Ohio Environmental Protection Agency

2016 and 2017 Biological and Habitat Studies of the Rivers and Streams in 33 Section 319(h) and SWIF/GLRI Project Areas in Ohio

Wildcat Run, RM 1.4, Delaware County, OH

Division of Surface Water
Ecological Assessment Unit

September 2020

Introduction

In 1987, the federal Clean Water Act amendments created a national program to control nonpoint source (NPS) pollution, established under Section 319 of the Clean Water Act. Ohio EPA is the designated water quality agency responsible for administering Ohio's 319 program. Since 1990, Ohio EPA has annually applied for, received and distributed Section 319 grant funds to correct NPS-caused water quality impairment to Ohio's surface water resources. Section 319(h) implementation grant funding is targeted to Ohio waters where NPS pollution is a significant cause of aquatic life use impairments. The cornerstone of Ohio's 319 program is working in partnership with watershed groups and others who are implementing locally developed watershed management plans and restoring surface waters impaired by NPS pollution.

A requirement of each Section 319(h) project is a baseline and post-project water quality monitoring study, used to gauge the effectiveness of the NPS project improvement. For projects approved prior to Federal Fiscal Year (FFY) 2008, the baseline and post-project monitoring was conducted by the subgrantees. Since FFY2008, Ohio EPA's Ecological Assessment Section (EAS) has completed all baseline and post-project environmental monitoring for the projects. Monitoring includes evaluating biological and physical habitat conditions. All biological, physical habitat, field water quality, data processing and data analysis methods and procedures adhere to those specified in the *Surface Water Field Sampling Manual* for water column chemistry, bacteria and flows (Ohio EPA 2013) for field parameter measurement, *Biological Criteria for the Protection of Aquatic Life*, Volumes II - III (Ohio EPA 1987, 1989a, 1989b, 2015a, 2015b) for biological assemblage assessment, and *The Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods and Application* (Ohio EPA 1989c, 2006) for physical habitat assessment.

The following summaries include baseline monitoring conducted at each Section 319(h) grant, statewide Surface Water Improvement Fund (SWIF) and Cuyahoga County GLRI-SWIF grant project areas during the summer and fall of 2016 and 2017 (Tables 1-4). Each summary includes an attainment table, site location table and site location map. Appendices A-E include a compilation of biological and habitat data collected at all collection sites.

Acknowledgements

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Report preparation and analysis: Mike Bolton

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Table 1 — Section 319(h) grant projects pre-project baseline monitoring, 2016

Project #	Project Title	Project Sponsor	Grant Amount
16(h)EPA-09	Continuing Water Quality Efforts in the South Fork of the Sugar Creek	Holmes Soil & Water Conservation District	$40,101
16(h)EPA-10	Cilley Creek Stream Restoration at Stearns Woods	City of Wyoming	$176,140
16(h)EPA-13	Mill Creek Low-Head Dam Mitigation	City of Cincinnati	$292,048
16(h)EPA-16	Phase II Stream Restoration of Kelsey Creek in Kennedy Park	City of Cuyahoga Falls	$133,299
16(h)EPA-17	Coe Creek Daylighting and Stream & Habitat Restoration Project	City of Fairview Park	Terminated
16(h)EPA-19	Marcourt Farms Chagrin River Restoration Project	Village of Hunting Valley	$243,000
16(h)EPA-25	Clinton Avenue Ditch Stream and Wetland Restoration Project	Lorain County Community Development Dept.	$295,000
16(h)EPA-27	Marrek Pond Dam Removal and Wetland Restoration	Cleveland Metroparks	$81,373

Table 2 — Prior year Section 319(h), statewide SWIF and Cuyahoga County GLRI-SWIF grant projects post-project monitoring, 2016.

Project #	Project Title	Project Sponsor	Year Completed
10(h)EPA-26S	Scioto Greenways Main Street Dam Removal	Columbus Downtown Development Corporation	2014
12(h)EPA-33	Pond Brook Restoration	Metro Parks, Serving Summit County	2015
12SWIF-10	Phase I Stream Restoration of Kelsey Creek in Kennedy Park	City of Cuyahoga Falls	2014
14(h)EPA-13	BALDWIN RUN STREAM Restoration Phase 2	City of Lancaster	2016
14(h)EPA-18	Pond Brook Tributary Restoration	Village of Reminderville	2016
05(h)L662, 14SWIF-SEP-86	Olentangy River Dam Removal and Restoration Project	City of Delaware	2015
NUTR11-GLRI-01	Lake Erie Nutrient Reduction Demonstration Project	Crawford Soil and Water Conservation District	2016

Table 3 — Section 319(h) grant projects pre-project baseline monitoring, 2017.

Project #	Project Title	Project Sponsor	Grant Amount
17(h)EPA-05	Removal of Abbott's Mill Dam Remnants on the Grand River	Lake County	$88,426
17(h)EPA-06	Fetter's Run Stream Restoration	City of Lancaster	$180,000
17(h)EPA-07	Reading Floodplain Bench - Phase I	City of Reading, Ohio	$185,000
17(h)EPA-08	Ilesboro Road Reclamation Project	Ohio University	$287,591
17(h)EPA-09	East Branch Chagrin River Streambank Stabilization Project	City of Kirtland	$150,000
17(h)EPA-10	Chagrin River Streambank Stabilization & Riparian Restoration	Village of Chagrin Falls	$88,800
17(h)EPA-12	Dysart[1] Run Stream Restoration Project	Franklin County SWCD	$48,265
17(h)EPA-14	Pond Brook Phase 3 Stream Restoration	Summit Metro Parks	$200,000
17(h)EPA-15	A Link in the Chain - Restoring the Upper East Branch at Royalton Farms	Cuyahoga County SWCD	$199,000
17(h)EPA-17	Eckert Ditch Drinking Water Quality Improvements	City of Akron	$237,914
17(h)EPA-18	Village Floodplain Restoration - Phase I	North Perry Village	$120,000
17(h)EPA-19	Valley Forge Headwater Stream Restoration	City of Solon	$165,000
17(h)EPA-20	East Branch of Euclid Creek, School of Innovation Stream Restoration	Cuyahoga County SWCD	$156,462
17(h)EPA-21	Gates Mills Village Center Chagrin River Restoration	Village of Gates Mills	$209,747

Table 4 — Prior year Section 319(h) grant projects post-project monitoring, 2017.

Project #	Project Title	Project Sponsor	Year Completed
10(h)EPA-25S	Wildemuth Stream and Wetland Restoration	Butler County Water & Sewer	2014
13(h)EPA-19	Sycamore Run Stream Restoration	City of Gahanna	2015
13(h)EPA-21	Clover Groff Run at Hilliard Municipal Park	City of Hilliard	2017
14(h)EPA-25	St. Mary's Stream Restoration Project	City of Solon	2016
15(h)EPA-18	Lakewood Streambank Restoration and Fish Shelf	City of Lakewood/Dept. of Public Works	2016

1- Known as “Dysart” Run in Franklin County Soil and Water documents, this stream is called “Dysar” Run based on Ohio EPA documents, including Ohio EPA’s Water Quality Standards.

Continuing Water Quality Efforts in the South Fork of the Sugar Creek

Pre-Project Baseline Monitoring

Project Number: 16(h)EPA-09
Streams Sampled: South Fork Sugar Creek and Troyer Valley Creek

Summary

Fifty-nine practices have been installed by 19 producers in the South Fork Sugar Creek through the Alpine WQT, EPRI, and MWCD. An additional six farms installed 8500 feet of fencing through the 2003 OARDC 319 grant, protecting 7,520 feet of stream bank. An additional 35 practices on seven farms will be installed with this grant. These 35 practices are structural only, and do not address nutrient management plans, cover crops or conservation plans. The structural practices addressed by this grant will be to fence livestock off the stream, improve manure management practices, and identify discharges from animal management operations such as milk houses and animal feeding operations and provide incentives and controls to eliminate these sources.

The successful completion of this project will:

- plant 500 acres of cover/manure crops
- develop nutrient management plans for 500 acres
- develop whole farm conservation plans for 500 acres
- implement conservation tillage practices for 300 acres
- install 200 acres of livestock exclusion fencing
- install two alternative water supplies
- install two erosion & sediment control structures
- install two acres of vegetated filter areas
- install seven heavy use feeding pads
- install 2,500 linear feet of livestock access lanes
- install six milk house waste treatment systems
- project-specific education and outreach including fact sheets, public meetings, press releases, website, displays, tours, field days and newsletters

This project is being implemented consistent with recommendations within the South Fork of Sugar Creek TMDL and/or state-endorsed Watershed Action Plan.

Biological sampling occurred upstream of the project areas on South Fork Sugar Creek (RM 21.11) and downstream on South Fork Sugar Creek (RM 18.4) and Troyer Valley Creek (RM 1.08). The two stations on South Fork Sugar Creek met the biocriteria for the designated Modified Warmwater Habitat (MWH) aquatic life use with poor to marginally good biological communities. The station on Troyer Valley Creek did not meet the biocriteria for the designated Warmwater Habitat (WWH) aquatic life use with very poor biological communities. (Tables 5 & 6, Figure 1).

Table 5 — Aquatic Life Use Attainment – South Fork Sugar Creek and Troyer Valley Creek.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. Stream sites are in the Western Allegheny Plateau ecoregion. In the Ohio Water Quality Standards, South Fork Sugar Creek is designated Modified Warmwater Habitat (MWH) and Troyer Valley Creek is designated Warmwater Habitat (WWH) within the study area.

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[b]	ICI[c]	QHEI	Narrative Assessment Fish/Macroinvertebrates
South Fork Sugar Creek - MWH						
RM 21.11[H] (7.3)	FULL	24	-	F	29.5 (Very Poor)	Poor/Fair
RM 18.4[H] (19.8)	FULL	38	-	MG	30.0 (Poor)	Fair/Marginally Good
Troyer Valley Creek - WWH						
RM 1.08[H] (2.4)	NON	12*	-	VP*	38.0 (Poor)	Very Poor/Very Poor

Ecoregion Biocriteria: Western Allegheny Plateau		
Index – Site Type	MWH	WWH
IBI: Headwater	24	44
ICI	22	36

b MIwb is not applicable to headwater streams with drainage areas ≤ 20 mi^2.

c Narrative evaluation used in lieu of ICI when score not available (VP-Very Poor, F-Fair, MG-Marginally Good).

H Headwater electrofishing site.

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

\- No sample taken.

Table 6 — South Fork Sugar Creek and Troyer Valley Creek sampling locations, 2016.

River Mile	Station ID	Latitude	Longitude	Sampling Location
South Fork Sugar Creek				
21.11	R05S41	40.4683	-81.7275	CR 114
18.4	303658	40.472035	-81.678416	SR 93
Troyer Valley Creek				
1.08	R05S64	40.4867	-81.6758	SR 93

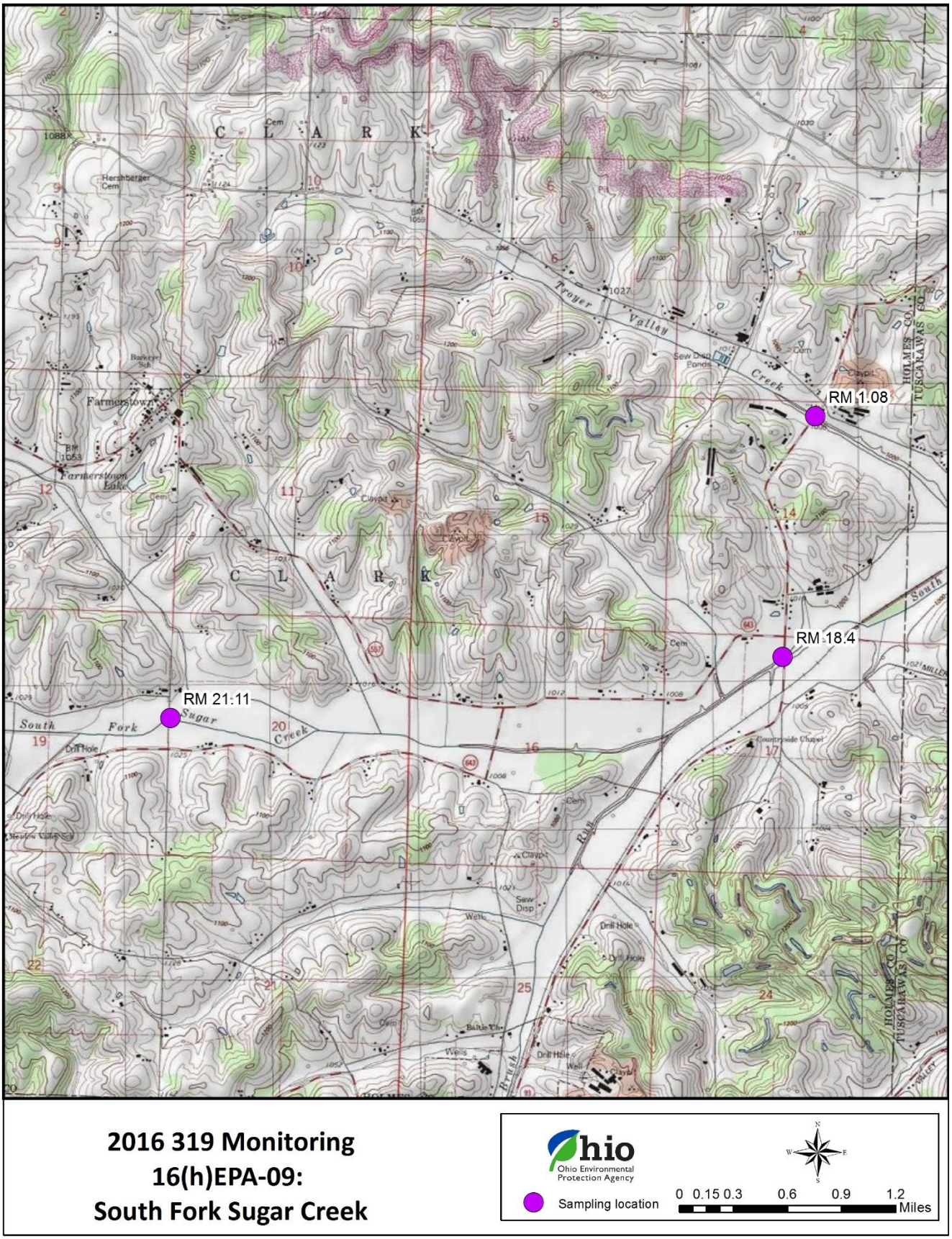

Figure 1 - South Fork Sugar Creek and Troyer Valley Creek sampling locations.

Cilley Creek Stream Restoration at Stearns Woods

Pre-Project Baseline Monitoring

Project Number: 16(h)EPA-10
Stream Sampled: Tributary to Cilley Creek (RM 1.40)

Summary

The Cilley Creek stream restoration project at Stearns Woods will result in the removal of one small concrete dam, natural channel restoration of 400 linear feet of degraded stream channel, and the restoration of more than 2,000 linear feet of natural flow and hydrology. Bioengineering methods will be used to stabilize and restore severely eroding streambanks and in-stream structures such as rock bank treatments will be used to control channel gradient, prevent down cutting and dissipating stream energy. The project will also restore 3 acres currently infested with invasive species and replant with native trees and shrubs.

The successful completion of this project will:

- restore 400 linear feet of floodplain and stream channel
- install 800 erosion & sediment control structures
- install four in-stream habitat structures
- install four grade structures
- restore 2,200 linear feet of natural flow
- restore 800 linear feet of streambank using bio-engineering
- restore 800 linear feet of streambank by recontouring or regrading
- plant three acres of native grasses in riparian areas
- stabilize 800 linear feet of streambank using bio-engineering
- remove/treat three acres of invasive species
- plant three acres of trees, shrubs and/or live stakes in riparian areas
- remove one dam
- remove three associated dam support structures
- install four fish passage and/or habitat structures
- restore 2,220 linear feet of natural flow
- dispose of 110 cubic yards of debris
- project-specific education and outreach including fact sheets, public meetings, press releases, website, project sign, tours and newsletters

This project was specifically recommended in the state endorsed Lower Mill Creek Watershed Action Plan. This project is being implemented consistent with recommendations within the Congress Run Mill Creek TMDL and/or state-endorsed Watershed Action Plan.

Biological communities were sampled within the project areas on the Tributary to Cilley Creek (RM 1.40). This stream is undesignated and therefore will be evaluated using the base goal use, Warmwater Habitat (WWH) Aquatic Life Use. The sampled station did not meet WWH expectations with very poor to fair biological communities (Tables 7 & 8, Figure 2).

Table 7 — Aquatic Life Use Attainment – Tributary to Cilley Creek (RM 1.40).

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. Stream site is in the Interior Plateau ecoregion. In the Ohio Water Quality Standards Tributary to Cilley Creek (RM 1.40) is undesignated.

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Tributary to Cilley Creek (RM 1.40) - undesignated[c]						
RM 0.8^H (0.1)	NON	12*	-	F*	64.0 (Good)	Very Poor/Fair

Ecoregion Biocriteria: Interior Plateau	
Index – Site Type	WWH
IBI: Headwater	40
ICI	30

a MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.

b Narrative evaluation used in lieu of ICI when score not available (F-Fair).

c Undesignated streams are evaluated with the WWH biocriteria.

H Headwater electrofishing site.

- No sample taken.

* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).

Table 8 — Tributary to Cilley Creek (RM 1.40) sampling location, 2016.

River Mile	Station ID	Latitude	Longitude	Sampling Location
0.8	303660	39.230705	-84.480186	Upstream impoundment at Stearns Woods

Figure 2. - Tributary to Cilley Creek (RM 1.40) sampling location.

Mill Creek Low-Head Dam Modification

Pre-Project Baseline Monitoring

Project Number: 16(h)EPA-13
Stream Sampled: Mill Creek

Summary

This project will modify two low-head dams on Mill Creek. The negative water quality impacts of these two low-head dams on the Mill Creek will be modified as a result of this project; the City of Cincinnati will install rock riffles immediately adjacent to the downstream edge of these two dams. Removal is not an option due to the wastewater and water infrastructure that are contained within the low-head structures. Rock riffles will eliminate the current water quality impacts by restoring fish passage, improving aeration of the stream, restore naturalized sediment transport and remove existing navigational hazards for recreational canoeists. These projects are part of a much larger effort to restore the highly modified Mill Creek as it flows through the city of Cincinnati. The project is consistent with habitat restoration recommendations within the Mill Creek/West Fork TMDL and the state endorsed Lower Mill Creek Watershed Action Plan. This project is being implemented consistent with recommendations within the Congress Run Mill Creek and West Fork Mill Creek TMDL and/or state-endorsed Watershed Action Plan.

The successful completion of this project will:

- modify two dams
- install two fish passage and/or habitat structures
- restore 1,750 linear feet of natural flow
- project-specific education and outreach including fact sheets, public meetings, press releases, website, project signs, tours and newsletters

Biological communities were sampled upstream of the project areas on Mill Creek (RM 7.85), within the project area at RM 4.9, and downstream at RM 4.25. The upstream station partially met the biocriteria for the designated Warmwater Habitat (WWH) aquatic life use with fair to very good biological communities. The stations within and downstream the project area met the biocriteria for the designated Modified Warmwater Habitat (MWH) aquatic life use with fair to good biological communities.

Table 9 — Aquatic Life Use Attainment – Mill Creek.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. Stream sites were located in the Interior Plateau ecoregion. In the Ohio Water Quality Standards, Mill Creek upstream from RM 7.3 is designated Warmwater Habitat (WWH) and downstream from RM 7.3 is designated Modified Warmwater Habitat (MWH).

River Mile (drainage mi²)	Attainment Status	IBI	MIwb[b]	ICI[c]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Mill Creek – WWH						
RM 7.85[W] (121)	PARTIAL	44	7.4*	44	60.0 (Good)	Good-Fair/Very Good
Mill Creek - MWH						
RM 4.9[W] (139)	FULL	36	8.2	F	56.3 (Fair)	Marginally Good-Good/Fair
RM 4.25[W] (141)	FULL	40	8.6	MG	64.5 (Good)	Good/Marginally Good

Ecoregion Biocriteria: Interior Plateau		
Index – Site Type	MWH	WWH
IBI: Wading	24	40
MIwb: Wading	6.2	8.1
ICI	22	30

b MIwb is not applicable to headwater streams with drainage areas < 20 mi².

c Narrative evaluation used in lieu of ICI when score not available (F - Fair, MG – Marginally Good).

H Headwater electrofishing site.

- No sample collected.

* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units) or WWH narrative expectation. Underlined scores are in the Poor range.

Table 10 — Mill Creek sampling locations, 2016.

River Mile	Station ID	Latitude	Longitude	Sampling Location
7.85	Q01S12	39.1861	-84.4956	Center Hill Avenue
4.9	Q01S09	39.1611	-84.5281	Salway Park
4.25	302045	39.15729	-84.5377	South Ludlow Avenue

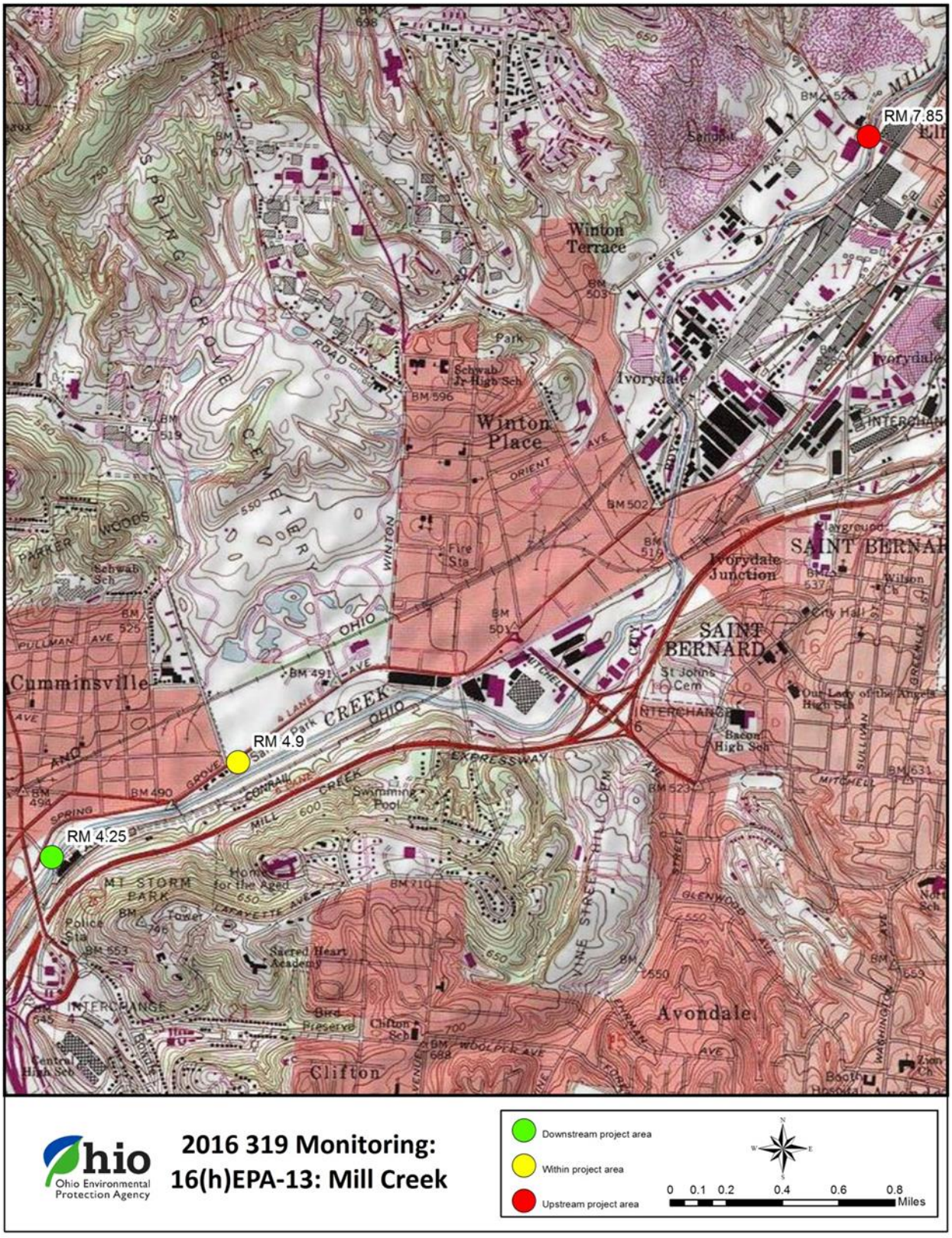

Figure 3 - Mill Creek sampling locations.

Phase II Stream Restoration of Kelsey Creek in Kennedy Park

Pre-Project Baseline Monitoring

Project Number: 16(h)EPA-16
Stream Sampled: Kelsey Creek

Summary

This project will restore 750 linear feet of stream channel, install sediment control structures and instream grade structures. The project will also treat invasive species and plant native grasses, trees, shrubs and/or live stakes throughout the project area. Kelsey Creek is a headwater stream and tributary of the Cuyahoga River flowing through a heavily visited city park within Cuyahoga Falls. There is a Middle Cuyahoga River TMDL and a watershed action plan in development. The project is consistent with recommended actions within the TMDL. This project is being implemented consistent with recommendations within the Cuyahoga River TMDL and/or state-endorsed Watershed Action Plan.

