April 2010

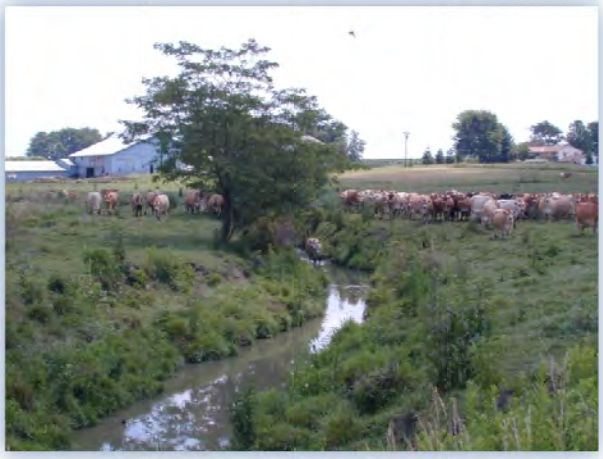
Ohio Environmental Protection Agency

Division of Surface Water

Biological and Habitat Studies: 7 River and Stream Projects

Year 2009 Section 319(h) Clean Water Act Grants

State of Ohio



Ted Strickland, Governor
Lee Fisher, Lt. Governor
Chris Korleski, Director

Biological and Habitat Studies

7 River and Stream Projects in Ohio

Year 2009 Section 319(h) Clean Water Act Grants

State of Ohio
April 9, 2010
OEPA Report EAS/2010-4-5

prepared for
State of Ohio Environmental Protection Agency
Division of Surface Water
Nonpoint Source Program
Lazarus Government Center
50 W. Town St., Suite 700
Columbus, Ohio 43215

prepared by
Ohio Environmental Protection Agency
Division of Surface Water
Ecological Assessment Section
4675 Homer Ohio Lane
Groveport, Ohio 43125

Ted Strickland, Governor
State of Ohio

Chris Korleski, Director
Environmental Protection Agency

INTRODUCTION

In 1987 the federal Clean Water Act amendments created a national program to control nonpoint source pollution (NPS), established under Section 319 of the Clean Water Act. Ohio EPA is the designated water quality agency responsible for administering the Ohio 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 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 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 FFY2008, the baseline and post-project monitoring was conducted by the subgrantees. Starting with FFY2008 approved Section 319 projects, all baseline and post-project environmental monitoring is being completed by the Ohio EPA, Ecological Assessment Section (EAS). Monitoring includes evaluating biological and physical habitat conditions. The following summaries in this report include baseline monitoring conducted at each FFY2009 project area during the summer and fall of 2009.

Detailed descriptions of each FFY2009 Section 319 project area are located on the Ohio EPA website http://www.epa.ohio.gov/portals/35/nps/319DOCS/FINAL%20FFY2009%20PROJECT%20SUMMARIES.pdf. Biological monitoring results are included on the Ohio EPA, Division of Surface Water website at: http://wwwapp.epa.ohio.gov/dsw/gis/bio/index.php indexed under *2009 319 Projects (Pre-Project Monitoring)*.

Ohio Environmental Protection Agency

FFY2009 Section 319(h) Subgrant Projects

2009 Project Baseline Monitoring Areas

Project #	County	Project Title	Project Sponsor	Grant Amount
09(h)EPA-14	Summit	Furnace Run Restoration & Conservation Project	The Metro Parks Serving Summit County	$249,984
09(h)EPA-16	Greene	Little Miami River Restoration & Shawnee Creek Preservation	City of Xenia	$341,100
09(h)EPA-15	Hamilton	Mill Creek Confluence Wetlands Restoration and NPS Educational Project	Mill Creek Watershed Council of Governments	$317,420
09(h)EPA-17	Franklin	Village of New Albany Stream Restoration Project	Village of New Albany	$101,742
09(h)EPA-10	Washington	Wolf Creek Watershed 319 Project	Washington County SWCD	$138,790
09(h)EPA-07	Cuyahoga	Hudson High School/Tinker's Creek Stream Restoration Project	Cuyahoga County Board of Health	$329,208
09(h)EPA-13	Union	Marysville Town Run Restoration Project	City of Marysville	$322,434

