies
criteria f	Time Frame	Short Term (1-3years)
criteria g	Short Description	Riparian Buffers/Filter strips are needed along critical areas of Tiderishi Creek
criteria g	Project Narrative	The TMDL Report for the Blanchard River watershed states that the Tiderishi Creek HUC-12 impairments are related to the agricultural uses in growing crops. Surface run-off along the main stem of Tiderishi Creek from the mouth upstream to RM 2.9 is contributing to this area not reaching the attainment score needed for QHEI, IBI and ICI. The goal is to establish riparian buffers/filter strips along 1,500 linear feet of Critical Area 2. The riparian buffers/ filter strips will be at least 50 feet wide (approximately 3.5 acres). The TMDL notes that sediment is the main reason that the macroinvertebrate index (ICI) at RM 0.1 is causing the QHEI score to be a 58. The prevention of sediment and nutrients entering the creek from surface runoff will help raise the QHEI score to at least 60. In addition the ICI will be raised to "good" and the IBI score to 40 at RM 2.90. The estimated load reduction will be are 225 kg. or 500 lbs. phosphorus and 10 tons of sediment.
criteria d	Estimated Total Cost	$20,000
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 raise the QHEI from 58 to 60 in the lower reach, the IBI at RM 2.9 from 34 to 40 and the ICI from marginally good to good at RM 2.9. To reduce the phosphorus loading by 3,741 kg./yr.

Table 4.11: Project Summary Sheet Critical Area 2 Project 1 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 225 kg. or 500 lbs. or 13.4 % of the goal. In addition, there will be an estimated 10 tons of sediment removed.
criteria b & h	Part 3: Load Reduced?	Estimated: 225 kg. or 500 lbs. phosphorus and 100 tons of sediment/year.
criteria i	How will the effectiveness of this project in addressing the NPS impairment to be measured?	A QHEI will be conducted at RM 0.1 after the three years. At the TR 59 bridge, water will be tested during high flow daily and monthly during average flow. 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 Hancock SWCD, NRCS and the BRWP to eligible producers. The overall reduction and improvements with be shared with the public as well.

4.3.2 Summary of Critical Area 2

The BMPs discussed in projects 1 & 2 for this area are shovel ready practices. These two projects will reduce the phosphorus by an estimated 1,125 kg. or 2,480lbs./year and sediment by 210 tons. The prevention of sediment and nutrients entering the creek from surface runoff will help raise the QHEI score to at least 60. In addition the ICI will be raised to "good" and the IBI score to 40 at RM 2.90.

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Appendices

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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	Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) Index
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

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