The successful completion of this project will:

- restore 750 linear feet of stream channel and flood plain
- install two erosion & sediment control structures
- install eight in-stream habitat structures
- install eight grade structures
- construct 650 linear feet of two-stage channel
- restore 750 linear feet of natural flow
- restore 750 linear feet of streambank using bio-engineering
- restore 750 linear feet of streambank by recontouring or regrading
- plant 0.33 acre of native grasses in riparian areas
- stabilize 750 linear feet of streambank using bio-engineering
- remove/treat 0.5 acre of invasive species
- plant one acre of trees, shrubs and/or live stakes in riparian areas
- project-specific education and outreach including fact sheets, public meetings, press releases, signs, tours, stream clean-ups, workshops and newspaper/City quarterly newsletter articles

Biological communities were sampled upstream of the project areas on Kelsey Creek at RM 0.9, within the project area at RM 0.75, and downstream at RM 0.6. Kelsey Creek is undesignated but based on the results of this and previous studies it is recommended the Warmwater Habitat (WWH) aquatic life use. All three stations were not meeting the biocriteria for WWH with fair biological communities.

Table 11 — Aquatic Life Use Attainment – Kelsey Creek, 2016.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. Stream sites are in the Erie-Ontario Lake Plains ecoregion. In the Ohio Water Quality Standards, Kelsey Creek is undesignated but is recommended WWH based on the findings of this assessment.

River Mile (drainage mi^2)	Attainment Status[b]	IBI	MIwb[c]	ICI[d]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Kelsey Creek – WWH Recommended						
RM 0.9^H (2.5)	NON	32*	-	F*	64.5 (Good)	Fair/Fair
RM 0.75^H (2.6)	NON	28*	-	F*	62.5 (Good)	Fair/Fair
RM 0.6^H (3.0)	NON	28*	-	F*	70.25 (Excellent)	Fair/Fair

Ecoregion Biocriteria: Erie-Ontario Lake Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	34

b WWH criteria apply to undesignated sites.

c MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.

d Narrative evaluation used in lieu of ICI when score not available (F - Fair).

H Headwater electrofishing site.

- No sample taken.

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

Table 12 — Kelsey Creek sampling locations, 2016.

River Mile	Station ID	Latitude	Longitude	Sampling Location
0.9	302716	41.13214	-81.45576	Northmoreland Boulevard
0.75	302252	41.134461	-81.45578	Intersection Kelsey/Rainier
0.6	302253	41.136796	-81.456786	Footbridge in Kennedy Park

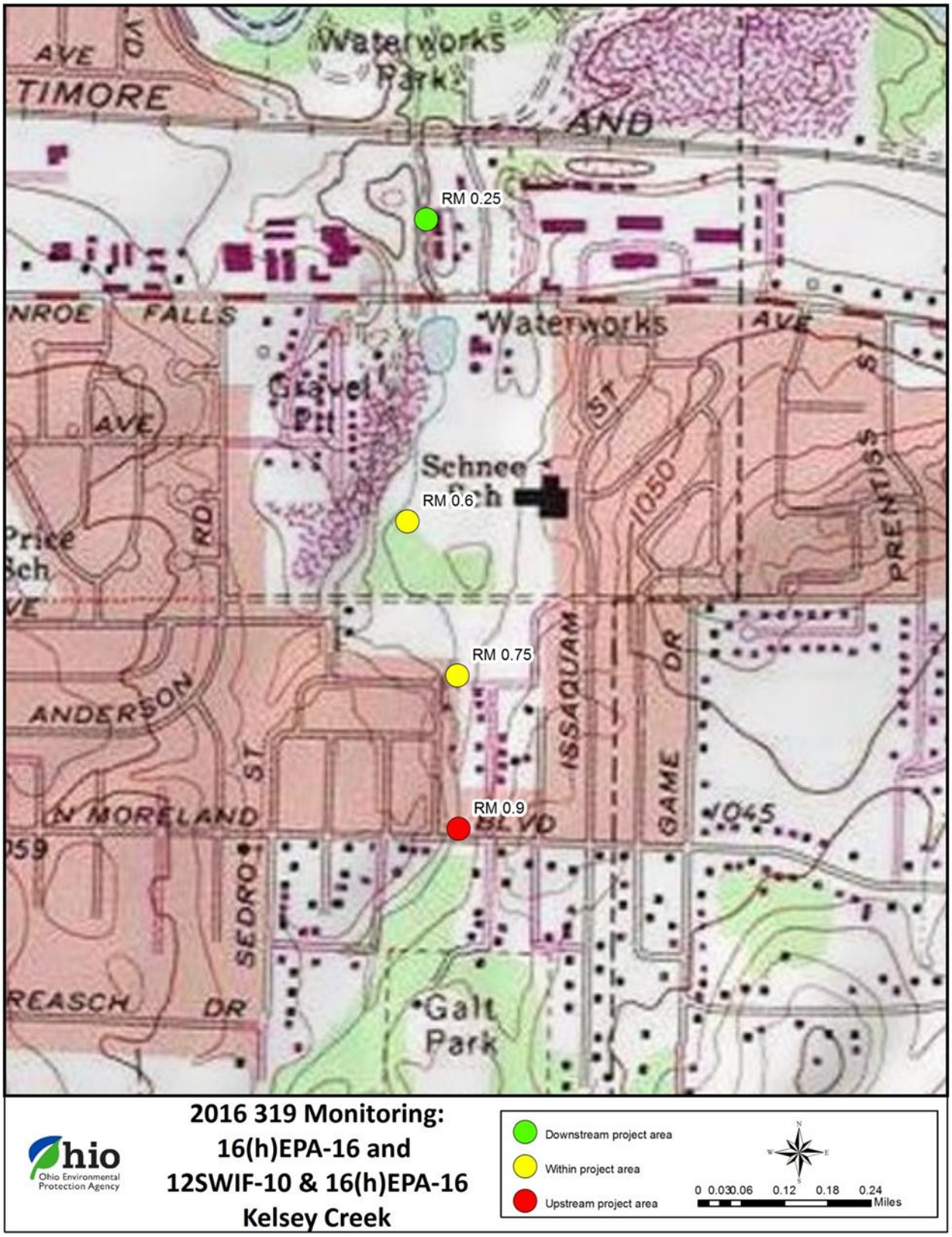

Figure 4 – Kelsey Creek sampling stations.

Marcourt Farms Chagrin River Restoration Project

Pre-Project Baseline Monitoring

Project Number: 16(h)EPA-19
Stream Sampled: Chagrin River

Summary

This project will stabilize approximately 500 linear feet of the mainstem of the Chagrin River and restore one acre of riparian areas with native plantings. The project will result in the installation of six bendway weir structures that will redirect the stream flow energy away from the bank and the streambank will be restored to a 3:1 slope. All plantings will be native trees, shrubs and grasses. This project is being implemented consistent with recommendations within the Chagrin River TMDL and state-endorsed Watershed Action Plan. This project is being implemented consistent with recommendations within the Main Branch Chagrin River TMDL and/or state-endorsed Watershed Action Plan.

The successful completion of this project will:

- install six erosion & sediment control structures
- restore 500 linear feet of streambank using bio-engineering
- stabilize 500 linear feet of streambank using bio-engineering
- plant one acre of trees, shrubs and/or live stakes in riparian areas
- project-specific education and outreach including fact sheets, websites, newsletter, presentation at CRWP Board of Trustees meeting and annual report

Chagrin River was sampled within of the restoration area at RM 19.7. The fish and macroinvertebrate communities met expectations of the designated Warmwater Habitat (WWH) aquatic life use with very good to exceptional evaluations (Tables 13 & 14, Figure 5).

Table 13 — Aquatic Life Use Attainment – Chagrin River, 2016.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. Stream site is in the Erie-Ontario Lake Plains ecoregion. In the Ohio Water Quality Standards, Chagrin River is designated Warmwater Habitat (WWH) within the study area.

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[b]	ICI	QHEI	Narrative Assessment Fish/Macroinvertebrates
Chagrin River - WWH						
RM 19.7[W] (157)	FULL	52	9.3	48	75.3 (Excellent)	Exceptional-Very Good/Exceptional

Ecoregion Biocriteria: Erie-Ontario Lake Plains	
Index – Site Type	WWH
IBI: Wading	40
MIwb: Wading	7.9
ICI	34

b MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.

W Wading electrofishing site.

* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units) or WWH narrative expectation. Underlined scores are in the Poor range.

Table 14 — Chagrin River sampling location, 2016.

River Mile	Station ID	Latitude	Longitude	Sampling Location
19.7	301233	41.49877	-81.40069	Dst. Hunting Valley, within Marcourt Farms area

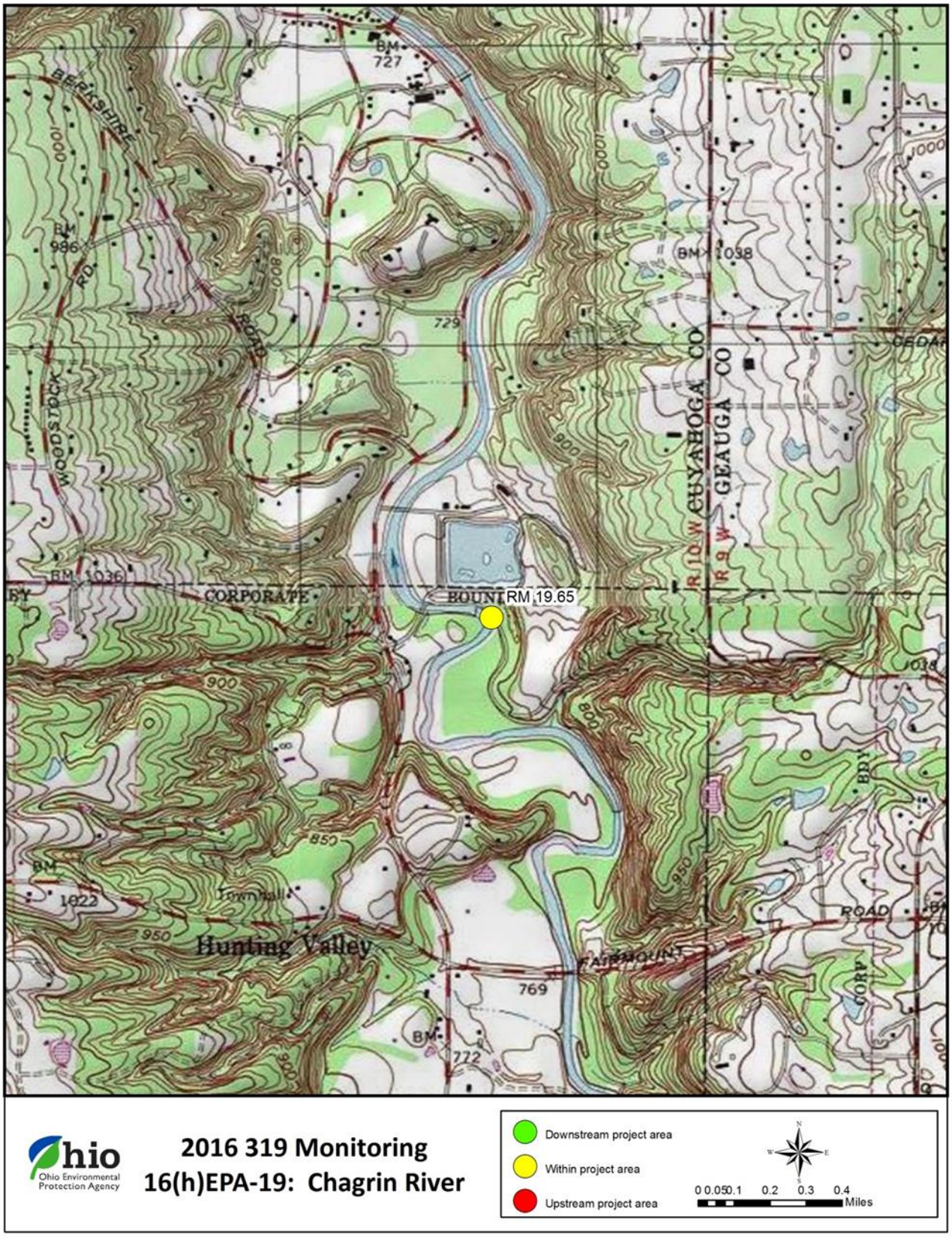

Figure 5. Chagrin River sampling area.

Clinton Avenue Ditch Stream and Wetland Restoration Project

Pre-Project Monitoring

Project Number: 16(h)EPA-25
Stream Sampled: Tributary to Black River (RM 6.55)

Summary

This project will restore approximately 1,950 linear feet of stream channel and riparian areas within an unnamed tributary to the Black River on property owned by the city of Lorain. The project will restore a meandering channel and reconnect the stream to existing floodplain wetland areas. Restoration activities include installation of erosion/sediment control structures, instream grade structures, treating invasive species and planting of native grasses, trees, shrubs and/or live stakes, constructing inlet/outlet channels and reconnecting the wetlands to the stream. Implementation of this project is consistent with recommendations within the Black River TMDL and the Black River Area of Concern Remedial Action Plan. This project is being implemented consistent with recommendations within the Black River TMDL and/or state-endorsed Watershed Action Plan.

The successful completion of this project will:

- restore 1,950 linear feet of flood plain
- restore 1,950 linear feet of stream channel
- install four erosion & sediment control structures
- install five in-stream habitat structures
- install five grade structures
- restore 1,950 linear feet of streambank using bio-engineering
- restore 1,950 linear feet of streambank by recontouring or regrading
- plant 0.9 acre of native grasses in riparian areas
- remove/treat 0.9 acre of invasive species
- plant 0.9 acre of trees, shrubs and/or live stakes in riparian areas
- construct five inlet channels
- construct five outlet channels
- reconnect 10 acres of wetland to stream
- reconstruct & restore 10 acres of wetlands
- plant 6.8 acres of wetland species
- treat/remove 15.8 acres of invasive species
- install five water control devices
- project-specific education and outreach including fact sheets, press releases, website and project sign

Biological communities were sampled within the project area on the Tributary to Black River (RM 6.55). This stream is undesignated and therefore will be evaluated using the base goal use, Warmwater Habitat (WWH) Aquatic Life Use. The sampled station did not meet WWH expectations with very poor to low fair biological communities (Tables 15 & 16, Table 6).

Table 15 — Aquatic Life Use Attainment – Tributary to Black River (RM 6.55), 2016.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. This stream site is in the Erie-Ontario Lake Plains ecoregion. In the Ohio Water Quality Standards, the Tributary to Black River (RM 6.55) is undesignated.

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Tributary to Black River (RM 6.55) - Undesignated[c]						
RM 3.0^H (0.3)	NON	12*	-	LF*	38.5 (Poor)	Very Poor/Low Fair

Ecoregion Biocriteria: Erie-Ontario Lake Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	34

a MIwb is not applicable to headwater streams with drainage areas < 20 mi2.
b Narrative evaluation used in lieu of ICI when score not available (LF-Low Fair).
c Undesignated streams are evaluated with the WWH biocriteria.
H Headwater electrofishing site.
* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units). Underlined scores are in the poor range.

Table 16 — Tributary to Black River (RM 6.55) sampling location, 2016.

River Mile	Station ID	Latitude	Longitude	Sampling Location
3.0	303666	41.412851	-82.137408	Within Clinton Ave. Restoration Area

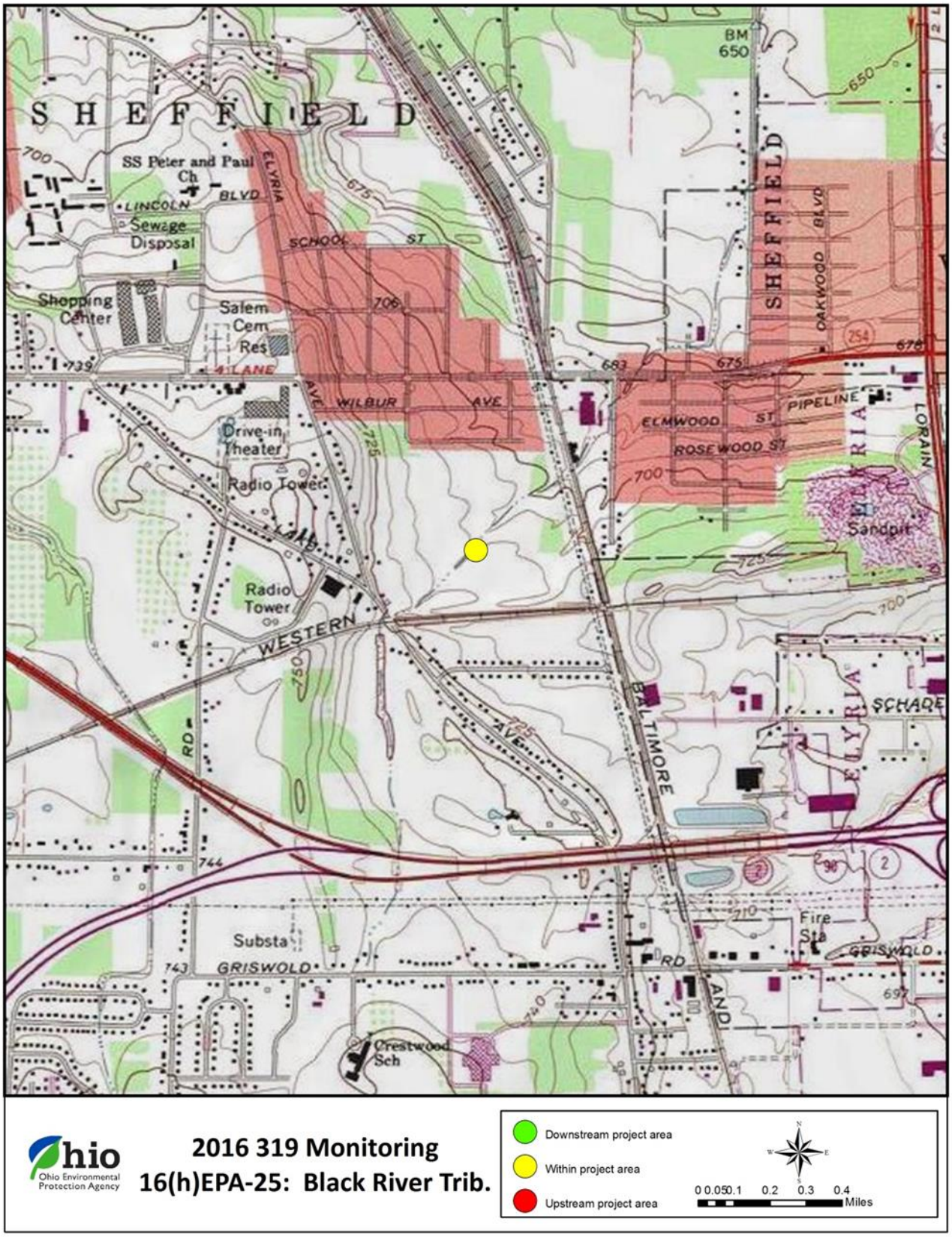

Figure 6 – Tributary to Black River (RM 6.55) sampling location.

Marrek Pond Dam Removal and Wetland Restoration

Pre-Project Monitoring

Project Number: 16(h)EPA-27
Stream Sampled: Tributary to East Branch Rocky River (RM 23.72)

Summary

This project will restore the natural hydrology and functionality of the stream including dam removal, draining of Marrek pond, restoration of 640 linear feet of stream, restoration of 0.9 acre of wetlands, and enhancement of 0.4 acre of existing wetlands. Before the pond is drained, Cleveland Metroparks staff will remove all desirable fish species from the pond for use at other fishing areas throughout Cleveland Metroparks. This project is being implemented consistent with recommendations within the Rocky River East Branch TMDL and state-endorsed Watershed Action Plan.

The successful completion of this project will:

- restore 640 linear feet of flood plain
- restore 640 linear feet of stream channel
- install one in-stream habitat structure
- install one grade structure
- restore 640 linear feet of natural flow
- restore 640 linear feet of streambank using bio-engineering
- restore 640 linear feet of streambank by recontouring or regrading
- plant one acre of native grasses in riparian areas
- plant 640 linear feet of trees, shrubs and/or live stakes in riparian area
- remove one dam
- remove associated dam support structure
- restore 640 linear feet of natural flow
- reconstruct & restore 0.9 acre of wetlands
- plant 0.9 acre of wetland species
- treat/remove 0.4 acre of invasive species
- enhance 0.4 acre of existing wetlands
- project-specific education and outreach including public meetings, press releases, website, project sign, tour, newsletters, volunteer activities, social media posts and presentations

The Tributary to East Branch Rocky River (RM 23.72) was sampled upstream from Marrek Pond (RM 0.8, macroinvertebrates only) and within Marrek Pond (RM 0.6, both fish and macroinvertebrates) in 2016 (Tables 17 & 18, Figure 7). The downstream station was dry and therefore was not sampled. The upstream station was supporting a good macroinvertebrate community including seven coldwater taxa. The station within Marrek Pond had marginally good biological communities composed of pond taxa.

Table 17 — Aquatic Life Use Attainment – Tributary to East Branch Rocky River (RM 23.72), 2016.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. Stream sites are in the Erie/Ontario Lake Plain ecoregion. In the Ohio Water Quality Standards, the Tributary to East Branch Rocky River (RM 23.72) is undesignated.

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Tributary to East Branch Rocky River (RM 23.72) - Undesignated[c]						
RM 0.8 (0.1)	(FULL)	-	-	G	-	- / Good
RM 0.6[B] (0.1)	FULL	36[ns]	-	MG[ns]	43.0 (Fair)	Marginally Good / Marginally Good
RM 0.5	-	-	-	-	-	Stream was dry

Ecoregion Biocriteria: Erie/Ontario Lake Plain	
Index – Site Type	WWH
IBI: Headwater	40
ICI	34

a MIwb is not applicable to headwater streams with drainage areas < 20 mi2.

b Narrative evaluation used in lieu of ICI when score not available (MG - Marginally Good, G - Good).

c Undesignated streams are evaluated with the WWH biocriteria.

B Headwater electrofishing site that was sampled with a boat because it was in a pond.

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

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

Table 18 — Tributary to East Branch Rocky River (RM 23.72) sampling locations, 2016.

River Mile	Station ID	Latitude	Longitude	Sampling Location
0.8	303680	41.207789	-81.714011	Upstream Marrek Pond
0.6	303681	41.209147	-81.712483	In Marrek Pond (Impounded)
0.5	303682	41.209301	-81.710658	Downstream Marrek Pond

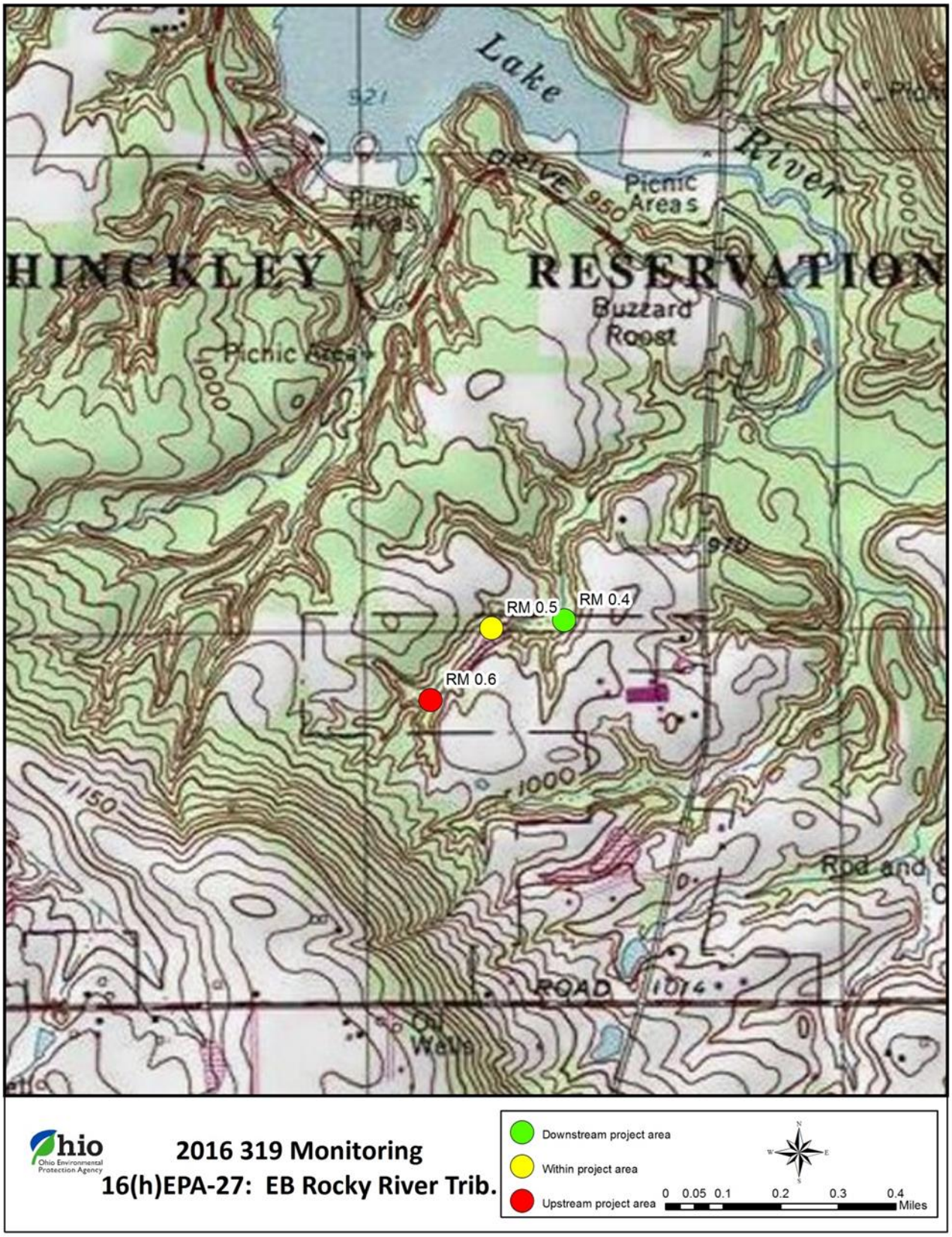

Figure 7 - Tributary to East Branch Rocky River (RM 23.72) sampling locations, 2016.