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FURNACE RUN RESTORATION AND CONSERVATION PROJECT

Project Baseline Stream Monitoring

PROJECT NAME: FURNACE RUN RESTORATION & CONSERVATION
Project Baseline Stream Monitoring

PROJECT NUMBER: #09(h) EPA-14
STREAMS SAMPLED: Furnace Run

SUMMARY

Furnace Run is a headwater tributary to the Cuyahoga River in northwest Summit County. This project will use ecologically sound restoration practices to stabilize eroding portions and improve the hydraulic and ecological integrity of the stream. Successful completion of this project will result in the natural channel design restoration of approximately 1,500 linear feet of the Furnace Run mainstem. Restored segments completed under this project will be placed under a 5-acre conservation easement and protected in perpetuity. Current attainment with warmwater aquatic life uses is threatened at the proposed project sites. Successful completion of this project will improve habitat where major threats to attainment should be eliminated, thereby insuring continued attainment in the immediate area.

Six biological sites were sampled in Furnace Run during 2009. Five of the six sites were fully attaining the Warmwater Habitat (WWH)) aquatic life use. The most upstream site was partially attaining the WWH use during 2009, with the macroinvertebrate community reflective of fair water quality. Flashy stream flows and significant sediment bedload at RM 7.3 contributed to the reduced macroinvertebrate community. High quality habitats have been documented throughout Furnace Run, evidenced by excellent habitat scores at each sampling location (mean QHEI = 78.1). However, bank erosion is severe in some locations and the stream channel appears to be unstable with its course changing radically during most storm events. These effects associated with high flows during storm events threaten full attainment of the warmwater habitat use designation.

A 2006 study of Furnace Run can be found on the Ohio EPA website at:
http://www.epa.ohio.gov/portals/35/documents/FurnaceRunSurveyReport2007.pdf.

AQUATIC LIFE USE ATTAINMENT – FURNACE RUN 2009.

The Index of Biotic Integrity (IBI) 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 located in the Erie-Ontario Lake Plain (EOLP) ecoregion. In the Ohio Water Quality Standards, Furnace Run is designated Warmwater Habitat (WWH). Results from a 2006 study of Furnace Run are included.

Sample Site River Mile	Attainment Status	IBI	ICI[a]	QHEI	Biological Assessment
7.3	***FULL***	*45*	*44*	*80.5 (Excellent)*	*Year 2006: Good/ Very Good*
7.2	**PARTIAL**	42	Fair*	85.0 (Excellent)	Fair/Good
6.9	**FULL**	46	Marg. Good[ns]	80.0 (Excellent)	Marginally Good/ Very Good
6.5	***FULL***	*52*	*44*	*83.0 (Excellent)*	*Year 2006: Very Good/ Exceptional*
6.5	**FULL**	44	Marg. Good[ns]	81.0 (Excellent)	Marginally Good/ Good
1.1	**FULL**	42	38	74.0 (Excellent)	Good
0.9/0.8	**FULL**	44	Good	71.0 (Excellent)	Good
0.4	**FULL**	44	40	77.5 (Excellent)	Good