Scioto Greenways Main Street Dam Removal

Post-Project Monitoring

Project Number: 10(h)EPA-26S
Stream Sampled: Scioto River

Summary

This project successfully removed the Main Street Dam and restored stream channel and riparian areas along approximately 7,000 linear feet of the Scioto River.

The Scioto River was evaluated in 2009 within the Main Street Dam pool. The fish community met the designated MWH expectations with fair to good results, however, the macroinvertebrate community did not meet expectations with very poor results. The Scioto River was evaluated again in 2016 after the Main Street Dam was removed. Because of the river becoming free-flowing both biological communities were fully meeting WWH expectations with very good to exceptional evaluations (Tables 19 & 20, Figure 8). As a result of this study it is recommended that the Scioto River be designated WWH from the Olentangy River (132.3) to the railroad bridge downstream from the Main Street bridge (RM 131.06).

Table 19 — Aquatic Life Use Attainment – Scioto River 2009 and 2016.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Eastern Corn Belt Plains ecoregion. In the Ohio Water Quality Standards, the Scioto River in the study area is designated Modified Warmwater Habitat (MWH). Based the results of this study it is recommended that the Scioto River be designated Warmwater Habitat (WWH) from the Olentangy River (132.3) to the railroad bridge downstream from the Main Street bridge (RM 131.06).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb	ICI	QHEI	Narrative Assessment Fish/Macroinvertebrates
Scioto River – WWH Recommended						
131.8[B] (1611) - 2016	FULL	45	10.3	42	62.0 (Good)	Very Good – Exceptional/Very Good
131.8[B] (1611) - 2009	NON	34	9.0	0*	45.0 (Fair)	Fair – Good/Very Poor

Ecoregion Biocriteria: Eastern Corn Belt Plains	
Index – Site Type	WWH
IBI: Boat	42
MIwb: Boat	8.5
ICI	36

B Boat electrofishing site.

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

Table 20 — Scioto River sampling location, 2009 and 2016.

River Mile Fish/Macros	Station ID	Latitude	Longitude	Sampling Location
131.4/132.1 (2016)	303673	39.9583	-83.0044	Town Street (Free-Flowing)
131.8 (2009)	V07P16	39.9628	-83.0075	Town Street (Impounded)

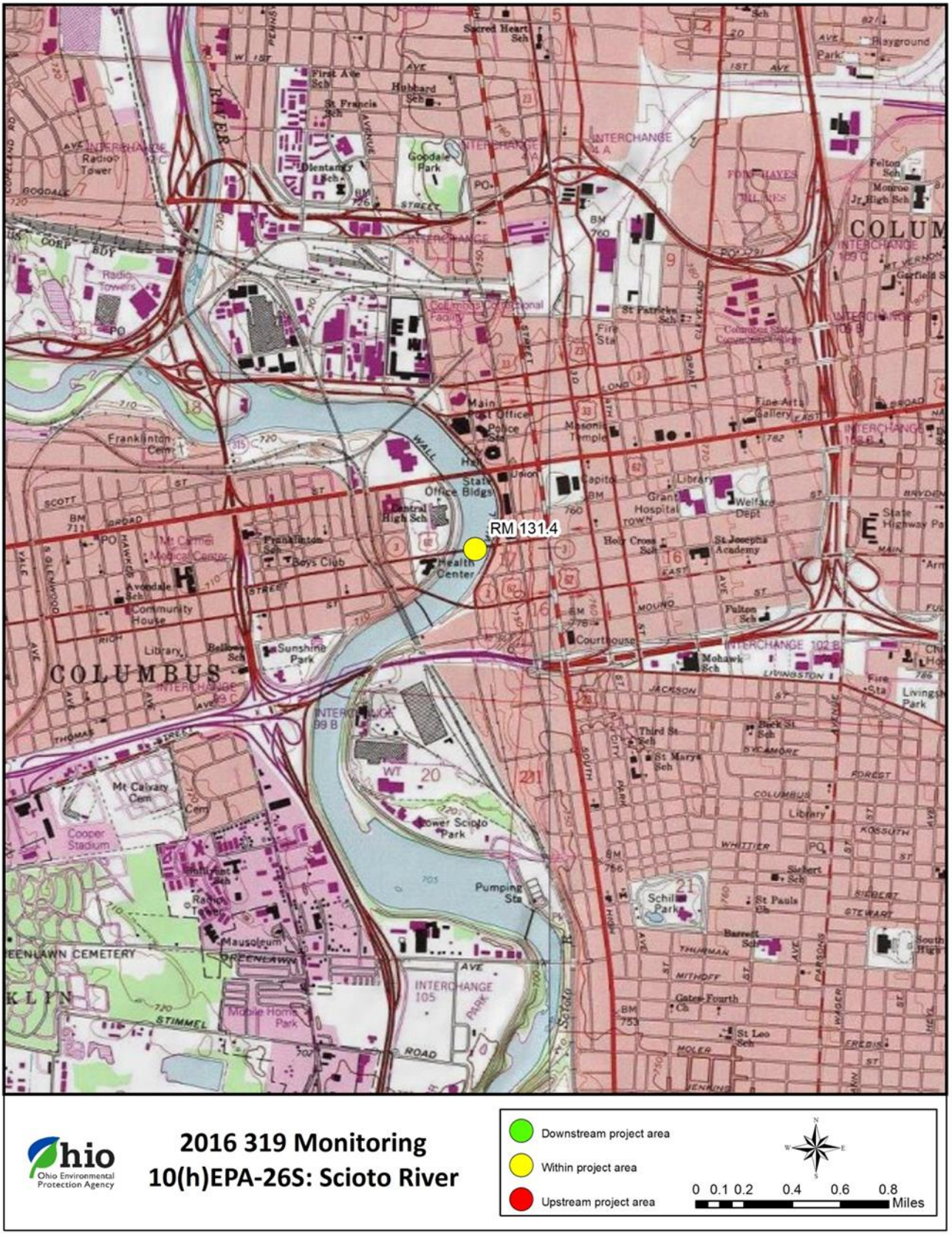

Figure 8 – Scioto River sampling location.

Pond Brook Restoration

Post-Project Monitoring

Project Number: 12(h)EPA-33
Stream Sampled: Pond Brook

Summary

Successful completion of this project reduced nonpoint source pollutant loadings to Tinkers Creek from Pond Brook and provided additional benefits to water quality in Pond Brook itself. These improvements included natural development of riffle/pool sequences, enhancement of floodplain and riparian connection, and a reduction in thermal impairment. Summit Metro Parks restored 5,500 linear feet of floodplain and stream channel in Pond Brook (which was channelized and entrenched through the project length). Natural flow was restored by reducing stream channel width and establishing meanders through a restored 120 foot wide floodplain. In-stream habitat was restored, including coarse sand substrates, root-wads, boulders, and over-hanging vegetation, and significant riparian re-vegetation. Although not the primary goal of the project, some wetlands were installed in the newly modified floodplain. This project is being implemented consistent with recommendations in the Tinkers Creek TMDL.

Specifically, the project included:

- Restoration of 1,150 linear feet of stream channel.
- Restoration of 1,150 linear feet of flood plain.
- Installation of 1,100 tons of stream substrate.
- Planting 475 container shrubs and trees and 6,900 bare root shrubs and trees.
- Removing five acres of invasive plant species and replanting with native grasses.

The two stations within the stream restoration area on Pond Brook showed improvement in biological performance after the stream restoration project was completed. In 2012 during the pre-restoration sampling the station at RM 2.59 was in non-attainment of the Modified Warmwater Habitat (MWH) aquatic life use with fair to poor biological communities and the station at RM 2.39 was in partial attainment with poor to fair communities. In 2016, these stations were resampled after the stream restoration project was completed and the stations within the restoration area improved to partial attainment at RM 2.56 with fair to low fair communities and the station at RM 2.39 improved to full attainment with fair to marginally good communities (Tables 21 & 22, Figure 9).

Table 21 — Aquatic Life Use Attainment – Pond Brook 2012 and 2016.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie-Ontario Lake Plain ecoregion. In the Ohio Water Quality Standards, the Pond Brook is designated Modified Warmwater Habitat (MWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Pond Brook – MWH						
3.7^H (1.6) - 2016	NON	28	-	P*	27.5 (Very Poor)	Fair/Poor
3.7^H (1.6) - 2012	NON	38	-	P*	25.8 (Very Poor)	Marginally Good/Poor
3.4^H (5.0) - 2016	(NON)	-	-	P*	-	- /Poor
3.4^H (5.0) - 2012	(FULL)	32	-	-	35.0 (Poor)	Fair/ -
2.59^H (9.8) - 2016	PARTIAL	28	-	LF*	51.0 (Fair)	Fair/Low Fair
2.59^H (9.8) - 2012	NON	34	-	P*	45.5 (Fair)	Fair/Poor
2.39^H (10.9) - 2016	FULL	30	-	MG	44.5 (Fair)	Fair/Marginally Good
2.39^H (10.9) - 2012	PARTIAL	20*	-	F	38.0 (Poor)	Poor/Fair
1.41^H (15.7) - 2016	FULL	24	-	F	36.5 (Poor)	Poor/Fair
1.41^H (15.7) - 2012	PARTIAL	22*	-	F	32.5 (Poor)	Poor/Fair

Ecoregion Biocriteria: Erie-Ontario Lake Plain	
Index – Site Type	MWH
IBI: Headwater	24
ICI	22

a MIwb is not applicable to headwater streams with drainage areas < 20 mi2.

b Narrative evaluation used in lieu of ICI when score not available (P – Poor, LF – Low Fair, F – Fair, MG - Marginally Good).

\- No sample collected or not applicable.

* Indicates departure from applicable biocriteria. Underlined scores are in the Very Poor range for fish or in the Poor to Very Poor range for macroinvertebrates.

Table 22 — Pond Brook sampling locations, 2012 and 2016.

River Mile	Station ID	Latitude	Longitude	Sampling Location
3.7	F01S42	41.335653	-81.402102	Tradewind Cove Road, upstream WWTP, upstream restoration area
3.4	F01S41	41.3314	-81.4028	Downstream WWTP, upstream restoration area
2.59	301659	41.3216	-81.4013	Within restoration area
2.39	F01W28	41.3186	-81.4004	Just downstream of tributary, within restoration area
1.41	F01S40	41.305	-81.3997	SR 82, downstream restoration area

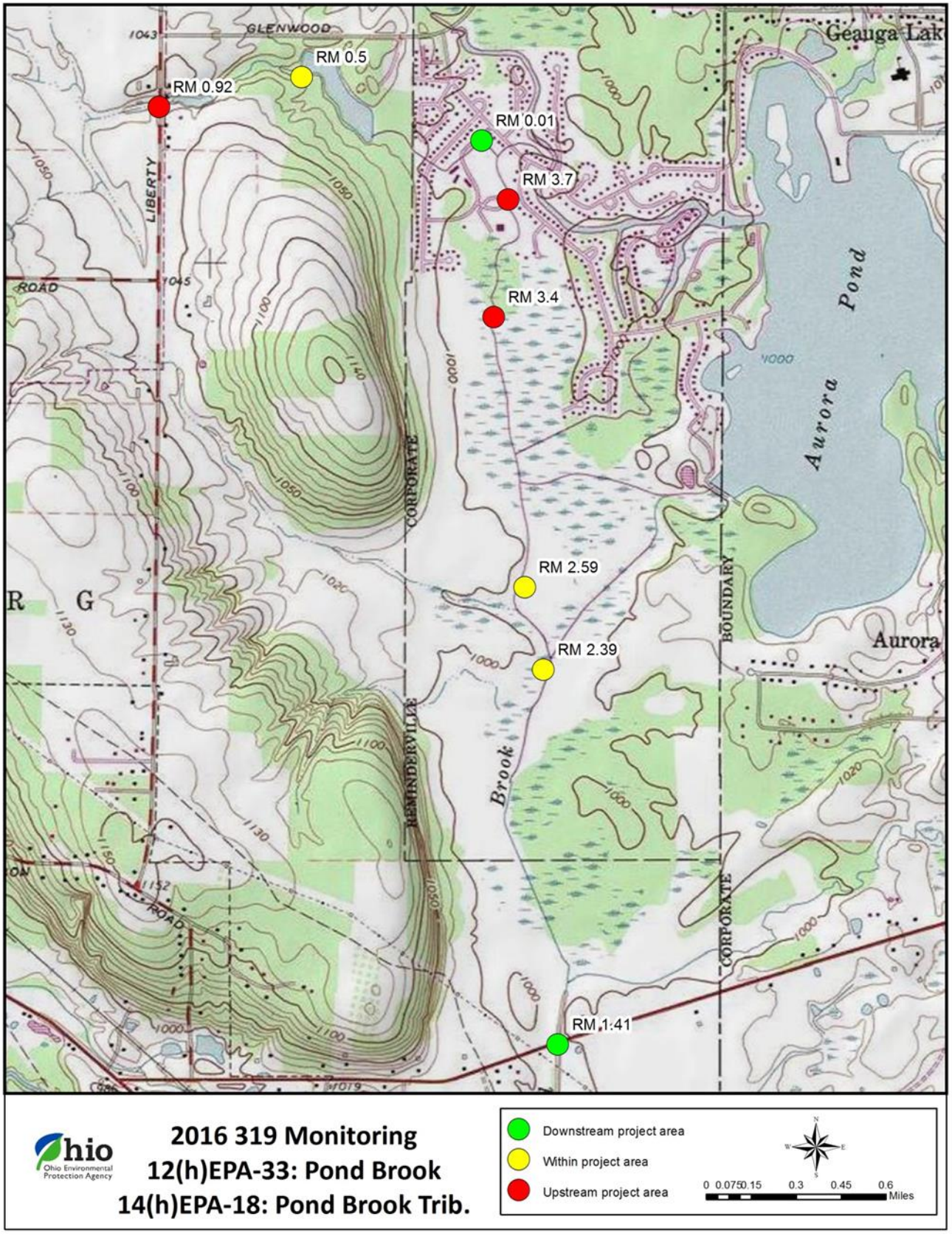

Figure 9 – Pond Brook sampling locations.

Baldwin Run Stream Restoration Phase 2

Post-Project Monitoring

Project Number: 14(h)EPA-13
Stream Sampled: Baldwin Run, Fetters Run, Ewing Run

Summary

This project restored 960 linear feet of Baldwin Run through bank stabilization and in-stream habitat structures including vortex rock weirs and eddy rocks, both of which create habitat for local fish and macroinvertebrates. The bank was stabilized along 250 feet of the channel through regrading and installing Armorflex matting to protect the bank while allowing vegetation to grow up through the cells. 23 in-stream habitat structures were installed including three vortex rock weirs and four groups of eddy rocks, totaling 20 boulders in all. A total of 0.35 acres of invasive species were removed as per the plan and replaced with seed mixtures and live-stake plantings to secure noninvasive, natural vegetation on the streambank. Easements were repurposed as conservation easements prior to restoration construction activities.

Specifically, the project included:

- Restored 960 linear feet of stream
- Installed 23 in-stream habitat structures
- Restored 250 linear feet of streambank by Recontouring or regrading
- Removed/treated 0.35 acre of invasive species
- Planted 0.35 acre of trees, shrubs and/or live stakes in riparian areas
- Executed two conservation easements (easements are already in place, but these replaced the 1939 easement with an inclusive conservation easement)
- Provided project-specific public education and outreach using fact sheets, public meetings, press releases, websites and displays

The station within the stream restoration area on Baldwin Run showed improvement in biological performance after the stream restoration project was completed. In 2014 during the pre-restoration sampling, the station at RM 0.7 was in partial attainment of the Warmwater Habitat (WWH) aquatic life use with marginally good to fair biological communities. In 2016, this station was resampled after the stream restoration project was completed. The station improved to full attainment with good communities. The stations upstream and downstream of the project area were also in full attainment of the WWH use in 2016 (Tables 23 & 24, Figure 10).

Table 23 — Aquatic Life Use Attainment – Baldwin Run, Ewing Run and Fetters Run 2014 and 2016.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, Baldwin Run, Ewing Run and Fetters Run are designated Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Fetters Run – WWH						
RM 0.2^H (6.5) - 2016	FULL	44	-	G	67.5 (Good)	Good/Good
RM 1.15^H (6.1) - 2014	FULL	54	-	MG^{ns}	72 (Excellent)	Exceptional/Marginally Good
Ewing Run - WWH						
RM 0.17^H (2.2) - 2016	FULL	50	-	G	57.5 (Good)	Exceptional/Good
RM 0.17^H (2.2) - 2014	PARTIAL	46	-	F*	58.3 (Good)	Very Good/Fair
Baldwin Run - WWH						
RM 0.7^H (11.7) - 2016	FULL	44	-	G	65.0 (Good)	Good/Good
RM 0.7^H (11.7) - 2014	PARTIAL	38^{ns}	-	F*	66.8 (Good)	Marginally Good/Fair
RM 0.4^H (12.8) - 2016	FULL	42	-	G	53.0 (Fair)	Good/Good
RM 0.3^H (12.9) - 2014	PARTIAL	42	-	F*	68.0 (Good)	Good/Fair

Ecoregion Biocriteria: Erie/Ontario Lake Hills and Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	34

a MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.

b Narrative evaluation used in lieu of ICI when score not available (F-Fair, MG-Marginally Good, G-Good).

H Headwater electrofishing site.

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

- No sample taken.

* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).

Table 24 —Sampling locations, 2014 and 2016.

River Mile (2016)	Station ID	Latitude	Longitude	Sampling Location
Fetters Run				
2.0	302673	39.718725	-82.581959	Adjacent Lanreco Park
Ewing Run				
0.17	302672	39.719	-82.5788	Pleasantville Road
Baldwin Run				
0.7	302671	39.71543	-82.58047	Downstream Ewing Run and Fetter Run
0.4	J01S15	39.711044	-82.581859	Upstream Lawrence Street, upstream CSO

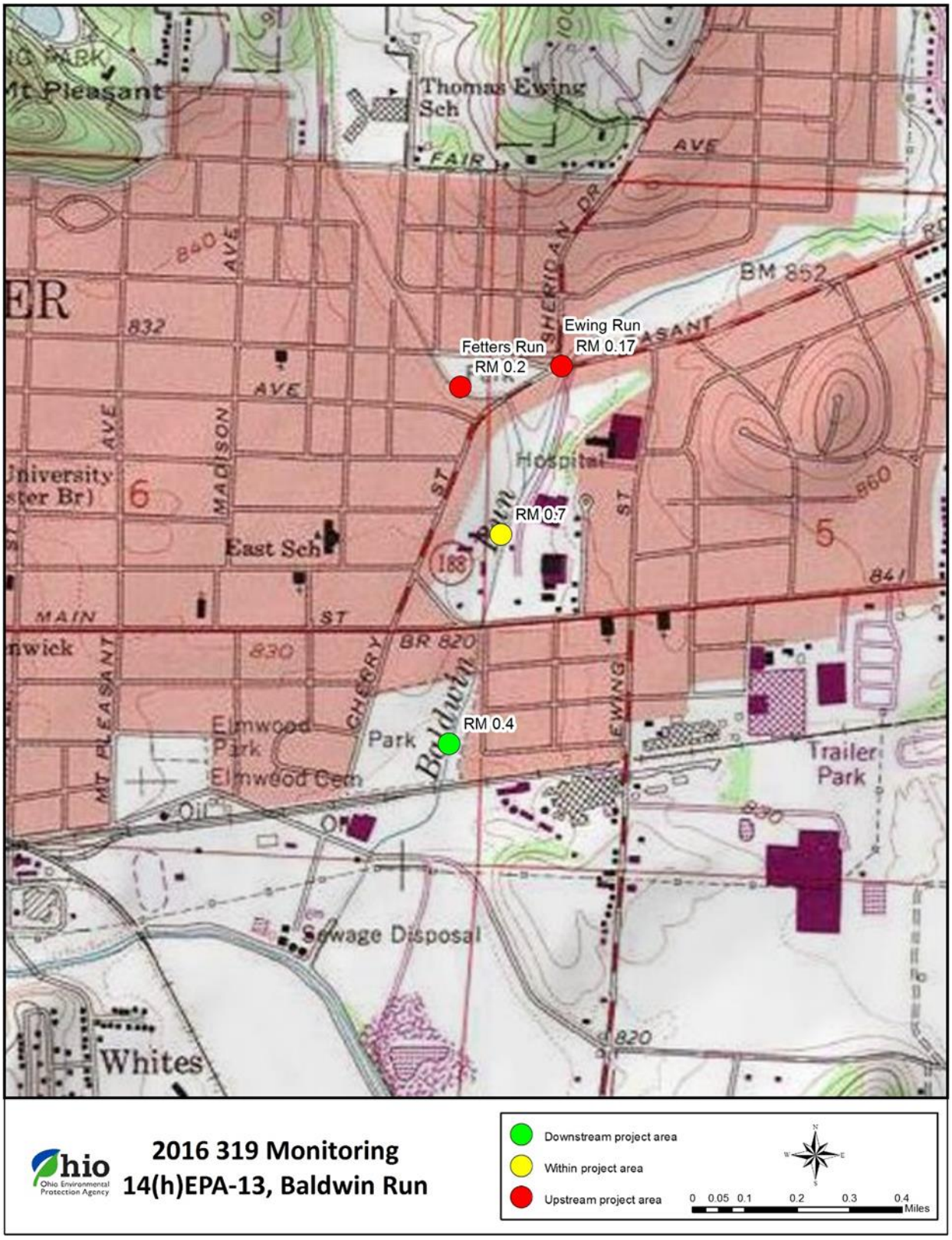

Figure 10 – Baldwin Run, Ewing Run and Fetters Run sampling locations.

Pond Brook Tributary Restoration

Post-Project Monitoring

Project Number: 14(h)EPA-18
Stream Sampled: Tributary to Pond Brook (3.90)

Summary

This project restored approximately 1,200 linear feet of floodplain; restored approximately 500 linear feet of streambank using bio-engineering, recontouring or regrading; and stabilized approximately 1,000 linear feet of streambank using bio-engineering.

Specifically, the project included:

- Restored approximately 1,200 linear feet of floodplain
- Restored approximately 500 linear feet of streambank using bio-engineering, recontouring or regrading
- Stabilized approximately 1,000 linear feet of streambank using bio-engineering
- Provided project-specific public education and outreach using fact sheets, public meetings, press releases, websites, project signs, tours, clean-up days, field days, newsletters and flyers/posters

The station within the stream restoration area on Tributary to Pond Brook (RM 3.90) did not show substantial improvement in biological performance after the stream restoration project was completed. In 2014 during the pre-restoration sampling, the station at RM 0.5 was in non-attainment of the recommended Warmwater Habitat (WWH) aquatic life use with fair to low fair biological communities. In 2016, this station was resampled after the stream restoration project was completed and the station remained in non-attainment with poor to fair communities. The stations upstream and downstream of the project area were also in non-attainment of the WWH use in 2016 (Tables 25 & 26, Figure 11).

Table 25 — Aquatic Life Use Attainment – Tributary to Pond Brook (RM 3.90), 2014 and 2016.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie-Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, the Tributary to Pond Brook (RM 3.90) is undesignated.

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Tributary to Pond Brook (RM 3.90) – Undesignated / WWH Recommended						
RM 0.92[H] (1.2)-2016	NON	28*	-	P*	77.0 (Excellent)	Fair/Poor
RM 0.92[H] (1.2)-2014	(NON)	-	-	P*	-	- / Poor
RM 0.5[H] (1.3)-2016	NON	26*	-	F*	65.5 Good)	Poor/Fair
RM 0.5[H] (1.3)-2014	NON	28*	-	LF*	70.3 (Excellent)	Fair/Low Fair
RM 0.01[H] (1.6)-2016	NON	30*	-	LF*	24.8 (Very Poor)	Fair/Low Fair
RM 0.01[H] (1.6)-2014	NON	26*	-	P*	41.8 (Poor)	Poor/Poor

Ecoregion Biocriteria: Erie-Ontario Lake Hills and Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	34

a MIwb is not applicable to headwater streams with drainage areas < 20 mi2.

b Narrative evaluation used in lieu of ICI when score not available (F-Fair, MG-Marginally Good, G-Good).

H Headwater electrofishing site.

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

Table 26 — Tributary to Pond Brook (RM 3.90) sampling locations, 2014 and 2016.

River Mile	Station ID	Latitude	Longitude	Sampling Location
0.92	302680	41.33902	-81.41895	Liberty Road, Upstream restoration area
0.50	302678	41.3401	-81.41207	From Glenway Drive, Within restoration area
0.01	302677	41.33779	-81.40338	Outriggers Cove, Downstream restoration area

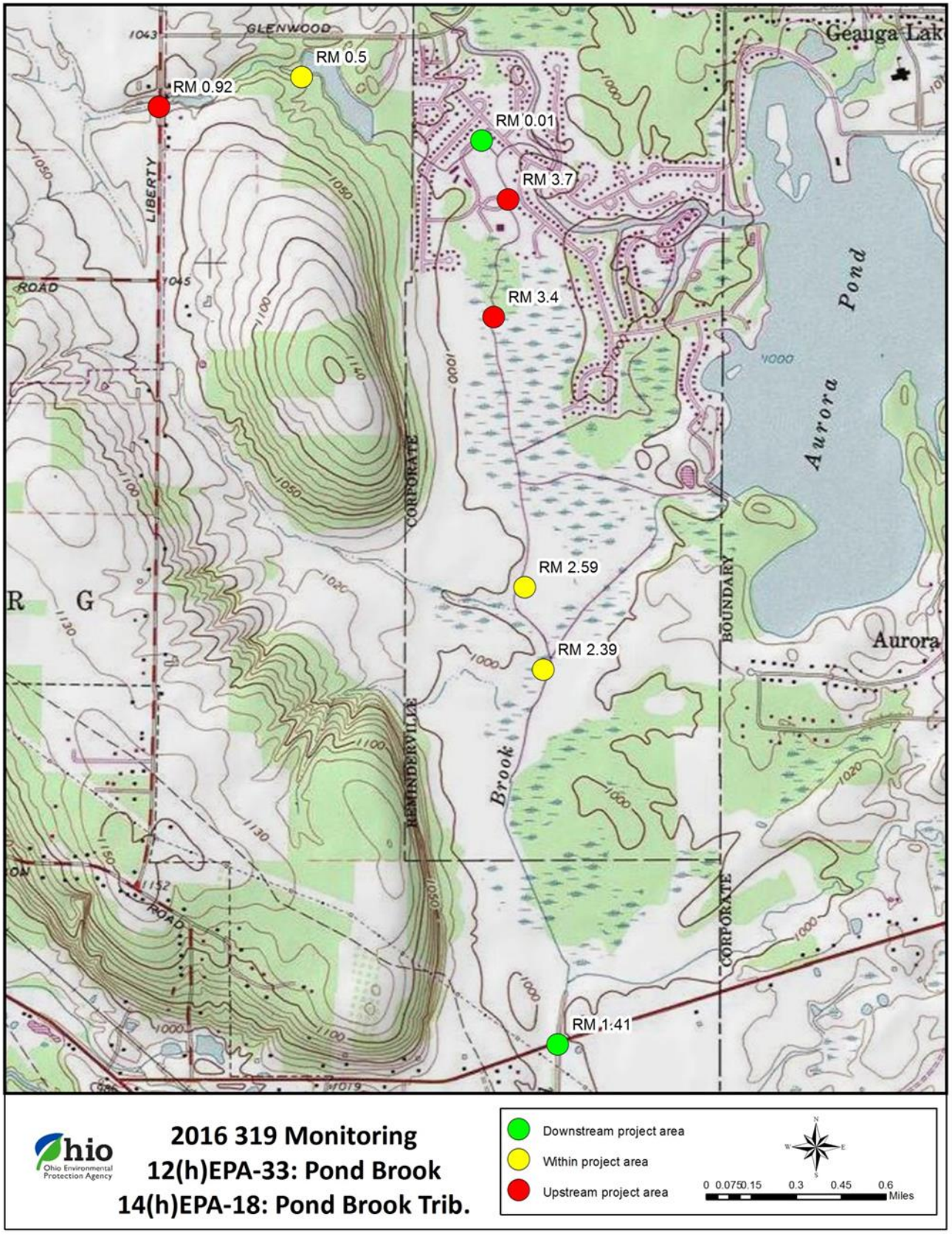

Figure 11 – Tributary to Pond Brook (RM 3.90) sampling locations.

Olentangy River Dam Removal & Restoration Project

Post-Project Monitoring

Project Number: 14SWIF-SEP-86, 05(h)L662
Stream Sampled: Olentangy River

Summary

In order to return the impounded portions on the Olentangy River to full attainment of at least the WWH Aquatic Life Use, the Panhandle Road Dam, Central Avenue Dam, Williams Street Dam, and two dams just north of the US 23 bridge were removed. This is the first evaluation of the removal of the two dams just north of the US 23 bridge.

Specifically, the project included:

- Complete one mussel survey
- Create one survey of low-head dam
- Install two sewer taps

The stations within four dam pools on the Olentangy River showed improvement in biological performance after the dams were removed. In 2005 during the pre-dam removal sampling, the stations at Panhandle Road, Central Avenue and Williams Street were in partial or non-attainment of the Warmwater Habitat (WWH) aquatic life use with fair to exceptional biological communities. In 2016, these stations were resampled after the dams were removed and the stations within the old dam pools improved to full attainment with good to exceptional communities. The station at RM 22.5 which was located upstream of two low-head dams that were removed in 2015 was in full attainment of WWH in 2016 with good to exceptional communities (Tables 27 & 28, Figure 12).

Table 27 — Aquatic Life Use Attainment – Olentangy River 2005 and 2016.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Eastern Corn Belt Plains ecoregion. In the Ohio Water Quality Standards, the Olentangy River is designated Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb	ICI	QHEI	Narrative Assessment Fish/Macroinvertebrates
Olentangy River – WWH						
RM 28.2^{W} (410)-2016	FULL	50	10.3	38	82.3 (Excellent)	Exceptional/Good
RM 28.2^{W} (410)-2005	NON	30*	6.8*	20*	55.5 (Fair)^{2003}	Fair/Fair
RM 26.0^{W} (421)-2016	FULL	48	11.0	46	83.0 (Excellent)	Very Good-Exceptional/Exceptional
RM 26.0^{W} (421)-2005	PARTIAL	38^{ns}	9.6	26*	45.5 (Fair)	Marginally Good-Exceptional/Fair
RM 25.8^{W} (421.1)-2016	FULL	48	9.6	48	77.5 (Excellent)	Very Good-Exceptional/Exceptional
RM 25.8^{W} (421.1)-2005	PARTIAL	34*	8.9	32^{ns}	49.0 (Fair)	Fair-Very Good/Marginally Good
RM 22.5^{W} (445)-2016	FULL	44	8.6	52	69.0 (Good)	Very Good-Good/Exceptional

Ecoregion Biocriteria: Eastern Corn Belt Plains		
Index – Site Type	WWH	EWH
IBI: Wading	40	50
MIwb: Wading	8.3	9.4
ICI	36	46

W Wading electrofishing site.

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

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

2003 QHEI score from 2003 TMDL survey.

Table 28 — Olentangy River sampling locations, 2016.

River Mile	Station ID	Latitude	Longitude	Sampling Location
28.2	301673	40.3258	-83.0701	Panhandle Road
26.0	300583	40.3012	-83.0634	Central Avenue
25.8	300582	40.2985	-83.0618	Williams Street
22.5	303672	40.257383	-83.062031	At Pollack Road and Braumiller Road

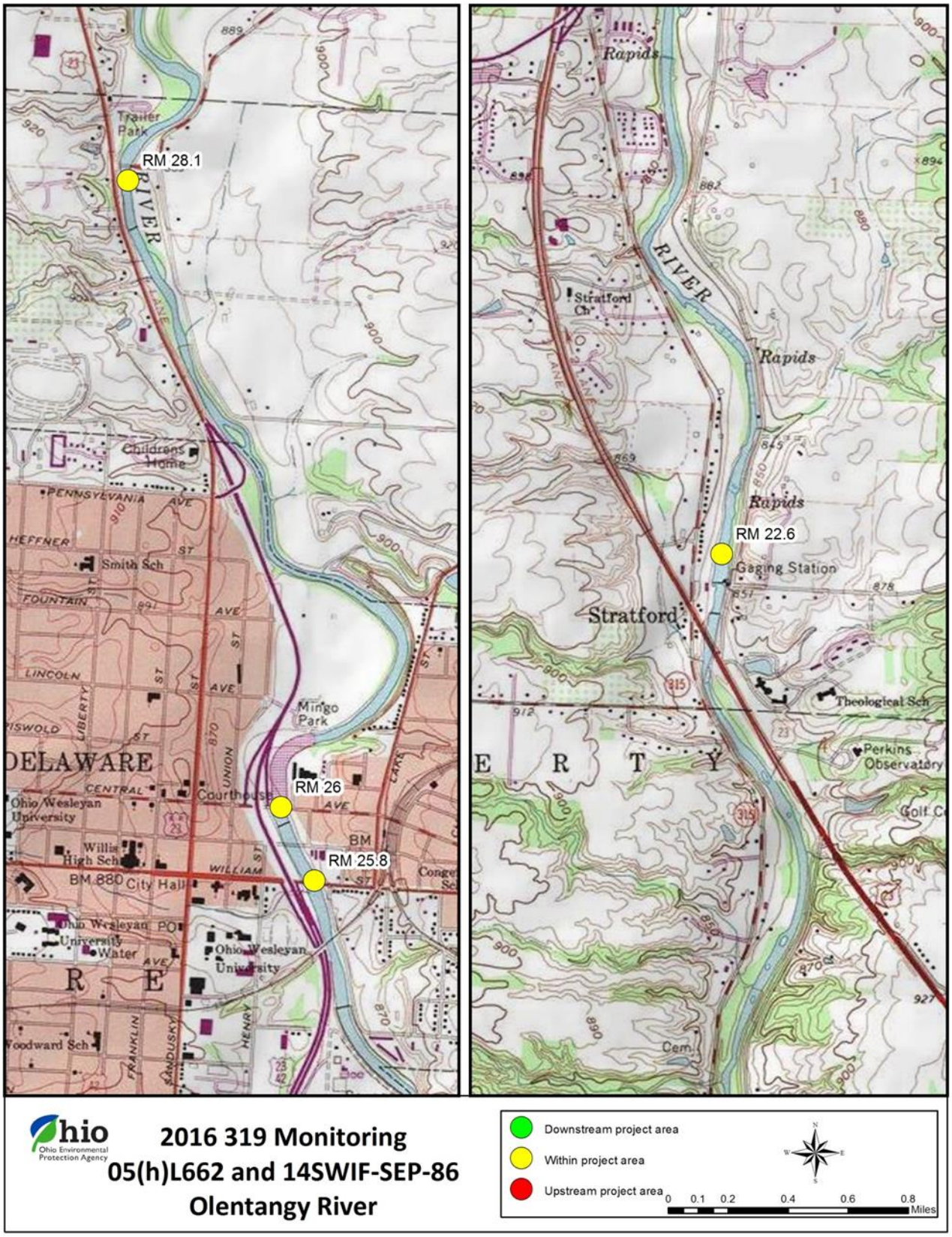

Figure 12 – Olentangy River sampling locations.

Lake Erie Nutrient Reduction Demonstration Project

Post-Project Monitoring

Project Number: NUTR11-GLRI-01
Stream Sampled: Loss Creek, South Fork Loss Creek and Allen Run

Summary

This project implemented a series of targeted nutrient reduction practices in the Loss Creek watershed, a tributary to the Sandusky River. The practices accomplished were: installation of 23 Drainage Water Management Structures to control drainage water from 594 acres, planting 1,949 acres of cover crops, variable rate tillage/fertilization implemented on 1,046 acres, nutrient management plan development on 5,343 acres of cropland including 58 whole farm conservation plans, installation of two grassed waterways to control gully erosion on 0.6 acres, one tile repair that saved the loss of an estimated 147 tons of soil, restoration of 175 linear feet of severely eroded streambank, and one manure storage system.

Specifically, the project included:

- Planted 1,000 acres of cover/manure crops
- Installed 750 acres of control drainage system
- Developed nutrient management plans for 500 acres
- Developed whole farm management plans for 2,000 acres
- Implemented conservation tillage practices for 2,000 acres
- Implemented prescribed & conservation grazing practices for 10 acres
- Installed four erosion and sediment control structures
- Installed six acres of grassed waterways
- Installed one heavy use feeding pad
- Installed one linear foot of livestock access lanes
- Installed 12 tile control structures
- Installed three acres of saturated buffers
- Installed two Manure Storage Facility
- Installed six Blind Inlet Structures
- Installed one Saturated Buffer

The stations downstream from the nutrient reduction demonstration project on Loss Creek, South Fork Loss Creek and Allen Run did not show substantial improvement in biological performance after the project was completed. In 2011 during the pre-project sampling, the stations on Loss Creek (at RM 5.18) and Allen Run were in non-attainment of the Warmwater Habitat (WWH) aquatic life use with very poor to good biological communities; while the stations on Loss Creek (at RM 0.96) and South Fork Loss Creek were in full attainment of WWH with marginally good to very good communities. In 2016, the stations were resampled after the project was completed and the stations on Loss Creek (at RM 5.18) and Allen Run remained in non-attainment with very poor to fair communities and the stations on Loss Creek (at RM 0.96) and South Fork Loss Creek declined from full to partial attainment of WWH with fair to good communities (Tables 29 & 30, Figure 13). 2016 may not have been a good year to evaluate any improvements from this project because stream flow in this area was substantially below normal, based on the USGS stream gauge on the Sandusky River near Bucyrus. Unusually reduced stream flow would have put added stress to the biological communities that could mask any positive effects from nutrient reductions in the watersheds.

Table 29 — Aquatic Life Use Attainment – Loss Creek, South Fork Loss Creek and Allen Run, 2011 and 2016.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Eastern Corn Belt Plains ecoregion. In the Ohio Water Quality Standards, Loss Creek, South Fork Loss Creek and Allen Run are designated Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Loss Creek – WWH						
RM 5.18^H (2.1)-2016	NON	32*	-	VP*	61.0 (Good)	Fair/Very Poor
RM 5.18^H (2.1)-2011	NON	40	-	P*	59.5 (Good)	Good/Poor
RM 0.96^H (11.7)-2016	PARTIAL	40	-	F*	71.5 (Excellent)	Good/Fair
RM 0.96^H (11.7)-2011	FULL	48	-	G	72.8 (Excellent)	Very Good/Good
South Fork Loss Creek – WWH						
RM 0.04^H (6.8)-2016	PARTIAL	30*	-	G	78.5 (Excellent)	Fair/Good
RM 0.04^H (6.8)-2011	FULL	46	-	MG^{ns}	73.8 (Excellent)	Very Good/Marginally Good
Allen Run - WWH						
RM 1.18^H (4.1)-2016	NON	28*	-	P*	51.0 (Fair)	Fair/Poor
RM 1.18^H (4.1)-2011	NON	40	-	VP*	52.5 (Fair)	Good/Very Poor

Ecoregion Biocriteria: Erie-Eastern Corn Belt Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	36

a MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.

b Narrative evaluation used in lieu of ICI when score not available (VP-Very Poor, P-Poor, F-Fair, MG-Marginally Good, G-Good).

H Headwater electrofishing site.

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

\- No sample taken.

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

Table 30 — Loss Creek, South Fork Loss Creek and Allen Run sampling locations, 2011 and 2016.

River Mile	Station ID	Latitude	Longitude	Sampling Location
Loss Creek				
5.18	301595	40.86464	-82.764055	SR 96
0.96	U02G03	40.841717	-82.818239	Biddle Road
South Fork Loss Creek				
0.04	201377	40.850796	-82.792609	Loss Creek Road
Allen Run				
1.18	U02G20	40.785057	-82.773902	Crestline Road

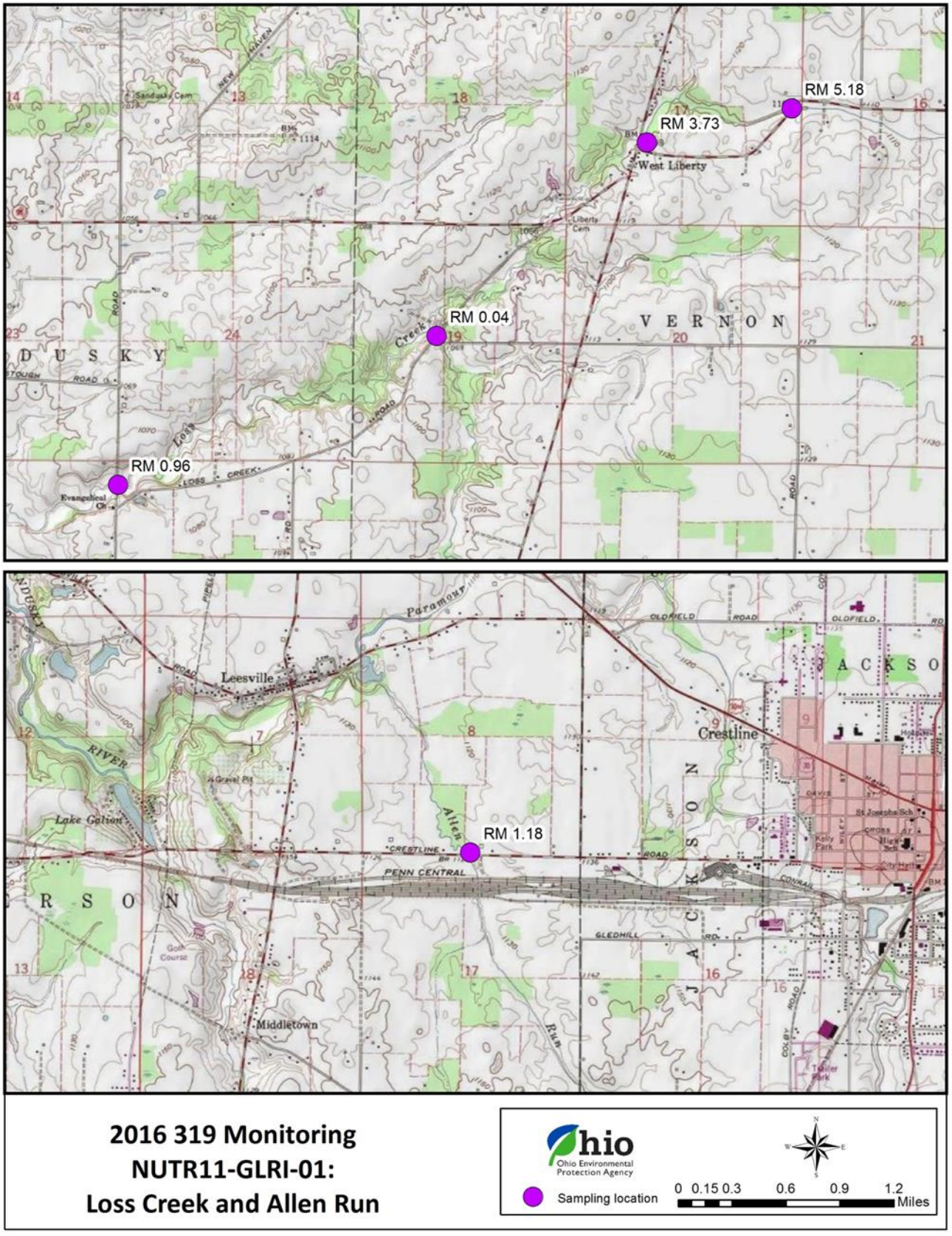

Figure 13 – Loss Creek, South Fork Loss Creek and Allen Run sampling locations.

Removal of Abbott's Mill Dam Remnants on the Grand River

Pre-Project Monitoring

Project Number: 17(h)EPA-05
Stream Sampled: Grand River

Summary

This project proposes to remove 106 cubic yards of concrete and steel remnant dam materials from the Abbott's Mill Dam on the Grand River (lower) under the East Main Street Bridge in the City of Painesville, Lake County, Ohio. This project will also improve floodplain access and natural flow along at least 500 linear feet of downstream areas on both banks. This project is being implemented consistent with recommendations within the Red Creek-Grand River TMDL and/or state-endorsed Watershed Action Plan.

The successful completion of this project will:

- Remove one dam
- Restore 500 linear feet of natural flow
- Dispose of 106 cubic yards of debris
- Conduct public education and outreach by developing one fact sheet and one press release, create/maintain two websites, install one project sign, give one presentation to the CRWP Board of Trustees, and publish one article in the local newspaper

Grand River was sampled within the restoration area at RM 6.78. The fish and macroinvertebrate communities met the expectations of the designated Exceptional Warmwater Habitat (EWH) aquatic life use with exceptional evaluations (Tables 31 & 32, Figure 14).

Table 31 — Aquatic Life Use Attainment – Grand River, 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, Grand River is Exceptional Warmwater Habitat (EWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb	ICI	QHEI	Narrative Assessment Fish/Macroinvertebrates
Grand River – EWH						
RM 6.78[B] (687)-2017	FULL	58	11.0	46	82.0 (Excellent)	Exceptional/Exceptional

Ecoregion Biocriteria: Erie/Ontario Lake Hills and Plains	
Index – Site Type	EWH
IBI: Boat	48
MIwb: Boat	9.6
ICI	46

B Boat electrofishing site.

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

- No sample taken.

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

Table 32 — Grand River sampling location, 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
6.78	200586	41.7261	-81.2383	Main Street, downstream old dam

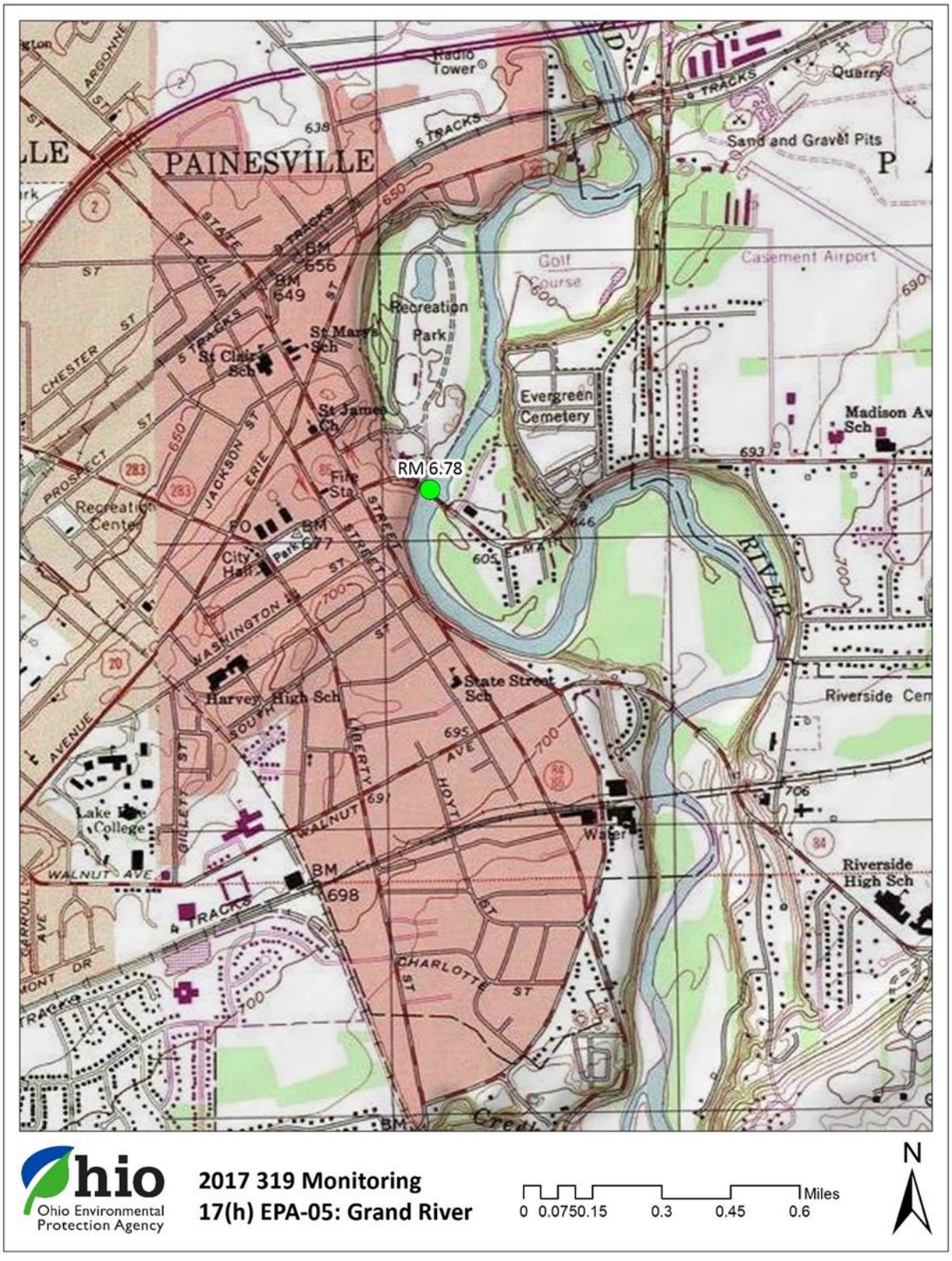

Figure 14 – Grand River sampling location.

Fetter's Run Stream Restoration

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-06
Stream Sampled: Fetters Run

Summary

This project is requested to restore the stream that remains impaired due to channelization. The construction will include debris removal, invasive species management, channel enhancements, installation of eddy rocks, bank stabilization, riparian corridor plantings and park infrastructure. This project is being implemented consistent with recommendations within the Fetter's Run TMDL and/or state-endorsed Watershed Action Plan.

Specifically, the project will include:

- Restore 800 linear feet of stream channel
- Restore 500 linear feet of streambank by re-contouring or regrading
- Remove/treat 0.33 acres of invasive species
- Plant 0.33 acres of trees, shrubs and/or live stakes in riparian areas
- Conduct public education and outreach by developing one fact sheet and two press releases, conducting two public meetings, create/maintain two websites, install two project signs, and install one information kiosk

Fetters Run was sampled within the restoration area at RM 0.2. The fish and macroinvertebrate communities met or marginally met expectations of the designated Warmwater Habitat (WWH) aquatic life use with marginally good to very good evaluations (Tables 33 & 34, Figure 15).

Table 33 — Aquatic Life Use Attainment – Fetters Run, 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, Fetters Run is designated Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Fetters Run – WWH						
RM 0.2^H (6.5)	FULL	46	-	MG^{ns}	65.0 (Good)	Very Good/Marginally Good

Ecoregion Biocriteria: Erie/Ontario Lake Hills and Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	34

a MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.

b Narrative evaluation used in lieu of ICI when score not available (MG – Marginally Good).

H Headwater electrofishing site.

* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).

\- No sample taken.