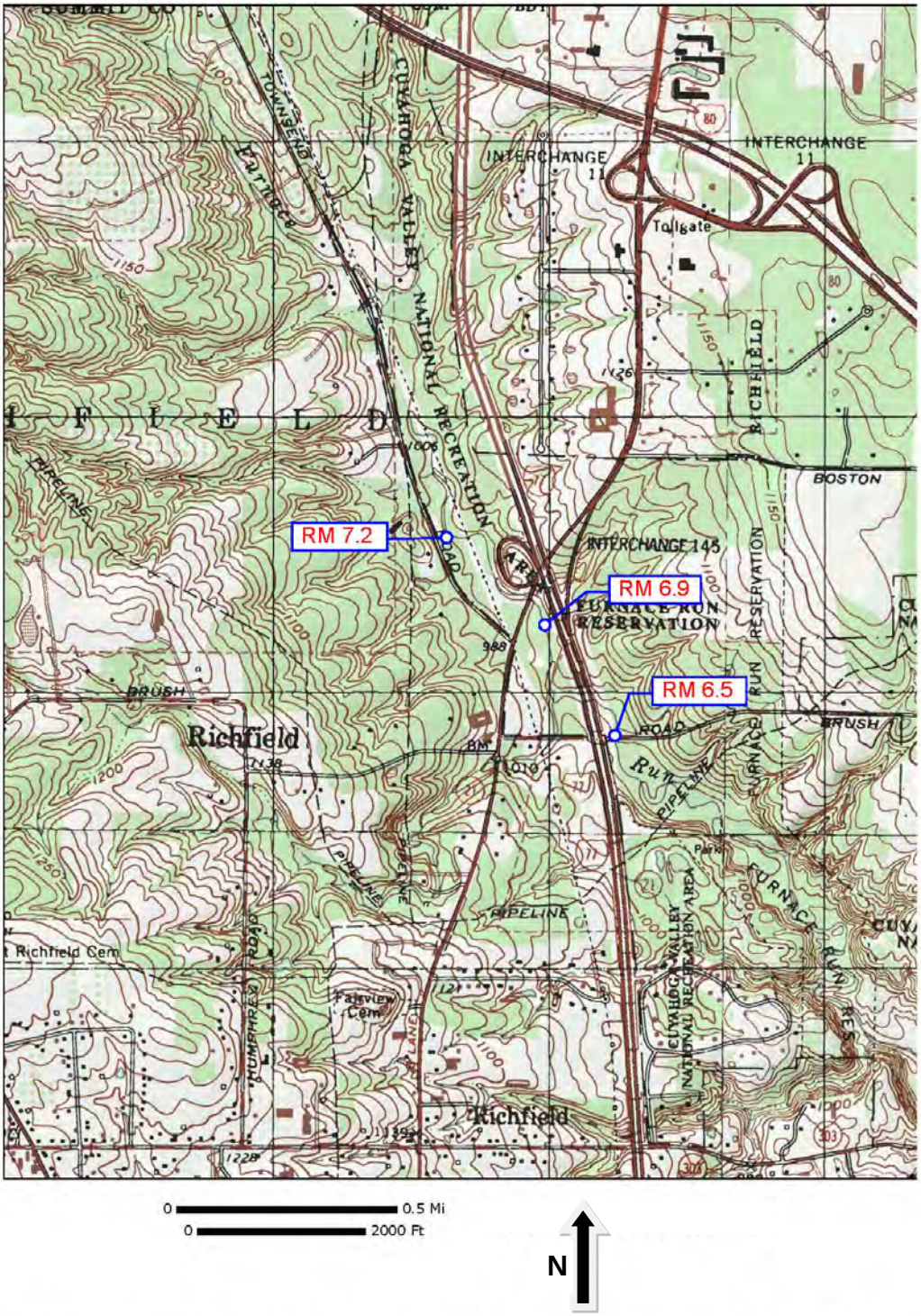
Ecoregion Biocriteria: Erie-Ontario Lake Plain (EOLP)		
INDEX – SITE TYPE	WWH	EWH
IBI: Headwaters	40	50
ICI	34	46

* Significant departure from biocriterion (>4 IBI or ICI units).
[ns] Non-significant departure from biocriterion (≤4 IBI or IC units).
[a] Narrative evaluation used in lieu of ICI.