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

Table 34 — Fetters Run sampling location, 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
0.2	302673	39.718725	-82.581959	Adjacent Lanreco Park, downstream CSO

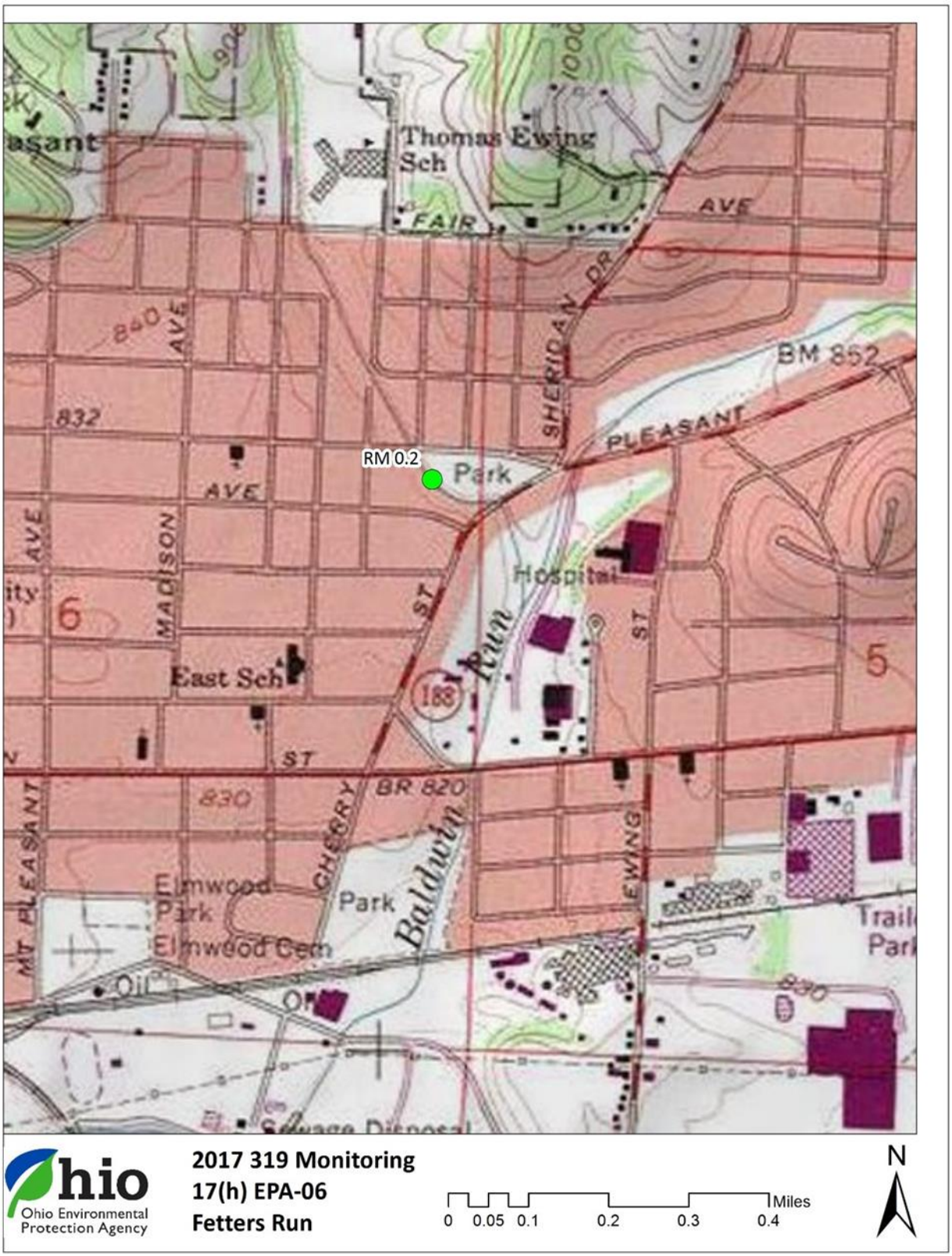

Figure 15 – Fetters Run sampling location.

Reading Floodplain Bench - Phase I

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-07
Stream Sampled: Mill Creek

Summary

Completion of this project will stabilize 520 linear feet of bank and 380 linear feet of floodplain bench, plant 1.1 acres of native trees, shrubs and live stakes, and 1.1 acres of riparian habitat established through plant and seed installation which will allow for decreases in turbidity in downstream sampling locations on the Mill Creek and increase in recreational use through restored stream section. This project is being implemented consistent with recommendations within the Sharon Creek-Mill Creek TMDL and/or state-endorsed Watershed Action Plan.

Specifically, the project will include:

- Restore 380 linear feet of flood plain
- Stabilize 520 linear feet of streambank by re-contouring or regrading
- Plant 1.1 acres of native grasses in riparian areas
- Stabilize 520 linear feet of streambank using bio-engineering
- Remove/treat 0.3 acres of invasive species
- Plant 1.1 acres of trees, shrubs and/or live stakes in riparian areas
- Conduct project-specific public education and outreach including developing fact sheets, creating/maintaining websites, installing project signs, conducting tours and canoe tours and cleanup days

Mill Creek was sampled within the restoration area upstream from Columbia Road. The biological communities were only partially meeting expectations of the designated Warmwater Habitat (WWH) aquatic life use with fair to very good evaluations (Tables 35 & 36, Figure 16).

Table 35 — Aquatic Life Use Attainment – Mill Creek, 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Interior Plateau ecoregion. In the Ohio Water Quality Standards, Mill Creek is designated Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb	ICI	QHEI	Narrative Assessment Fish/Macroinvertebrates
Mill Creek – WWH						
RM 13.7[W] (71.6)	PARTIAL	32*	6.3*	44	56.3 (Fair)	Fair/ Very Good

Ecoregion Biocriteria: Interior Plateau	
Index – Site Type	WWH
IBI: Wading	40
MIwb: Wading	8.1
ICI	30

W Wading electrofishing site.

* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).

Table 36 — Mill Creek sampling location, 2017.

River Mile Fish/Macros	Station ID	Latitude	Longitude	Sampling Location
13.35/13.7	Q01S15	39.234673	-84.440846	West Columbia Road

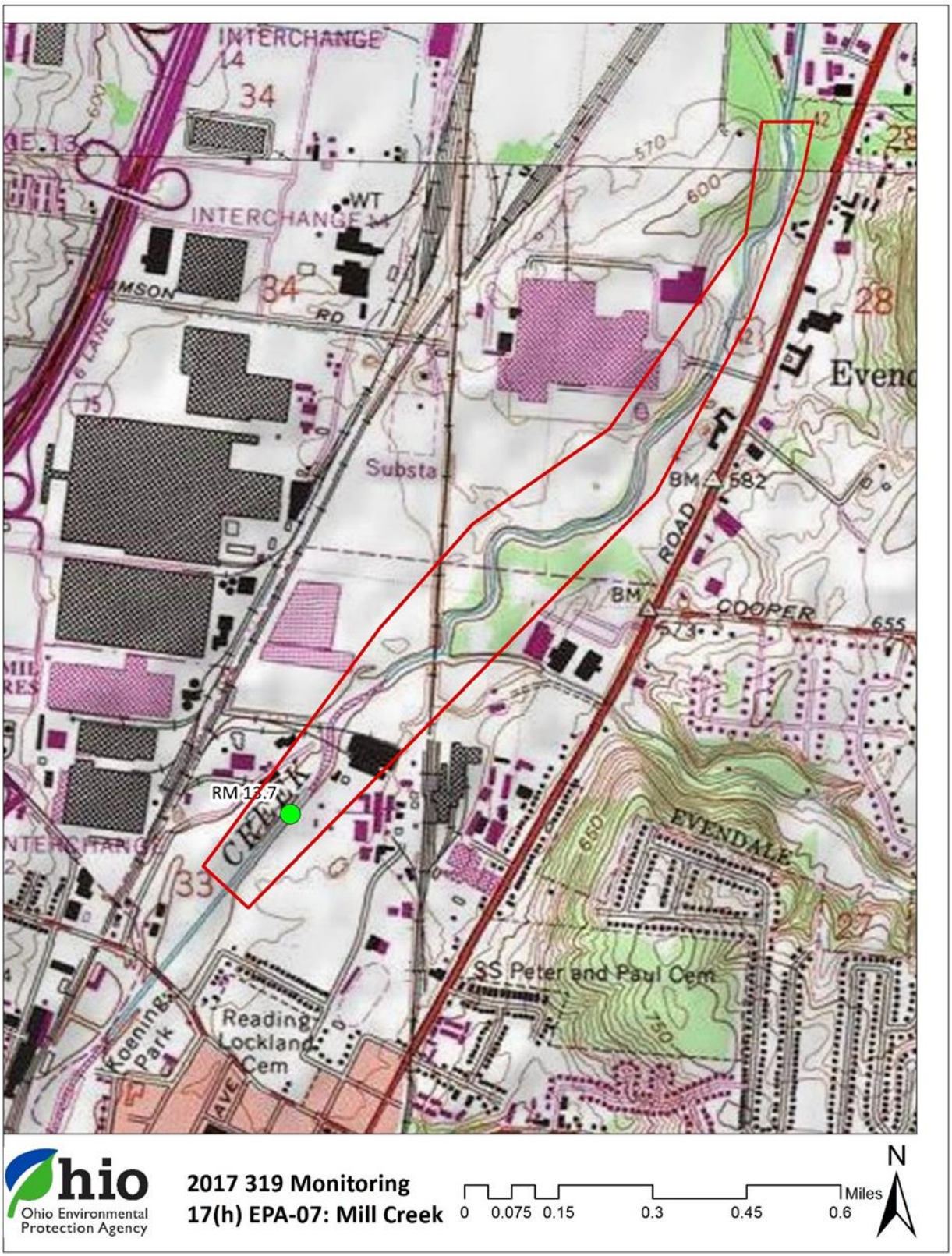

Figure 16 – Mill Creek sampling location.

Ilesboro Road Reclamation Project

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-08
Streams Sampled: West Branch Raccoon Creek, Brushy Fork

Summary

Completion of this project will reduce nonpoint source pollutant loadings to West Branch Raccoon Creek and reclaim 34 acres of abandoned mine land. Construction activities include:

• Treat and Drain Strip Pits: The two strip pits containing approximately two million gallons of AMD will be treated to a level equal to or better than, the receiving stream's water chemistry and then drained.

• Grade 34 Acre Spoil Area: The purpose of grading the spoil area to obtain positive drainage is to minimize precipitation from percolating into the spoil and clays, thus leaching out and transporting acidity and metals off site.

• Incorporate Lime into Spoil: Ag-lime will be incorporated into the spoil at a rate of 20 tons/acre. This will increase the alkalinity level and pH of the spoil to allow for successful vegetation establishment.

• Cover Spoil with Resoil Material: Onsite clay and soil material will be used to cap and resoil the spoil pile at a depth of approximately one - two feet. Resoil material will be limed at a rate of five tons/acre.

• Rock Channels: 1,500 linear feet of open limestone channels will be installed to connect side drainages to their main channels.

• Revegetation: Entire project and borrow area will be revegetated. A native pollinator mix is being tested at another reclaim site in 2017 and if successful, the native mix may be used on this site as well.

This project is being implemented consistent with recommendations within the West Branch Raccoon Creek TMDL and/or state-endorsed Watershed Action Plan.

Specifically, the project will include:

- Install 1,500 linear feet of limestone channels
- Reclaim 34 acres of abandoned mine land
- Reclaim 3.4 acres of pit impoundments
- Restore 34 acres of positive drainage
- Cover 30.6 acres of toxic mine spoils
- Conduct project-specific public education and outreach including creating/maintaining a website, conducting tours, developing newsletters and attending meetings and conferences

West Branch Raccoon Creek was sampled upstream and downstream from the project area. Both stations were in non-attainment of the designated WWH aquatic life use due to poor fish communities. The Brushy Fork station was sampled downstream from the project area was also in non-attainment of WWH due to fair fish and macroinvertebrate communities (Tables 37 & 38, Figure 17).

Table 37 — Aquatic Life Use Attainment – West Branch Raccoon Creek and Brushy Fork, 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream sites are in the Western Allegheny Plateau ecoregion. In the Ohio Water Quality Standards, the West Branch Raccoon Creek and Brushy Fork are Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
West Branch Raccoon Creek – WWH						
RM 5.68^H (3.8)	NON	22*	-	G	72.8 (Excellent)	Poor/Good
RM 4.1^H (6.8)	NON	26*	-	G	71.3 (Excellent)	Poor/Good
Brushy Fork - WWH						
RM 10.28^H (1.3)	NON	32*	-	F*	78.5 (Excellent)	Fair/Fair

Ecoregion Biocriteria: Western Allegheny Plateau	
Index – Site Type	WWH
IBI: Headwater	44
ICI	36

a MIwb is not applicable to headwater streams with drainage areas < 20 mi2.
b Narrative evaluation used in lieu of ICI when score not available (MG – Marginally Good).
H Headwater electrofishing site.
* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).
- No sample taken.
ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

Table 38 — West Branch Raccoon Creek and Brushy Fork sampling locations, 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
West Branch Raccoon Creek				
5.68	W03W36	39.4197	-82.4692	Cedar Falls Road
4.1	300428	39.4012242	-82.4532183	SR 93
Brushy Fork				
10.28	303831	39.397272	-82.473015	Ridge Road

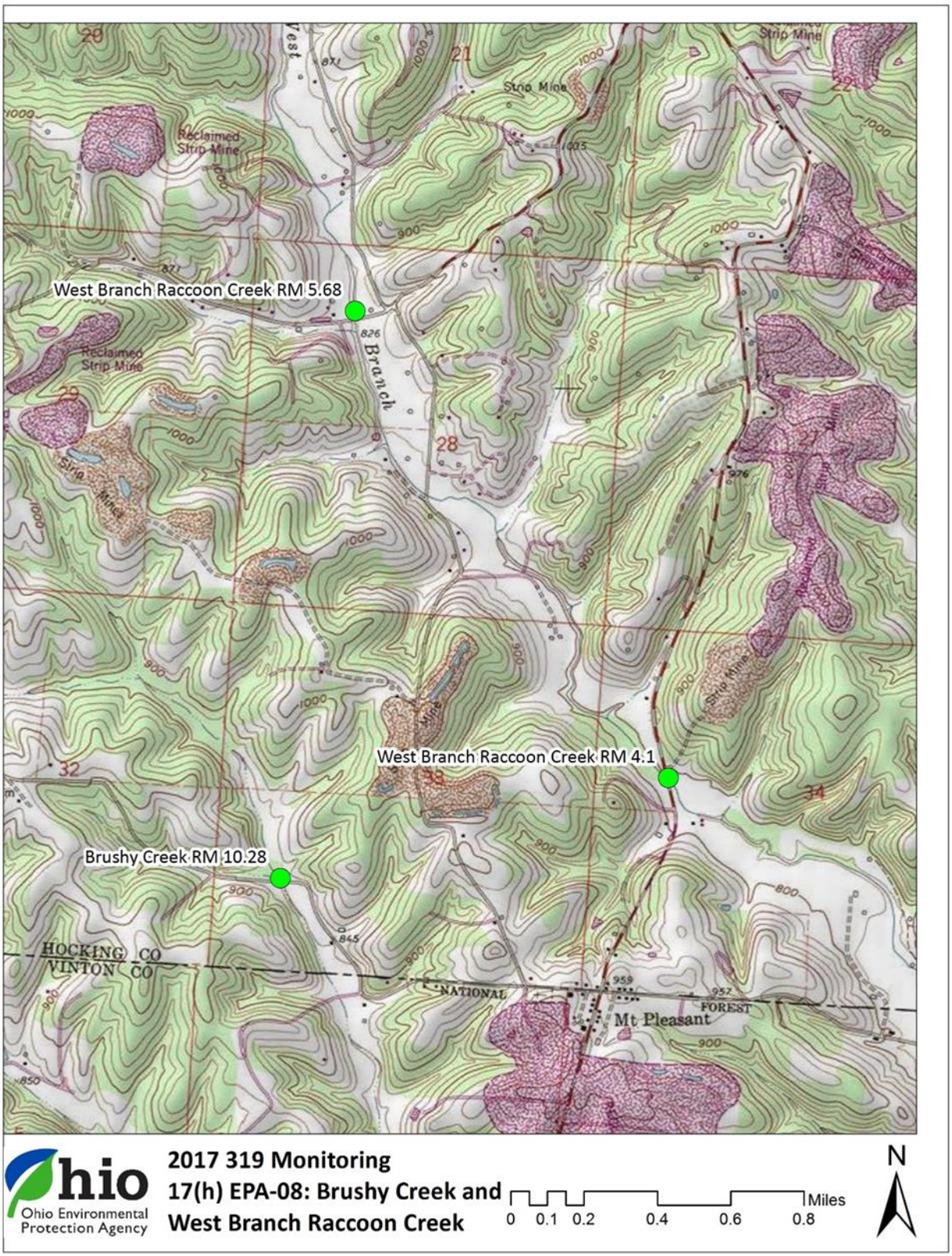

Figure 17 – West Branch Raccoon Creek and Brushy Fork sampling locations.

East Branch Chagrin River Streambank Stabilization Project

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-09
Stream Sampled: East Branch Chagrin River

Summary

Completion of this project will stabilize 425 linear feet of streambank that is contributing nonpoint sources of sediment and nutrient pollution to the East Branch of the Chagrin River. The project site is approximately 2,500 feet north of U.S. Route 6 adjacent to Wisner Road in the City of Kirtland, located in Lake County, and is located on property owned by Locust Farms Ltd., which has been protected with a conservation easement since 1997. Approximately 275 linear feet of the right bank of the East Branch along Wisner Road is eroding, with bank heights up to 18 feet. Just downstream of the erosion on this right bank, a point bar is creating a pinch point in the river and causing erosion on approximately 150 feet of the left bank.

Specifically, the project will include:

- Restore 425 linear feet of streambank using bio-engineering
- Restore 275 linear feet of streambank by re-contouring or regrading
- Plant 0.25 acre of trees, shrubs and/or live stakes in the riparian area
- Conduct project-specific public education and outreach including developing fact sheets and press releases, creating/maintaining websites and developing displays

The East Branch Chagrin River was sampled within the project area. The biological communities were in full attainment of the designated Coldwater Habitat (CWH) aquatic life use with exceptional evaluations and cold water indicator fish and macroinvertebrates.

Table 39 — Aquatic Life Use Attainment – East Branch Chagrin River, 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, East Branch Chagrin River is Coldwater Habitat (CWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[b]	ICI	QHEI	Narrative Assessment Fish/Macroinvertebrates
East Branch Chagrin River – CWH						
RM 13.1[H] (21.0)	FULL	50	-	50	77.0 (Excellent)	Exceptional/Exceptional

Ecoregion Biocriteria: Erie/Ontario Lake Hills and Plains	
Index – Site Type	CWH
IBI: Headwater	-
ICI	-

b MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.

H Headwater electrofishing site.

- No sample taken.

Table 40 — East Branch Chagrin River sampling location, 2017.

River Mile Fish/Macro	Station ID	Latitude	Longitude	Sampling Location
12.7/13.1	D01G14	41.585233	-81.30175	Adjacent Wisner Road

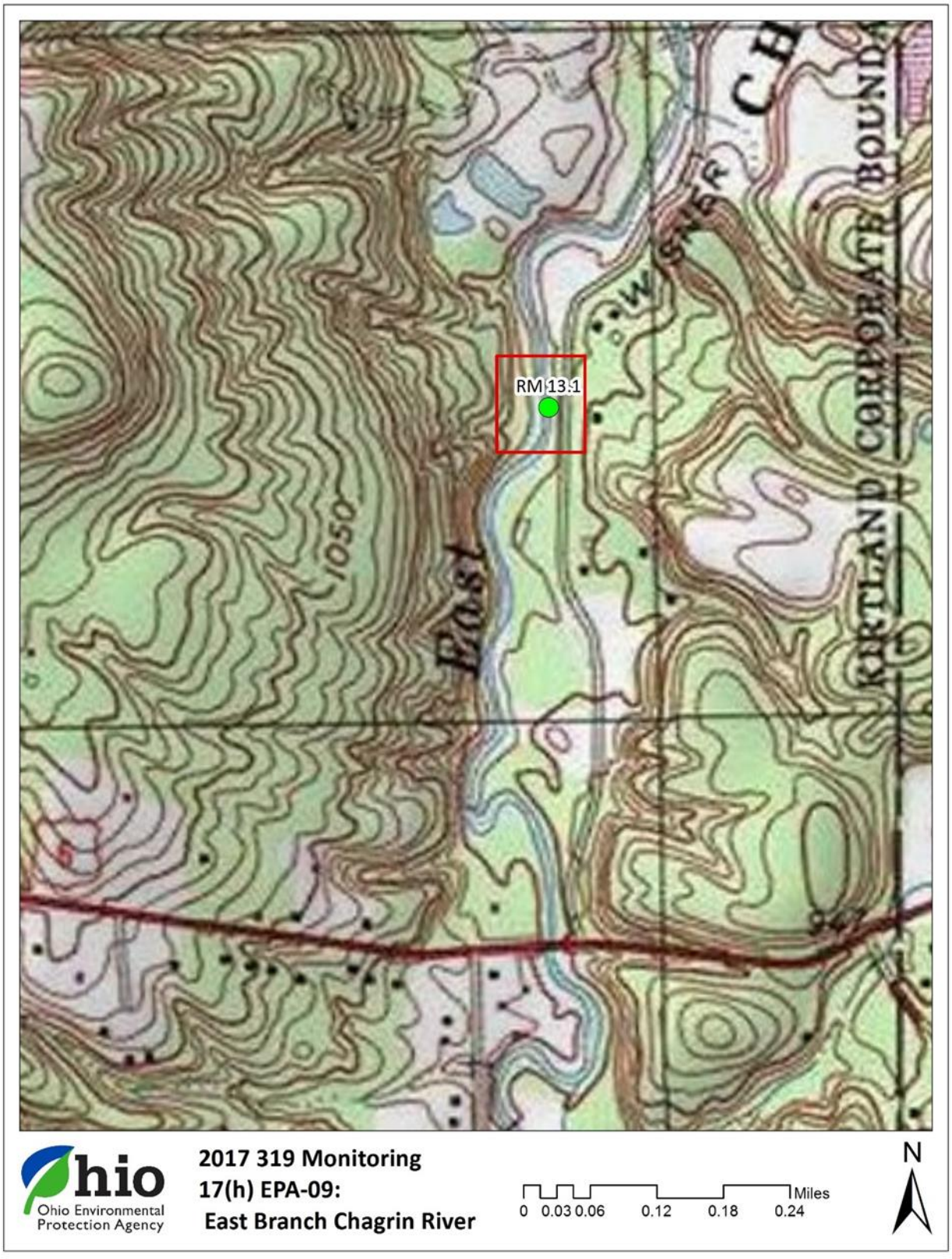

Figure 18 – East Branch Chagrin River sampling location.

Chagrin River Streambank Stabilization & Riparian Restoration

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-10
Stream Sampled: Chagrin River

Summary

Completion of this project will stabilize a badly eroding and highly degraded, 250-foot segment of the Chagrin River adjacent to the Village's municipal wastewater treatment plant (301 Meadow Lane). Site observations include a 90-degree bend at the location of bank failure, in which the stream flows with high energy into the bank during high-flow conditions, destabilizing soils overlaying the bedrock, and the presence of highly erodible Tioga loam along the streambank, which tends to wash away or slough when saturated. The Section 319 funding will be used to leverage local funds and fully complete the restoration construction, which will stabilize a severely eroding streambank, reduce sediment pollution and improve stream habitat in the 250 linear foot reach and restore 0.4 acres of riparian area with native trees and shrubs. The project will be shovel-ready as substantial design and all permitting will have been completed as part of the 2016 preliminary work. This project is being implemented consistent with recommendations within the Beaver Creek-Chagrin River TMDL and/or state-endorsed Watershed Action Plan.

Specifically, the project will include:

- Restore 250 linear feet of flood plain
- Restore 250 linear feet of stream channel
- Install three in-stream habitat structures
- Restore 250 linear feet of streambank using bio-engineering
- Restore 250 linear feet of streambank by re-contouring or regrading
- Stabilize 250 linear feet of streambank using bio-engineering
- Remove/treat 0.4 acre of invasive species
- Plant 0.4 acre of trees, shrubs and/or life stakes in riparian areas
- Conduct project-specific public education and outreach including developing fact sheets and press releases, creating/maintaining a website, conducting tours and giving presentations/annual reports

The Chagrin River was sampled within the project area. The fish and macroinvertebrate communities were in full attainment of the designated Warmwater Habitat (WWH) aquatic life use with exceptional evaluations (Tables 42 & 43, Figure 19).

Table 41 — Aquatic Life Use Attainment – Chagrin River, 2018.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, Chagrin River is Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb	ICI	QHEI	Narrative Assessment Fish/Macroinvertebrates
Chagrin River – WWH						
RM 28.6^{W} (60.0)	FULL	52	9.1	48	80.5 (Excellent)	Exceptional/Exceptional

Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)	
Index – Site Type	WWH
IBI: Wading	38
MIwb: Wading	7.9
ICI	34

H Wading electrofishing site.

* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units). Underlined scores are in the poor or very poor range.

\- No sample taken.

Table 42 — Chagrin River sampling location, 2018.