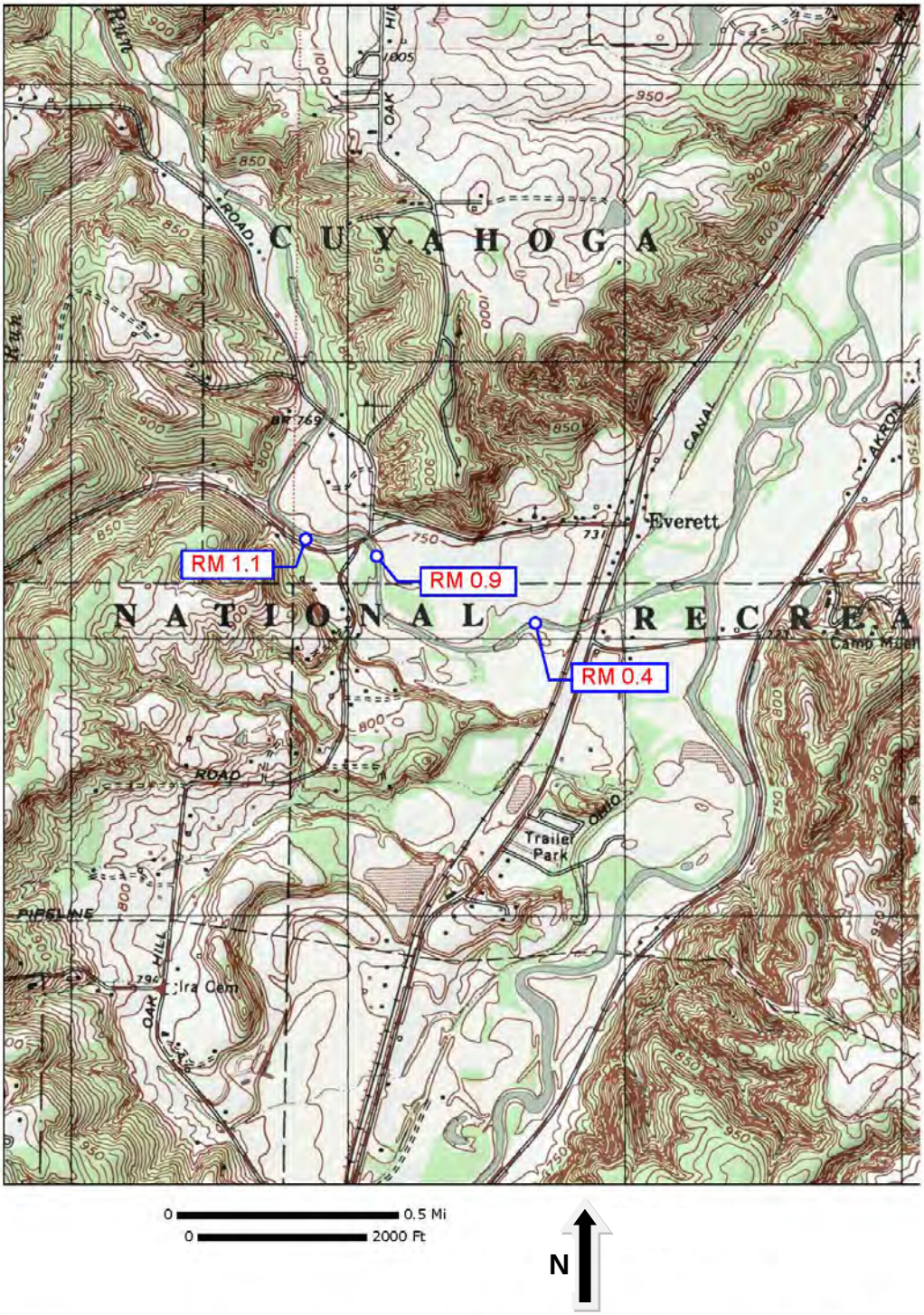
Sampling locations in the Furnace Run study area, 2009.