River Mile	Station ID	Latitude	Longitude	Sampling Location
28.6	303833	41.421919	-81.40004	Upstream Chagrin Falls WWTP, adjacent WWTP

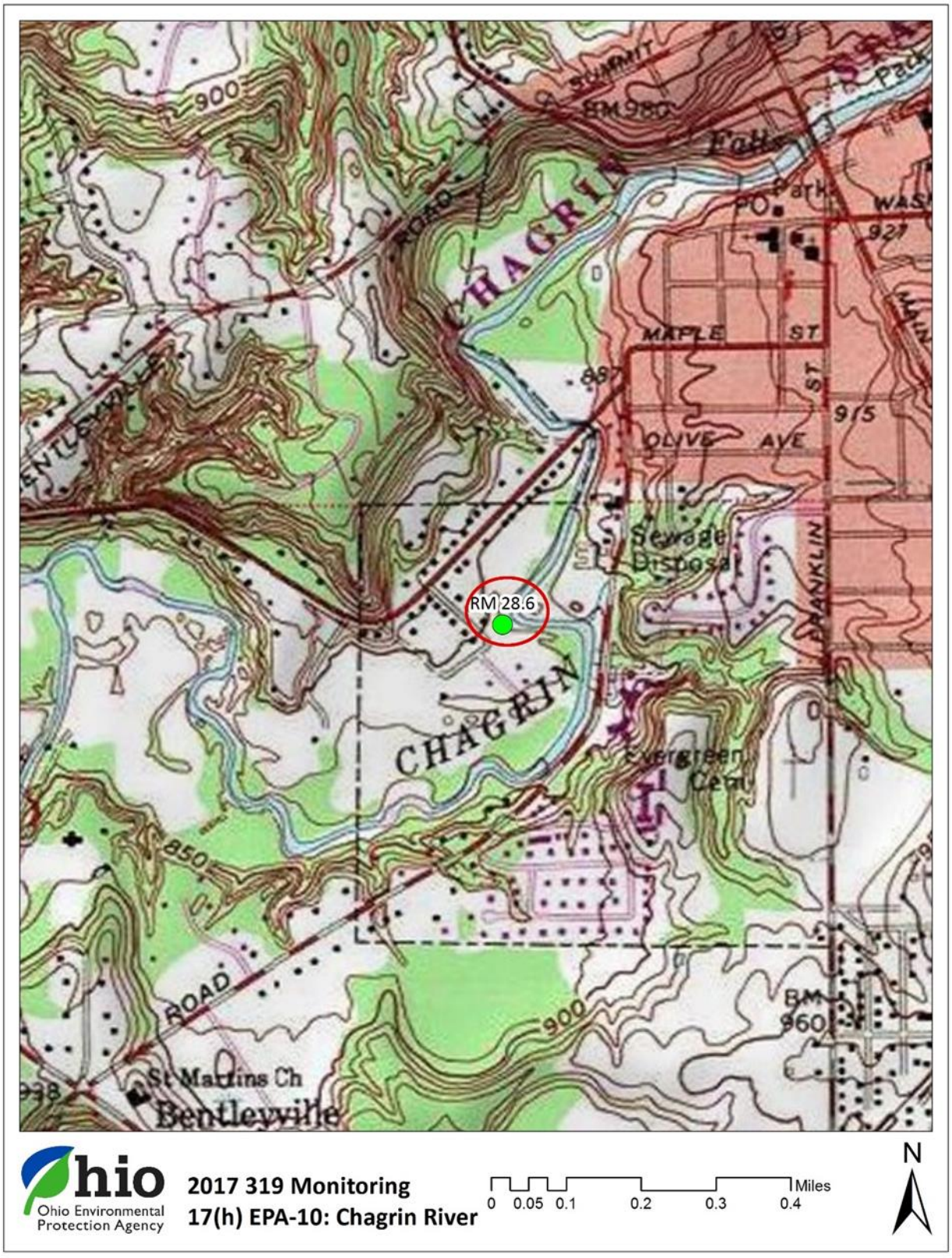

Figure 19 – Chagrin River sampling location.

Dysart[1] Run Stream Restoration Project	*Pre-Project Baseline Monitoring* Project Number: 17(h)EPA-12 Stream Sampled: Dysar Run

Summary

Completion of this project will address siltation and nutrient problems in this tributary to Blacklick Creek by installing modified cross vain structures and anchored wood structures into the 1,300 linear feet of stream.

Specifically, the project will include:

- Restoration of 1,100 linear feet of the West Creek using natural channel design methods including log cribs, live branch layering, log weirs, live staking and others.
- Restoration of eight acres of riparian wetlands and two acres of vernal pools.
- Restoration of riparian forested areas using plantings of 7,000-10,000 native tree seedlings and shrubs.
- Restoration of two acres of wetlands and riparian forested areas using plantings with native hardwood tree species.

Dysar Run was sampled within the project area. The biological communities were partially attaining the designated Warmwater Habitat (WWH) aquatic life use with good fish and fair macroinvertebrate evaluations (Tables 44 & 45, Figure 20).

Table 43 — Aquatic Life Use Attainment – Dysar Run, 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Eastern Corn Belt Plains ecoregion. In the Ohio Water Quality Standards, Dysar Run is Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Dysar Run – WWH						
RM 3.03[H] (1.3)	PARTIAL	42	-	F*	76.5 (Excellent)	Good/Fair

Ecoregion Biocriteria: Eastern Corn Belt Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	36

a MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.

b Narrative evaluation used in lieu of ICI when score not available (F-Fair).

H Headwater electrofishing site.

- No sample taken.

* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

Table 44 — Dysar Run sampling location, 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
3.03	303834	39.999016	-82.786947	Downstream Crete Lane, upstream RR

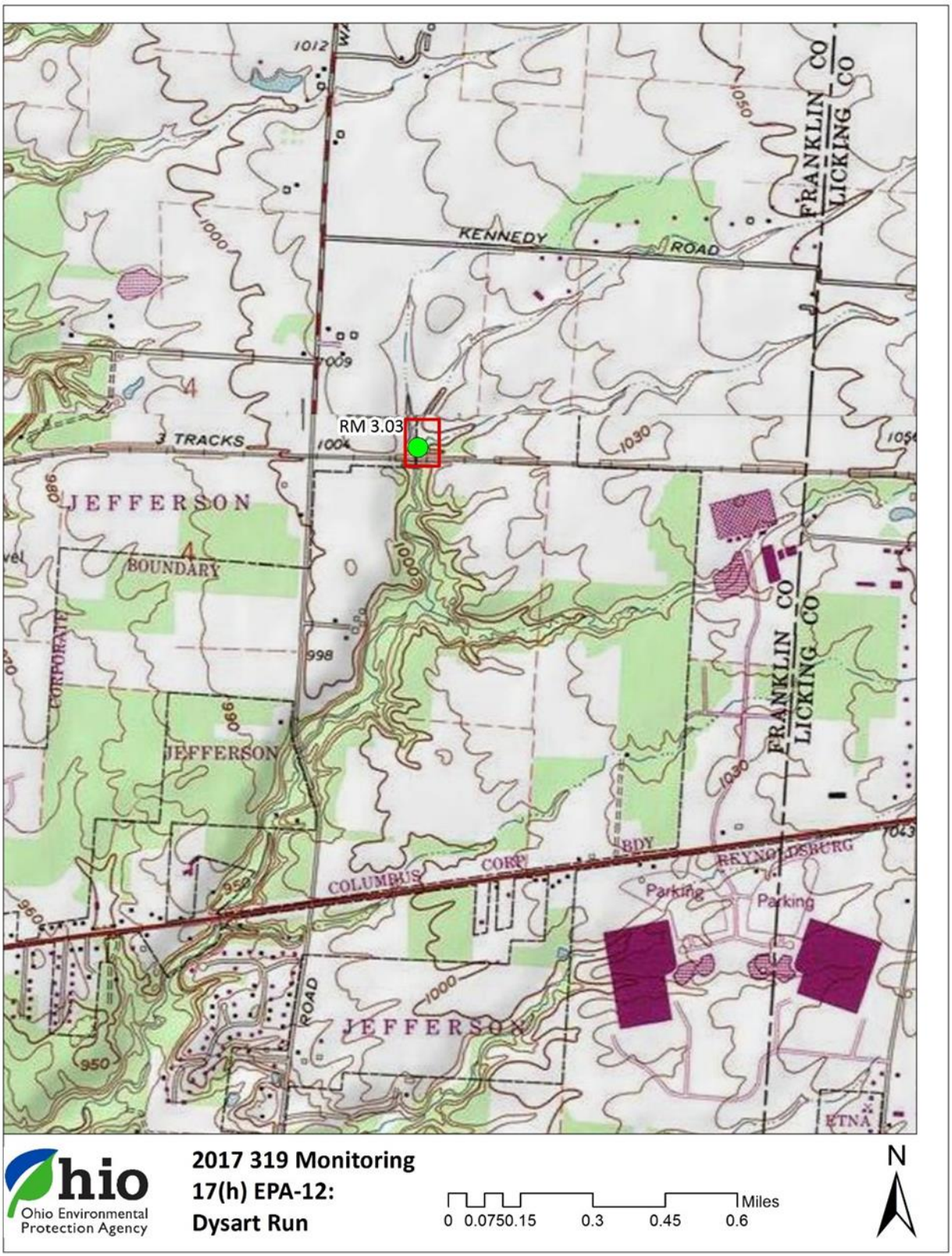

Figure 20 – Dysar Run sampling location.

Pond Brook Phase 3 Stream Restoration

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-14
Stream Sampled: Pond Brook

Summary

Completion of this project will return Pond Brook and its tributaries to functional streams with accessible floodplains and to provide an ecosystem that will meet the Warmwater Habitat water quality criteria by restoring 2,400 linear feet of floodplain, restoring 7,362 linear feet of stream channel and natural flow, by removing/treating 10.5 acres of invasive species, and by planting 10.5 acres of trees, shrubs and/or live stakes in riparian areas.

Specifically, the project will include:

- Restore 2,400 linear feet of floodplain
- Restore 7,362 linear feet of stream channel and natural flow
- Remove/treat 10.5 acres of invasive species
- Planting 10.5 acres of trees, shrubs and/or live stakes in riparian areas
- Conduct project-specific public education and outreach including developing fact sheets, press releases and newsletters, creating/maintaining websites, installing project sign, developing displays, conducting workshops and conducting field days

Pond Brook was sampled within the project area. The biological communities were fully attaining the designated Modified Warmwater Habitat (MWH) aquatic life use with poor fish and fair macroinvertebrate evaluations (Tables 46 & 47, Figure 21).

Table 45 — Aquatic Life Use Attainment – Pond Brook, 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, Pond Brook is Modified Warmwater Habitat (MWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Pond Brook – MWH						
RM 1.3[H] (15.7)	FULL	24	-	F	51.0 (Fair)	Poor/Fair

Ecoregion Biocriteria: Erie/Ontario Lake Hills and Plains	
Index – Site Type	MWH
IBI: Headwater	24
ICI	22

a MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.

b Narrative evaluation used in lieu of ICI when score not available (F-Fair).

H Headwater electrofishing site.

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

- No sample taken.

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

Table 46 — Pond Brook sampling location, 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
1.3	303835	41.303634	-81.399803	Downstream SR 82

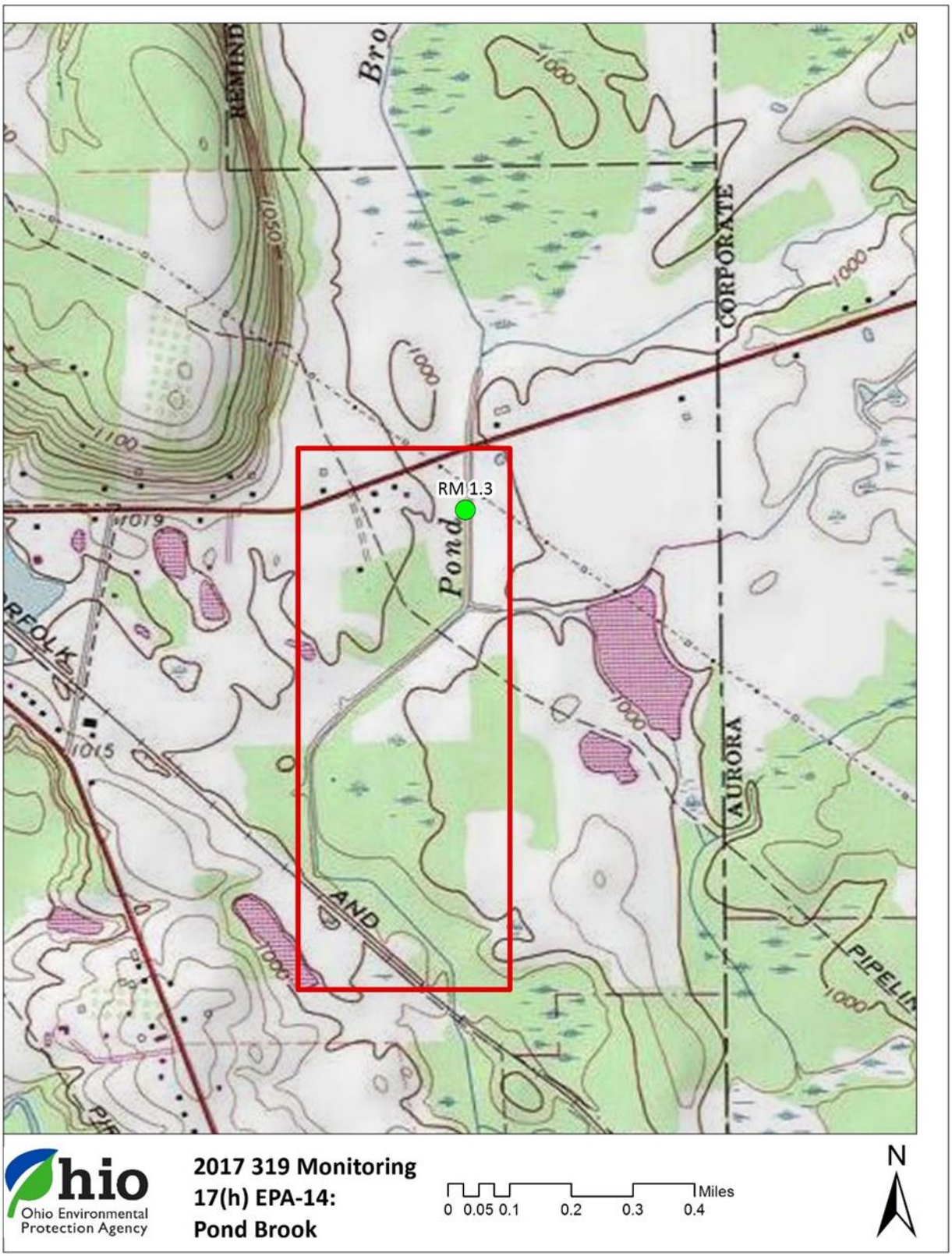

Figure 21 – Pond Brook sampling location.

A Link in the Chain - Restoring the Upper East Branch at Royalton Farms

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-15
Stream Sampled: East Branch Rocky River

Summary

Completion of this project will restore this reach to a natural, stable channel, increasing floodplain connectivity, and adding riparian and wetland vegetation, resulting in an increase in QHEI score from 47.5 to 70.

Specifically, the project will include:

- Regrade1,600 linear feet of streambank to achieve a more stable angle
- Vegetate 1,600 linear feet of streambank using live stakes, branch layering matting and/or seeding
- Add in-stream structures such as log vanes, root wads and/or rock riffles and weirs to control grand and enhance habitat along the 800 linear foot of project reach
- Excavate and vegetate a new ~0.3 acre floodplain area adjacent to the channel (excavated soil will be spoiled on site)
- Establish a forested riparian buffer along the project reach (one acre total)
- Conduct public education and outreach by developing fact sheets and newsletters, create/maintain website, and install project sign, and conduct tours

East Branch Rocky River was sampled within the project area. The macroinvertebrate community was not meeting the Warmwater Habitat (WWH) expectation with a fair evaluation (Tables 48 & 49, Figure 22).

Table 47 — Aquatic Life Use Attainment – East Branch Rocky River, 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, East Branch Rocky River *is Warmwater Habitat (WWH).*

River Mile (drainage mi²)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
East Branch Rocky River – WWH						
RM 35.5 (1.4)	(NON)	-	-	F*	-	- / Fair

Ecoregion Biocriteria: Erie/Ontario Lake Hills and Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	34

a MIwb is not applicable to headwater streams with drainage areas < 20 mi².

b Narrative evaluation used in lieu of ICI when score not available (F-Fair).

- No sample taken.

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

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

Table 48 — East Branch Rocky River sampling location, 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
35.5	303836	41.300135	-81.721531	Royalton Farms

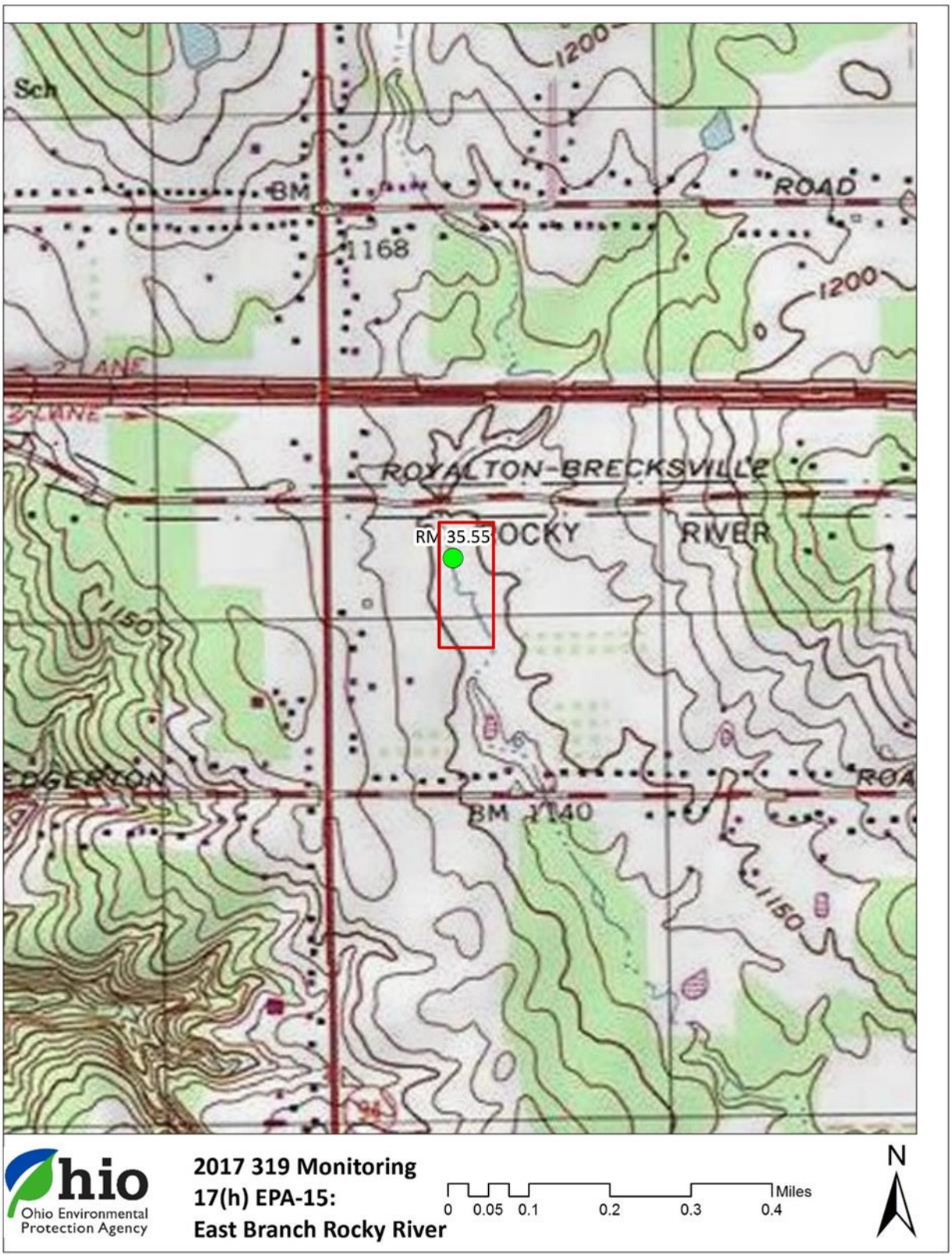

Figure 22 – East Branch Rocky River sampling location.

Eckert Ditch Drinking Water Quality Improvements

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-17
Stream Sampled: Eckert Ditch

Summary

Completion of this project will modify the wetland floodplain adjacent to Eckert Ditch, as well as to re-install some artificial sinuosity via phosphorus sequestration passive-reactive barriers. The first goal is natural stream channel, flood plain expansion and riparian corridor. This work includes the removal of invasive species and installing appropriate native species, as well as improving wetland quality and detention time for the tributary before it enters Lake Rockwell Reservoir.

The second goal is to install, within the improved wetland area and stream channels, phosphorus removal structures which utilize alum sludge (aluminum sulfate, Al2(SO4)3x14H20) or another beneficial reuse material as the sorbent (i.e. binding material), here within referred to as 'the material'. Aluminum-based water treatment residuals (Al-WTRs) have a strong affinity to absorb phosphorus. Alum is the most commonly utilized coagulant in the USA. The generated waste product (Al-WTRs) is typically stockpiled, landfilled or discharged into municipal sewer systems. The cost to a utility to dispose of the Al-WTR wastes can be costly, a burden on a utility trying to stretch funding to pay for updating aged infrastructure as well as improving water treatment systems to stay compliant with ever increasing regulations. Finding methods of beneficial reuse of the Al-WTRs is essential, and if these reused materials can assist with prevention of nutrient loading into the source waters, the savings and benefit to the utility can become a measurable success.

Specifically, the project will include:

- Restore 1,000 linear feet of floodplain
- Install up to 20 erosion and sediment control structures
- Install up to 20 in-stream habitat structures
- Plant two acres of native grasses in riparian areas
- Stabilize 1,000 linear feet of streambank using bio-engineering
- Remove/treat two acres of invasive species
- Conduct public education and outreach by developing fact sheets, press releases and presentations, conducting public meetings, create/maintain websites, and conduct tours, field days and workshops

Eckert Ditch was sampled within the project area. The biological communities were not attaining the designated Warmwater Habitat (WWH) aquatic life use with fair fish and poor macroinvertebrate evaluations (Tables 50 & 51, Figure 23).

Table 49 — Aquatic Life Use Attainment – Eckert Ditch, 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, Eckert Ditch is Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Eckert Ditch – WWH						
RM 1.09[H] (8.0)	NON	30*	-	P*	41.0 (Poor)	Fair/Poor

Ecoregion Biocriteria: Erie/Ontario Lake Hills and Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	34

a MIwb is not applicable to headwater streams with drainage areas < 20 mi2.

b Narrative evaluation used in lieu of ICI (P-Poor).

H Headwater electrofishing site.

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

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

Table 50 — Eckert Ditch sampling location, 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
1.09	F01G19	41.1912	-81.2907	Dawley Road

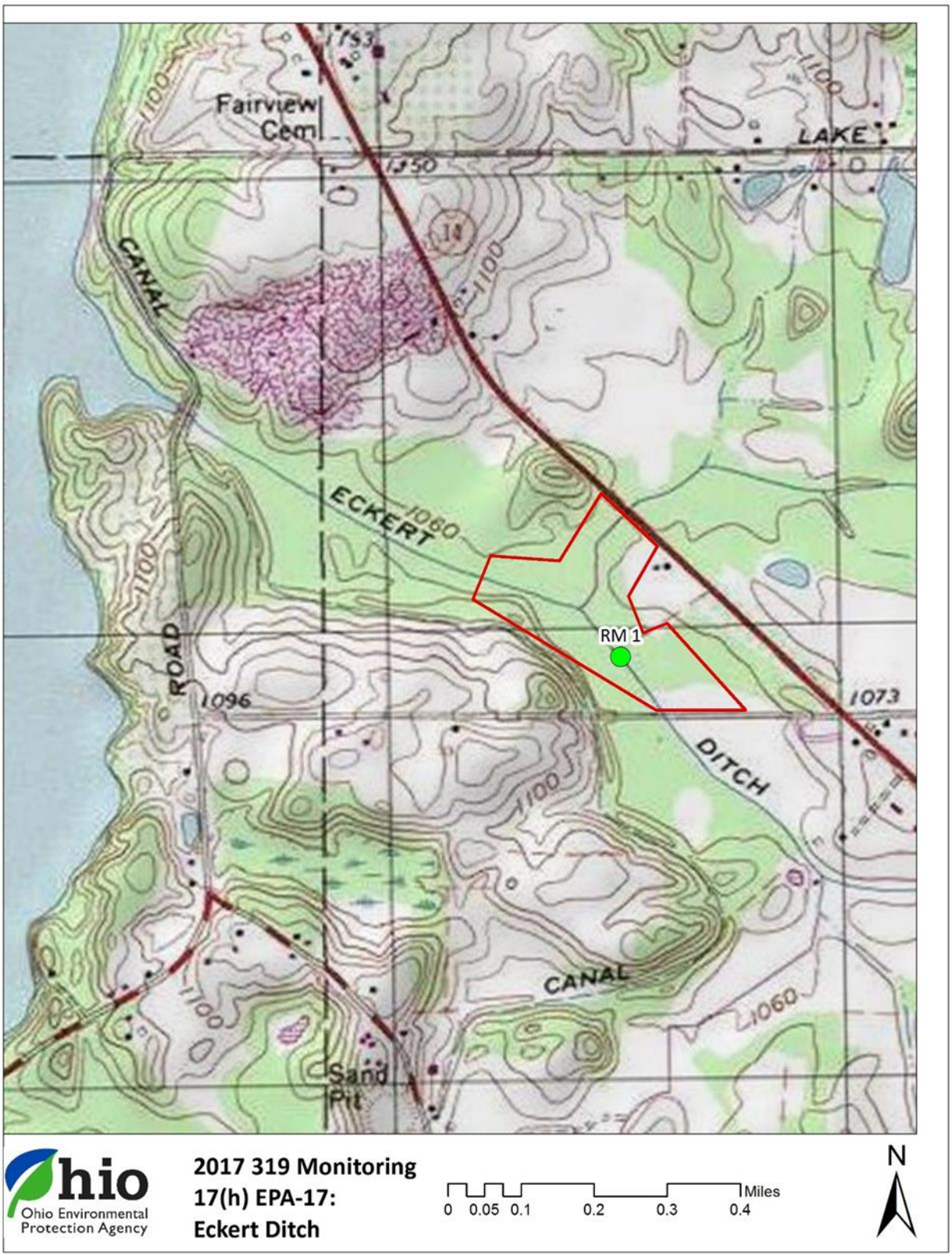

Figure 23 – Eckert Ditch sampling location.

Village Floodplain Restoration - Phase I

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-18
Stream Sampled: McKinley Creek

Summary

Completion of this project will restore 900 linear feet of floodplain and restore natural flow to McKinley Creek-Frontal Lake Erie, stabilize 1,800 linear feet of streambank using bio-engineering, and remove/treat 1.2 acres of invasive species and plant native grasses/trees/shrubs/live stakes in riparian areas.

Specifically, the project will include:

- Restore 900 linear feet of floodplain
- Restore 900 linear feet of natural flow
- Restore 1,800 linear feet of streambank using bio-engineering
- Restore 900 linear feet of streambank by re-contouring or regrading
- Plant 1.2 acres of native grasses in riparian areas
- Stabilize 1,800 linear feet of streambank using bio-engineering
- Remove/treat 1.2 acres of invasive species
- Plant 1.2 acres of trees, shrubs and/or live stakes in riparian areas
- Conduct public education and outreach by developing fact sheets, press releases and fliers, conduct public meetings, tours, stream clean-ups and workshops, create/maintain websites, and create displays

McKinley Creek was sampled within the project area. The biological communities were not attaining Warmwater Habitat (WWH) aquatic life use with poor fish and macroinvertebrate evaluations (Tables 52 & 53, Figure 24).

Table 51 — Aquatic Life Use Attainment – McKinley Creek 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb), and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is located in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, Blacklick Creek is Undesignated.

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
McKinley Creek – Undesignated[c]						
RM 0.8[H] (0.4)	NON	22*	-	P*	46.3 (Fair)	Poor/Poor

Ecoregion Biocriteria: Erie/Ontario Lake Hills and Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	364

a MIwb is not applicable to headwater streams with drainage areas < 20 mi2.

b Narrative evaluation used in lieu of ICI (P-Poor).

c Undesignated streams are evaluated with the WWH biocriteria.

H Headwater electrofishing site.

* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

Table 52 — McKinley Creek sampling location, 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
0.8	303837	41.807386	-81.109243	Townline Road

Figure 24 – McKinley Creek sampling location.

Valley Forge Headwater Stream Restoration

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-19
Stream Sampled: Tributary to Aurora Branch (RM 1.07, 1.71)

Summary

Completion of this project will restore 500 linear feet of a perennial headwater stream that is severely incising and contributing to riparian slope instability, channel erosion and water quality concerns in the McFarland Creek watershed.

Specifically, the project will include:

- Restore 500 linear feet of floodplain
- Restore 500 linear feet of stream channel
- Install five in-stream habitat structures
- Install six grade structures
- Restore 500 linear feet of streambank using bio-engineering
- Stabilize 500 linear feet of streambank using bio-engineering
- Plant 0.5 acre of trees, shrubs and/or live stakes in riparian areas
- Conduct public education and outreach by developing fact sheets and press releases, create/maintain websites, conduct tours and give presentations to CRWP Board of Trustees

Tributary to Aurora Branch (RM 1.07, 1.71) was sampled within the project area. The macroinvertebrate community was not meeting the Warmwater Habitat (WWH) expectation with a poor evaluation (Tables 54 & 55, Figure 25).

Table 53 — Aquatic Life Use Attainment – Tributary to Aurora Branch (RM 1.07, 1.71), 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, Tributary to Aurora Branch (RM 1.07, 1.71) is Undesignated.

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Tributary to Aurora Branch (RM 1.07, 1.71) – Undesignated[c]						
RM 0.25[H] (0.1)	(NON)	-	-	P*	47.5 (Fair)	- / Poor

Ecoregion Biocriteria: Erie/Ontario Lake Hills and Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	34

a MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.
b Narrative evaluation used in lieu of ICI (P-Poor).
c Undesignated streams are evaluated with the WWH biocriteria.
H Headwater electrofishing site.
* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).
ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).
- No sample taken.

Table 54 — Tributary to Aurora Branch (RM 1.07, 1.71) sampling location, 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
0.25	303832	41.393898	-81.416438	Downstream Liberty Road

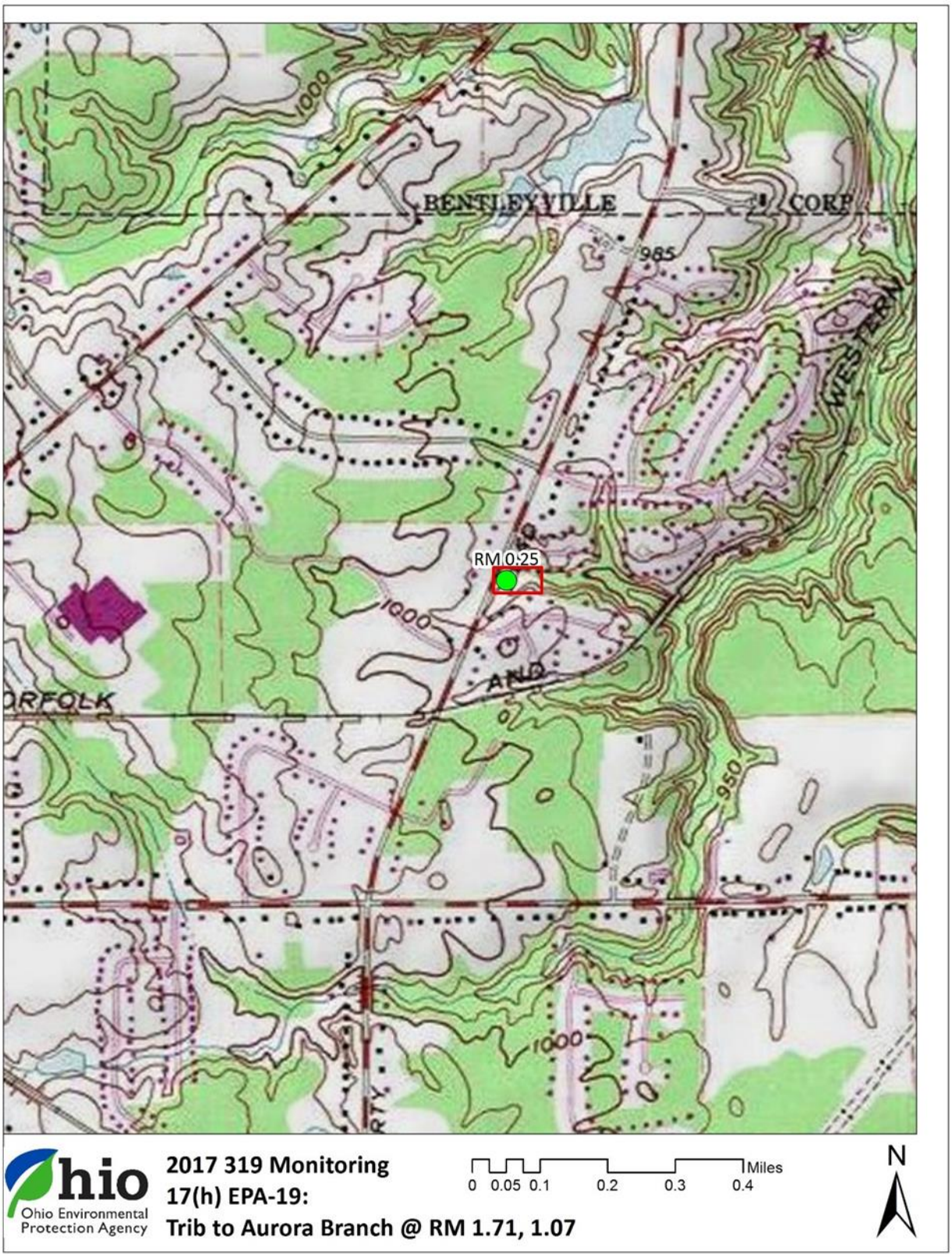

Figure 25 – Tributary to Aurora Branch (RM 1.07, 1.71) sampling location.

East Branch of Euclid Creek, School of Innovation Stream Restoration

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-20
Stream Sampled: East Branch Euclid Creek

Summary

Completion of this project will stabilize the eroding banks thus reducing downstream sedimentation, stabilize the stream bed, and improve in-stream and riparian habitat. The project will restore and stabilize 700 feet of stream channel, regrade and/or relocate and stabilize 1,600 feet of poor quality streambank using native plans and bio-engineering techniques. Also, 0.8 acre of existing degraded forest will be converted to native floodplain shrub land and native riparian forest; 3.3 acres of existing riparian forest will be enhanced; 0.6 acre will be treated for invasive plans and restored with natives; and 0.1 acre of wetland will be created and culvert improvement.

Specifically, the project will include:

- Restore 990 linear feet of floodplain
- Restore 700 linear feet of stream channel
- Install five in-stream habitat structures
- Restore 50 linear feet of natural flow
- Restore 1,600 linear feet of streambank using bio-engineering
- Remove/treat 0.6 acre of invasive species
- Plant 3.3 acres of trees, shrubs and/or live stakes in riparian areas
- Conduct public education and outreach by developing fact sheets, press releases and newsletters, conduct public meetings, create/maintain websites, install project signs and conduct tours.

East Branch Euclid Creek was sampled within the project area. The biological communities were not attaining the designated Warmwater Habitat (WWH) aquatic life use with fair fish and macroinvertebrate evaluations (Tables 56 & 57, Figure 26).

Table 55 — Aquatic Life Use Attainment – East Branch Euclid Creek, 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, East Branch Euclid Creek is Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
East Branch Euclid Creek – WWH						
RM 5.2[H] (1.4)	NON	30*	-	F*	62.5 (Good)	Fair/Fair

Ecoregion Biocriteria: Erie/Ontario Lake Hills and Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	34

a MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.

b Narrative evaluation used in lieu of ICI (F-Fair).

H Headwater electrofishing site.

ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).

- No Sample taken.

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

Table 56 — East Branch Euclid Creek sampling location, 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
5.2	303839	41.579957	-81.449893	From Chardon Road

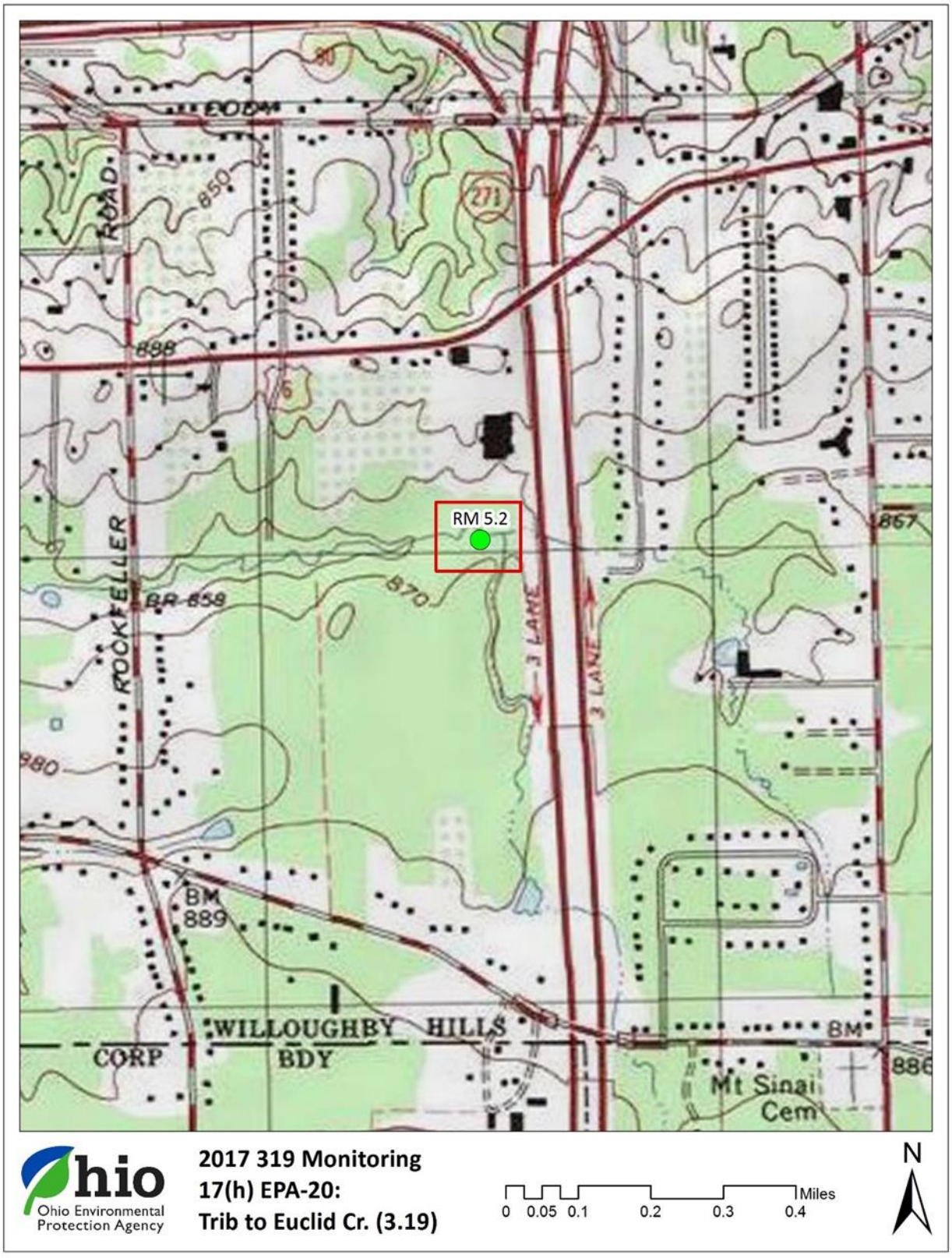

Figure 26 – East Branch Euclid Creek sampling location.

Gates Mills Village Center Chagrin River Restoration Project

Pre-Project Baseline Monitoring

Project Number: 17(h)EPA-21
Stream Sampled: Chagrin River

Summary

Completion of this project will stabilize 366 linear feet of the Main Branch of the Chagrin River and restore 0.13 acres of adjacent riparian area using a bio-engineered stream bank stabilization approach. The bio-engineered stabilization project will include the installation of approximately four bendway weirs to redirect the river thalweg toward the center of the channel to reduce near bank velocities and reduce the concentration of currents along the bank to minimize future erosion. The weirs will encourage a more natural re-building of the streambank through deposition, reduce further erosion into the river, and enhance in-stream habitat. The weirs will be keyed into the bank and live stakes will be interspersed in the bank to provide additional stabilization. Toe-rock protection will be installed across the 366 linear foot restoration area to provide additional stabilization. The bank will be graded to a more stable 2:1 or 3:1 slope where needed and planted with native, deep-rooted vegetation. The riparian area along this reach is currently dominated by invasive plant, common butterbur (*Petasites hybridus*). The large leaves shade out other vegetation, leaving bare earth beneath the plants. These plants will be removed as part of the restoration project. 0.13 acres of adjacent riparian area will be vegetated with native trees and shrubs, and floodplain and riparian seed mixes containing native grasses, sedges, and forbs. These plants will further stabilize the streambank, soak up stormwater runoff, and filter out pollutants. A one-year plant warranty will allow for the replacement of plants that do not successfully establish within the first growing season. The project design will protect existing native hard wood species such as large American sycamores (*Plantanus occidentalis*).

Specifically, the project included:

- Restore 366 linear feet of floodplain
- Restore 366 linear feet of stream channel
- Install four in-stream habitat structures
- Restore 0.065 acre of riparian area by removing/treating invasive plants
- Plant 0.13 acre of trees/shrubs/live stakes
- Restore/stabilize 366 linear feet of streambank using bio-engineering
- Conduct public education and outreach by developing fact sheets, press releases and newsletters, conducting meetings and creating/maintaining websites

The Chagrin River was sampled within the project area. The biological communities were attaining the designated Warmwater Habitat (WWH) aquatic life use with good fish and very good macroinvertebrate evaluations (Tables 58 & 59, Figure 27).

Table 57 — Aquatic Life Use Attainment – Chagrin River, 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie/Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards, Chagrin River is Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb	ICI	QHEI	Narrative Assessment Fish/Macroinvertebrates
Chagrin River – WWH						
RM 18.06[W] (163)	FULL	44	8.8	42	68.8 (Good)	Good/Very Good

Ecoregion Biocriteria: Erie/Ontario Lake Hills and Plains	
Index – Site Type	WWH
IBI: Wading	38
MIwb: Wading	7.9
ICI	34

W Wading electrofishing site.

Table 58 — Chagrin River sampling location, 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
18.06	D01P04	41.517731	-81.403418	Old Mill Road

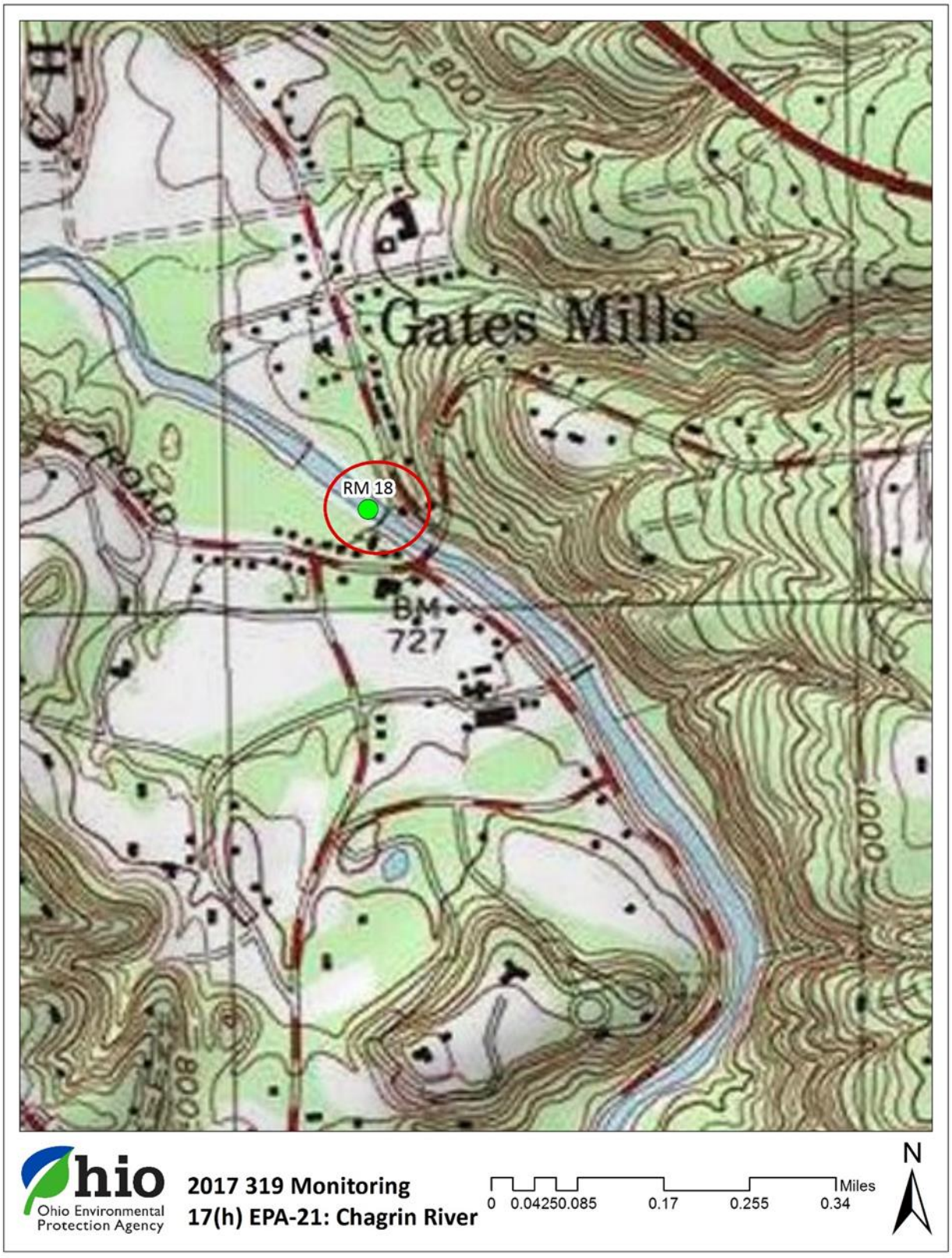

Figure 27 – Chagrin River sampling location.

Wildermuth Stream and Wetland Restoration

Post-Project Monitoring

Project Number: 10(h)EPA-25S
Stream Sampled: East Fork Mill Creek

Summary

Completion of this project restored 1,800 linear feet of the East Fork Mill Creek by installing in-stream grade control structures and enhanced the 22-acre Wildermuth floodplain wetland through contoured islands and planting of native vegetation. The project will alleviate extreme flood flows, reduce in-stream erosion and attenuate nutrient loads while broadening opportunities for the public to engage in wetland science and conservation.

Specifically, the project included:

- Restored 1,800 linear feet of the East Fork Mill Creek by installing in-stream grade control structures.
- Enhanced the 22-acre Wildermuth floodplain wetland through contoured islands and planting of native vegetation.
- Installation of in-stream structures to restore the stream profile, encourage floodplain access and reduce downstream flooding.
- Implementation of a detailed wetland and riparian restoration plan that enhances a variety of aquatic habitat types through invasive species control, native wetland plantings and riparian buffer habitat.
- Incorporation of conservation science activities and research among multiple stakeholders to build understanding of wetland ecosystem recovery.

Stream habitat and macroinvertebrate community health remained relatively similar before and after the restoration project with marginally good to good macroinvertebrate evaluations (Tables 60 & 61, Figure 28). The Fish community health remained similar at the upstream station with marginally good to good index scores but declined at the downstream station post-restoration from marginally good to poor.

Table 59 — Aquatic Life Use Attainment – East Fork Mill Creek, 2014 and 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream sites are in the Interior Plateau ecoregion. In the Ohio Water Quality Standards, the East Fork Mill Creek is Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
East Fork Mill Creek – WWH						
RM 1.85^{H} (8.1)-2017	FULL	36^{ns}	-	G	49.0 (Fair)	Marginally Good/Good
RM 1.85^{H} (8.1)-2014	FULL	40	-	MG^{ns}	51.3 (Fair)	Good/Marginally Good
RM 1.15^{H} (9.0)-2017	NON	<u>24</u>*	-	G	54.0 (Fair)	Poor/Good
RM 1.15^{H} (9.0)-2014	FULL	38^{ns}	-	G	50.8 (Fair)	Marginally Good/Good

Ecoregion Biocriteria: Erie- Interior Plateau	
Index – Site Type	WWH
IBI: Headwater	40
ICI	30

a MIwb is not applicable to headwater streams with drainage areas < 20 mi2.
b Narrative evaluation used in lieu of ICI (MG-Marginally Good, G-Good).
H Headwater electrofishing site.
ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).
- No sample taken.
* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units). Underlined scores are in the poor range.

Table 60 — East Fork Mill Creek sampling locations, 2014 and 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
1.85	600460	39.3133734	-84.4264152	Allen Road
1.15	301418	39.3038709	-84.4311918	Upstream Butler Co. Upper Mill Creek WWTP

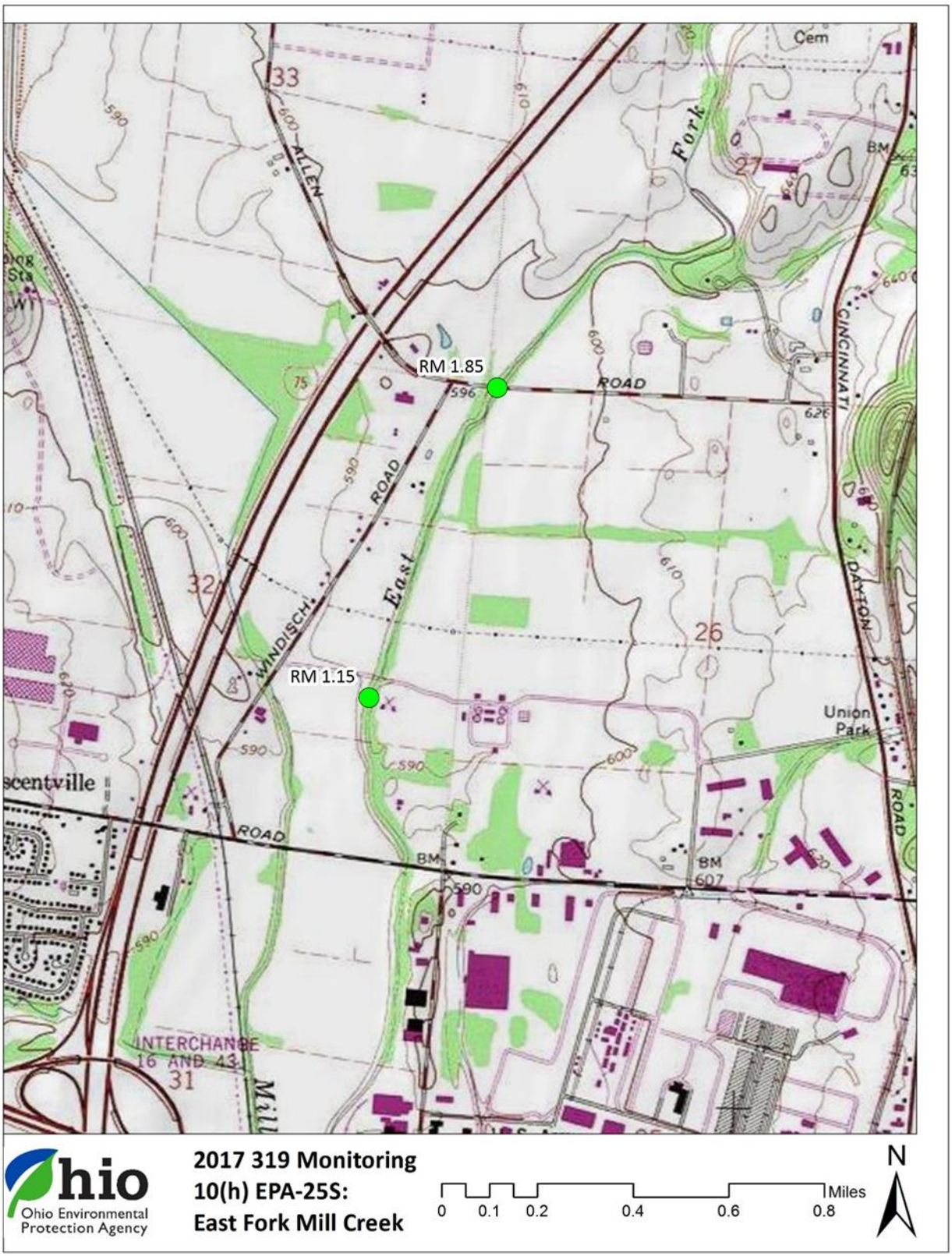

Figure 28 – East Fork Mill Creek sampling locations.