River Mile	Latitude	Longitude	Landmark
7.2	41.2597	81.6364	Adjacent Townsend Road, upstream Brecksville Road
6.9	41.2575	81.6330	Downstream Brecksville Road
6.5	41.2532	81.6295	Brush Road
1.1	41.2039	81.5862	Upstream Everett Road
0.9/ 0.8	41.2039	81.5836	Everett Road
0.4	41.2008	81.5760	Upstream RR bridge and Riverview Road

Furnace Run sampling sites, 2009



Furnace Run sampling sites, 2009



APPENDICES – FURNACE RUN STREAM RESTORATION

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores for Furnace Run.

Appendix Table 2. Index of Biotic Integrity (IBI) scores and metrics for Furnace Run.

Appendix Table 3. Ohio EPA fish results for Furnace Run.

Appendix Table 4. Invertebrate Community Index (ICI) scores and metrics for Furnace Run.

Appendix Table 5. Ohio EPA macroinvertebrate results for Furnace Run.

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores and physical attributes for fish sampling sites in Furnace Run, 2009.

Key QHEI Components

			WWH Attributes											MWH Attributes: *High Influence*						MWH Attributes: *Moderate Influence*														
River Mile	QHEI	Gradient (ft/mile)	No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max. Depth >40 cm	Low-Normal Riffle Embeddedness	**Total WWH Attributes**	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/ No Cover	Max. Depth <40 cm (WD,HW sites)	**Total High Influence Attributes**	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent & Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	**Total Moderate Influence Attributes**	**(MWH H.I.+1)/ (WWH+1) Ratio**	**(MWH M.I.+1)/ (WWH+1) Ratio**
Furnace Run (19-020) Year: 2009																																		
7.2	**85.0**	27.78	■	■		■	■	■	■	■	■	■	9						0													0	0.10	0.10
6.9	**80.0**	40.00	■	■		■	■	■	■	■	■	■	9						0													0	0.10	0.10
6.5	**81.0**	26.32	■	■		■	■	■	■		■	■	8			◆			1		●								●			2	0.22	0.44
1.1	**74.0**	37.04	■	■		■	■	■	■	■	■	■	9						0													0	0.10	0.10
0.9	**75.0**	32.26	■	■		■	■	■	■		■		7						0		●								●	●		3	0.13	0.50
0.4	**77.5**	22.73	■	■		■	■	■	■	■	■	■	9						0													0	0.10	0.10

Appendix Table 2. Index of Biotic Integrity (IBI) metrics and scores for sampling locations in Furnace Run, 2009.

				Number of						Percent of Individuals						
River Mile	Type	Date	Drainage area (sq mi)	Total species	Minnow species	Headwater species	Sensitive species	Darter & Sculpin species	Simple Lithophils	Tolerant fishes	Omni-vores	Pioneering fishes	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI
Furnace Run - (19-020)																
Year: 2009																
7.20	E	09/01/2009	5.7	8(3)	3(3)	1(1)	1(1)	2(3)	3(3)	21(5)	11(5)	12(5)	26(3)	0.0(5)	798(5)	42
6.90	E	09/01/2009	5.9	12(3)	4(3)	3(3)	3(3)	3(3)	5(3)	26(5)	11(5)	17(5)	29(3)	0.0(5)	778(5)	46
6.50	E	09/01/2009	7.6	11(3)	4(3)	2(3)	2(1)	3(3)	4(3)	27(5)	8(5)	15(5)	33(3)	0.0(5)	1080(5)	44
1.10	E	09/01/2009	19.7	10(3)	5(3)	2(3)	2(1)	3(3)	5(3)	21(5)	3(5)	8(5)	21(1)	0.0(5)	1348(5)	42
0.90	E	08/20/2009	19.8	16(3)	7(5)	2(3)	2(1)	3(3)	6(3)	28(5)	10(5)	14(5)	26(3)	0.0(5)	659(3)	44
0.40	E	09/01/2009	19.9	14(3)	6(3)	2(3)	3(1)	4(3)	6(3)	11(5)	4(5)	6(5)	27(3)	0.0(5)	1928(5)	44

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table 3. Ohio EPA fish results from Furnace Run, 2009.