Sycamore Run Stream Restoration

Post-Project Monitoring

Project Number: 13(h)EPA-19
Stream Sampled: Sycamore Run

Summary

Completion of this project restored 1,011 linear feet of unstable stream channel and completed significant floodplain enhancements along Sycamore Run in the Rocky Fork Creek watershed. In addition, approximately 2.6 acres of native riparian tree, shrub and grass plantings were provided. This project will be preserved via transfer of 3.52 acres of conservation easement to the City of Gahanna. This project is being implemented consistent with the endorsed Rocky Fork Creek Watershed Action Plan & Inventory (January 2010) and the U.S. EPA approved (August 2005) Big Walnut Creek Watershed TMDL. NPS load reductions resulting from project include: Nitrogen – 141.4 lbs/year, phosphorus - 75.6 lbs/year, Total Suspended Solids - 75.6 tons/year.

Specifically, the project included:

- Restoration of 1,011 linear feet of unstable stream channel in Sycamore Run in the Rocky Fork Creek watershed
- Installation of six erosion and sediment control structures
- Installation of 11 in-stream habitat structures
- Installation of nine grade structures
- Planting of 2.6 acres of native riparian tree, shrub and grass plantings
- Acquired and transferred 3.52 acres of conservation easement to the City of Gahanna
- Created 0.28 acres of floodplain wetlands within buffer area

The biological communities improved within the project area from partial attainment of the biological criteria before the stream restoration to full attainment afterword. The physical habitat and fish community health remained similar while the macroinvertebrate community health improved from a fair to marginally good evaluation after the project (Tables 60 & 61, Figure 28).

Table 62 — Aquatic Life Use Attainment – Sycamore Run, 2013 and 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Eastern Corn Belt Plains ecoregion. In the Ohio Water Quality Standards, Sycamore Run is Undesignated.

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Sycamore Run – Undesignated[c]						
RM 1.5^H (0.6)-2017	FULL	50	-	MG^{ns}	72.8 (Excellent)	Exceptional/Marginally Good
RM 1.5^H (0.6)-2013	PARTIAL	46	-	F*	75.3 (Excellent)	Very Good/Fair

Ecoregion Biocriteria: Eastern Corn Belt Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	36

a MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.
b Narrative evaluation used in lieu of ICI (F-Fair, MG-Marginally Good).
c Undesignated streams are evaluated with the WWH biocriteria.
H Headwater electrofishing site.
* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).
ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).
- No sample taken.

Table 63 — Sycamore Run sampling location, 2013 and 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
1.5	302245	40.034279	-82.867142	Adjacent Sycamore Woods Condominiums

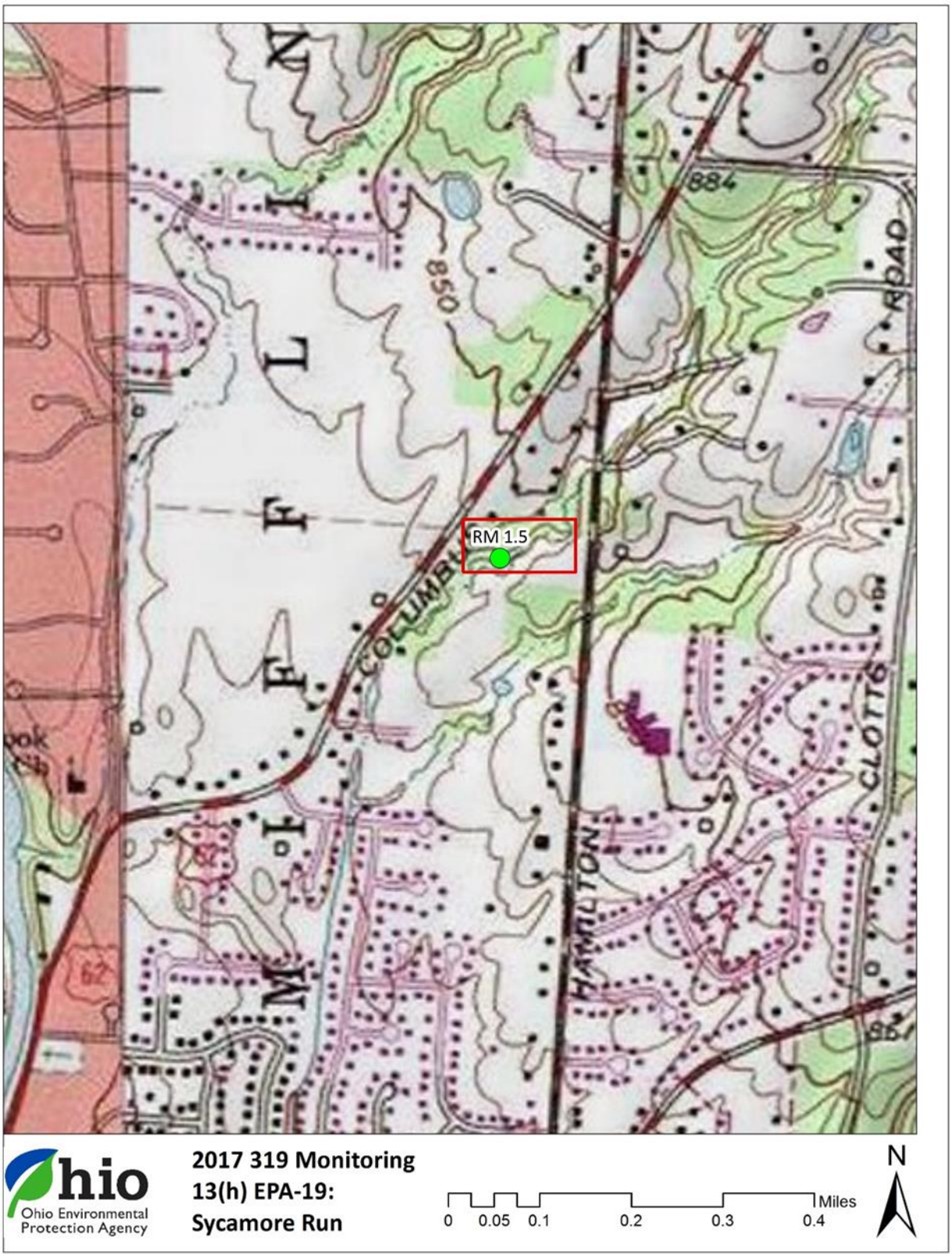

Figure 29 – Sycamore Run sampling location.

Clover Groff Run at Hilliard Municipal Park

Post-Project Monitoring

Project Number: 13(h)EPA-21
Stream Sampled: Clover Groff Run

Summary

Successful completion of this project restored 1,125 linear feet of stream channel in Clover Groff Run in the Big Darby Creek watershed. The existing over-wide linear channel was restored using natural channel design principles. Approximately 0.73 acre of floodplain wetland was also created along the restored reach of stream. The site will be preserved permanently via a conservation easement (5.59 acres) of which 5.29 acres will be restored with native grass, shrub and tree plantings. This project is located within the area covered by the Big Darby Accord Watershed Master Plan (June 2006) and the Hellbranch Run Watershed Action Plan (October 2006), and the U.S. EPA approved (January 2006) Big Darby Creek Watershed TMDL. NPS load reductions resulting from project include: Nitrogen - 158 lbs/year, phosphorus - 83 lbs/year, and Total Suspended Solids - 61 tons/year.

Specifically, the project included:

- Restoration of 1,125 linear feet of stream channel in Clover Groff Run
- Installation of six erosion and sediment control structures
- Installation of eight in-stream habitat structures
- Installation of eight grade structures
- Executed landowner contract to acquire 5.59 acres conservation easement
- Restoration of 5.29 acres with native grass, shrub and tree plantings

Fish and macroinvertebrate community quality remained relatively similar before and after the restoration project with fair fish and poor macroinvertebrate evaluations. Physical habitat conditions within the project area also remained relatively steady (very poor) between sampling years (Tables 64 & 65, Figure 30). The stream bed contained excessive siltation after the restoration project which should redistribute with time and be conducive to improved biological community quality.

Table 64 — Aquatic Life Use Attainment – Clover Groff Run, 2013 and 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Eastern Corn Belt Plains ecoregion. In the Ohio Water Quality Standards, Clover Groff Run is Modified Warmwater Habitat (MWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Clover Groff Run – MWH						
RM 7.0^H (3.2)-2017	NON	34	-	P*	25.5 (Very Poor)	Fair/Poor
RM 7.0^H (3.2)-2013	NON	28	-	P*	26.0 (Very Poor)	Fair/Poor

Ecoregion Biocriteria: Eastern Corn Belt Plains		
Index – Site Type	MWH	WWH
IBI: Headwater	24	40
ICI	22	36

a MIwb is not applicable to headwater streams with drainage areas < 20 mi^2.
b Narrative evaluation used in lieu of ICI (P-Poor).
H Headwater electrofishing site.
* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).
ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).
- No sample taken.

Table 65 —Clover Groff Run sampling location, 2013 and 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
7.0	203209	40.031514	-83.176556	Downstream Scioto-Darby Creek Road

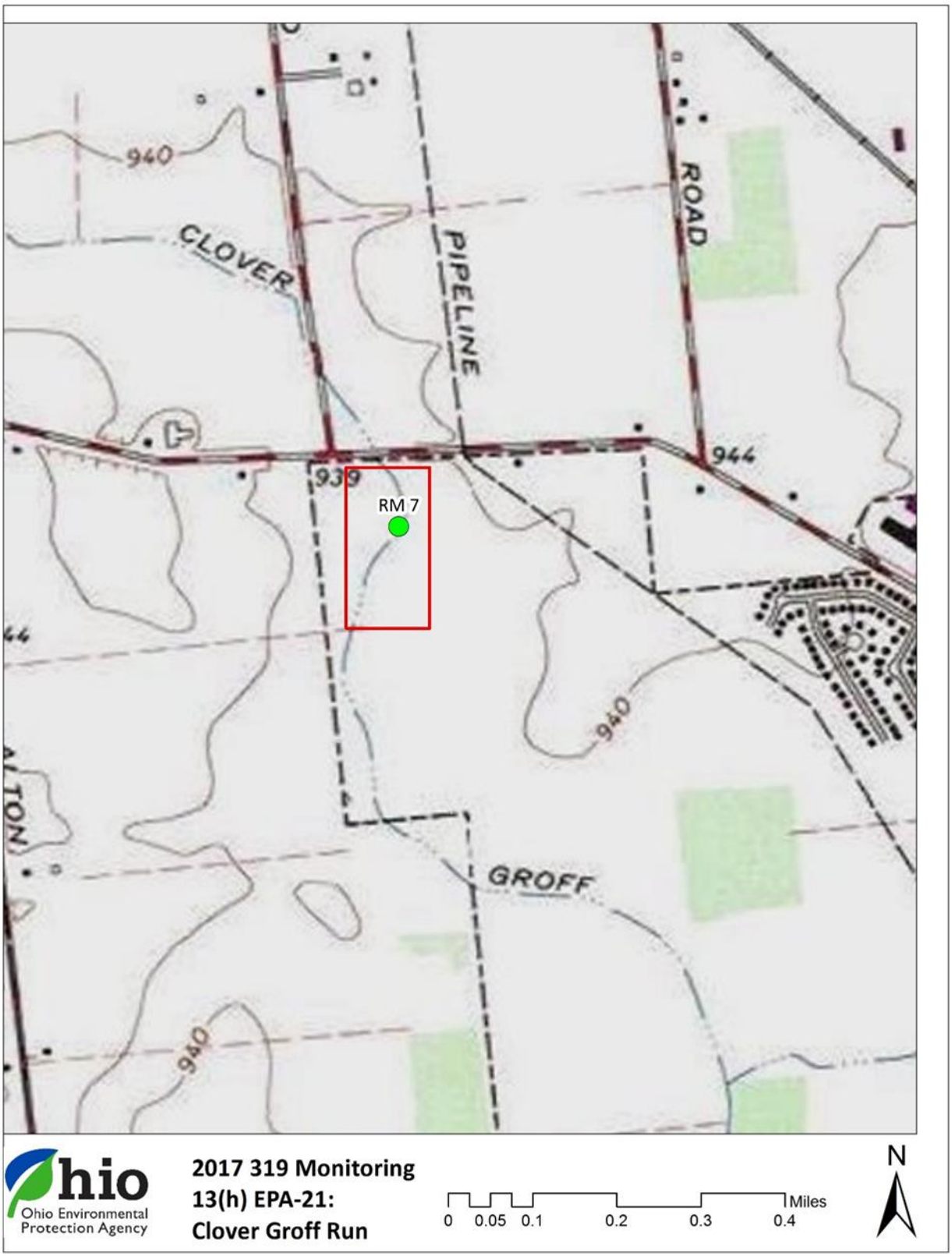

Figure 30 – Clover Groff Run sampling location.

St. Mary's Stream Restoration Project

Post-Project Monitoring

Project Number: 14(h)EPA-25
Stream Sampled: Hawthorne Creek

Summary

Completion of this project restored approximately 430 linear feet of severely eroding streambank and an acre of riparian habitat. It reduced harmful nutrients and sediment from entering Hawthorne Creek, bringing it significantly closer to achieving attainment of WWH water quality standards.

Specifically, the project included:

- Restored 430 linear feet of stream channel and floodplain
- Installed two erosion and sediment control structures
- Stabilized 430 linear feet of streambank using bio-engineering
- Planted one acre of trees, shrubs and/or live stakes in riparian areas
- Provided project-specific public education and outreach using fact sheets, websites, newsletters and presentations

Fish and macroinvertebrate community quality remained relatively similar before and after the restoration project. The biological communities were in non-attainment of the WWH aquatic life use with poor to fair evaluations (Tables 66 & 67, Figure 31). QHEI scores within the project area also remained relatively steady between sampling years.

Table 66 — Aquatic Life Use Attainment – Hawthorne Creek 2014 and 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie-Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards Hawthorne Creek is Warmwater Habitat (WWH).

River Mile (drainage mi²)	Attainment Status	IBI	MIwb[a]	ICI[b]	QHEI	Narrative Assessment Fish/Macroinvertebrates
Hawthorne Creek – WWH						
RM 2.8[H] (5.3)-2017	NON	24*	-	LF*	58.0 (Good)	Poor/Low Fair
RM 2.8[H] (5.3)-2014	NON	30*	-	P*	66.5 (Good)	Fair/Poor

Ecoregion Biocriteria: Erie-Ontario Lake Hills and Plains	
Index – Site Type	WWH
IBI: Headwater	40
ICI	34

a MIwb is not applicable to headwater streams with drainage areas < 20 mi².
b Narrative evaluation used in lieu of ICI (P-Poor, LF-Low Fair).
H Headwater electrofishing site.
* Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units).
ns Indicates nonsignificant departure from applicable biocriteria (<4 IBI or ICI units or <0.5 MIwb units).
- No sample taken.

Table 67 — Hawthorne Creek sampling location, 2014 and 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
2.8	302669	41.4046	-81.487	Upstream Aurora Road

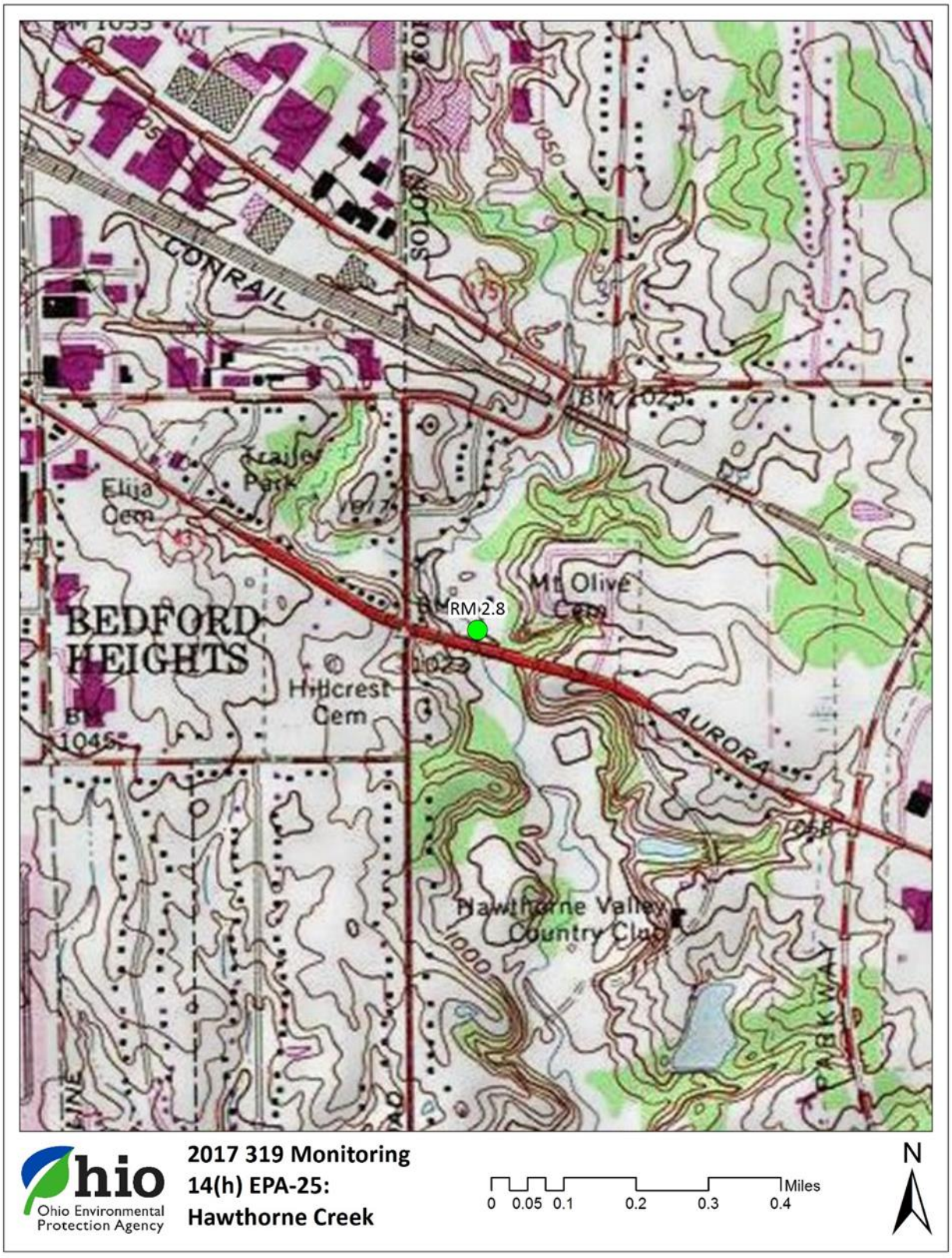

Figure 31 – Sampling location on Hawthorne Creek.

Lakewood Streambank Restoration and Fish Shelf

Post-Project Monitoring

Project Number: 15(h)EPA-18
Stream Sampled: Rocky River

Summary

Completion of this project restored and stabilized approximately 350 linear feet of streambank. Restoration included planting native riparian vegetation including trees and the inclusion of a fish shelf. The water quality and aesthetic quality of the main stem of the Rocky River will be tested for improvement when samples are tested at the next TMDL report update.

Specifically, the project included:

- Installation of one in-stream habitat structures
- Restoration of 350 linear feet of streambank using bio-engineering
- Restoration of 350 linear feet of streambank by recontouring or regrading
- Planted 0.38 acre of trees, shrubs and/or live stakes in riparian areas

Fish and macroinvertebrate community quality remained relatively similar before and after the restoration project. The biological communities were in full attainment of the WWH aquatic life use with good to exceptional evaluations (Tables 68 & 69, Figure 32).

Table 68 — Aquatic Life Use Attainment – Rocky River 2014 and 2017.

The Index of Biotic Integrity (IBI), Modified Index of Well-being (MIwb) and Invertebrate Community Index (ICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. The stream site is in the Erie-Ontario Lake Hills and Plains ecoregion. In the Ohio Water Quality Standards Rocky River is Warmwater Habitat (WWH).

River Mile (drainage mi^2)	Attainment Status	IBI	MIwb	ICI	QHEI	Narrative Assessment Fish/Macroinvertebrates
Rocky River – WWH						
RM 1.8^W (292)-2017	FULL	44	8.5	42	74.8 (Good)	Good/Very Good
RM 1.8^W (292)-2014	FULL	41	8.8	46	72.5 (Good)	Good/Exceptional

Ecoregion Biocriteria: Erie-Ontario Lake Hills and Plains	
Index – Site Type	WWH
IBI: Wading	38
MIwb: Wading	7.9
ICI	34

W: Wading electrofishing site.

Table 69 — Rocky River sampling locations, 2014 and 2017.

River Mile	Station ID	Latitude	Longitude	Sampling Location
1.8	T01W03	41.4788	-81.8216	Upstream Lakewood WWTP

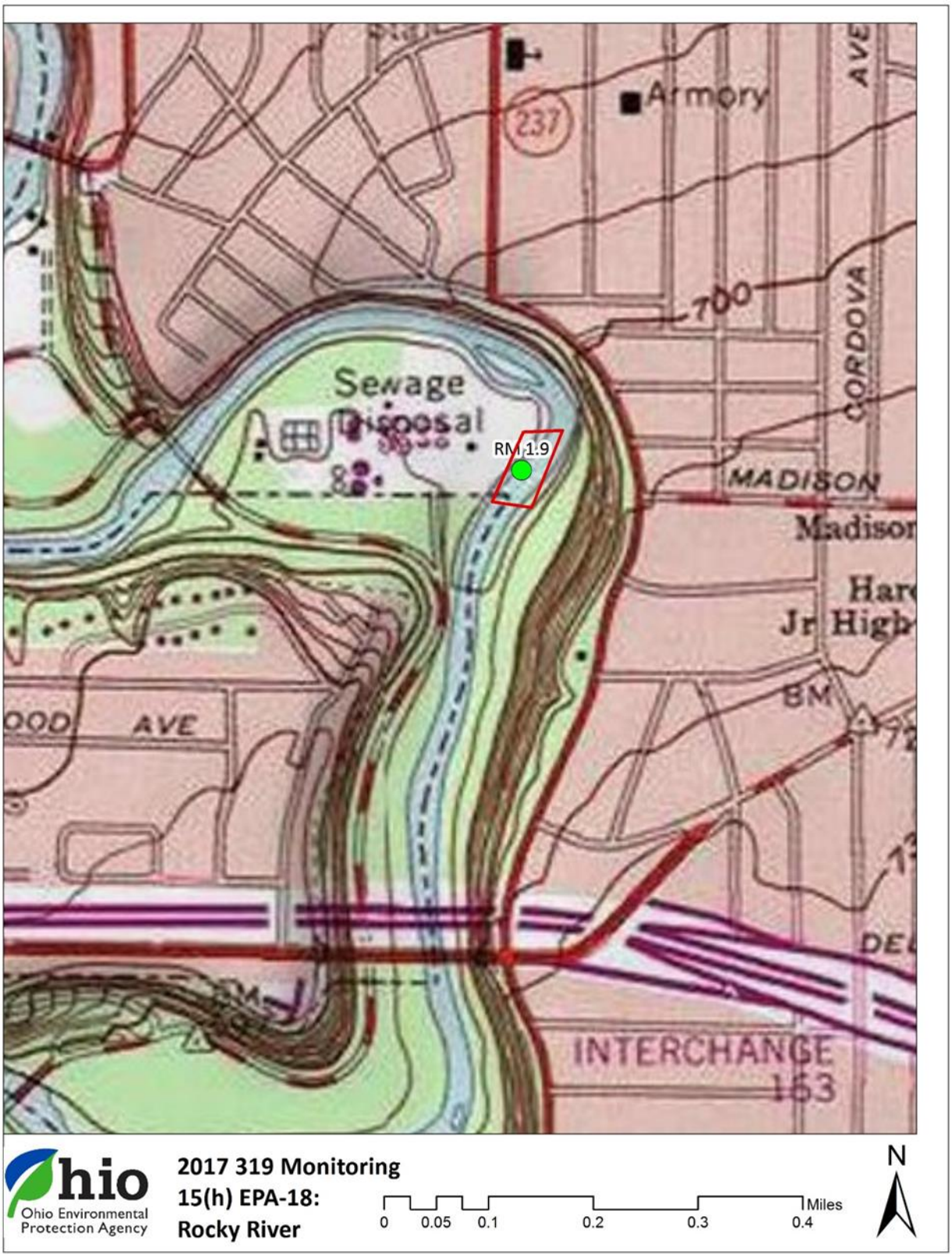

Figure 32 – Sampling location on the Rocky River.

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