Species List

River Code: **19-020**	Stream: **Furnace Run**	Sample Date: **2009**
River Mile: **7.20**	Location:	Date Range: 09/01/2009
Time Fished: 1779 sec	Drainage: 5.7 sq mi	
Dist Fished: 0.15 km	Basin: Cuyahoga River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	54	108.00	10.74			
Western Blacknose Dace	N	G	S	T	6	12.00	1.19			
Creek Chub	N	G	N	T	33	66.00	6.56			
Central Stoneroller	N	H	N		278	556.00	55.27			
Largemouth Bass	F	C	C		3	6.00	0.60			
Green Sunfish	S	I	C	T	11	22.00	2.19			
Johnny Darter	D	I	C		14	28.00	2.78			
Rainbow Darter	D	I	S	M	104	208.00	20.68			
	Mile Total				503	1,006.00				
	Number of Species				8					
	Number of Hybrids				0					

River Code: **19-020**	Stream: **Furnace Run**	Sample Date: **2009**
River Mile: **6.90**	Location:	Date Range: 09/01/2009
Time Fished: 1203 sec	Drainage: 5.9 sq mi	
Dist Fished: 0.15 km	Basin: Cuyahoga River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	9	18.00	1.72			
White Sucker	W	O	S	T	56	112.00	10.69			
Western Blacknose Dace	N	G	S	T	24	48.00	4.58			
Creek Chub	N	G	N	T	52	104.00	9.92			
Redside Dace	N	I	S	I	2	4.00	0.38			
Central Stoneroller	N	H	N		237	474.00	45.23			
Largemouth Bass	F	C	C		1	2.00	0.19			
Green Sunfish	S	I	C	T	3	6.00	0.57			
Bluegill Sunfish	S	I	C	P	2	4.00	0.38			
Johnny Darter	D	I	C		33	66.00	6.30			
Rainbow Darter	D	I	S	M	101	202.00	19.27			
Fantail Darter	D	I	C		4	8.00	0.76			
	Mile Total				524	1,048.00				
	Number of Species				12					
	Number of Hybrids				0					

Species List

River Code: **19-020**	Stream: **Furnace Run**	Sample Date: **2009**
River Mile: **6.50**	Location: Brush Rd.	Date Range: 09/01/2009
Time Fished: 1200 sec	Drainage: 7.6 sq mi	
Dist Fished: 0.15 km	Basin: Cuyahoga River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	20	40.00	2.72			
White Sucker	W	O	S	T	61	122.00	8.29			
Western Blacknose Dace	N	G	S	T	44	88.00	5.98			
Creek Chub	N	G	N	T	76	152.00	10.33			
Silverjaw Minnow	N	I	M		8	16.00	1.09			
Central Stoneroller	N	H	N		306	612.00	41.58			
Largemouth Bass	F	C	C		6	12.00	0.82			
Green Sunfish	S	I	C	T	15	30.00	2.04			
Johnny Darter	D	I	C		14	28.00	1.90			
Rainbow Darter	D	I	S	M	185	370.00	25.14			
Fantail Darter	D	I	C		1	2.00	0.14			
	Mile Total				736	1,472.00				
	Number of Species				11					
	Number of Hybrids				0					

River Code: **19-020**	Stream: **Furnace Run**	Sample Date: **2009**
River Mile: **1.10**	Location: upst. Covered Bridge	Date Range: 09/01/2009
Time Fished: 858 sec	Drainage: 19.7 sq mi	
Dist Fished: 0.15 km	Basin: Cuyahoga River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Rainbow Trout	E		N		10	20.00	1.17			
Northern Hog Sucker	R	I	S	M	22	44.00	2.57			
White Sucker	W	O	S	T	28	56.00	3.27			
Western Blacknose Dace	N	G	S	T	123	246.00	14.35			
Creek Chub	N	G	N	T	32	64.00	3.73			
Common Shiner	N	I	S		12	24.00	1.40			
Silverjaw Minnow	N	I	M		10	20.00	1.17			
Central Stoneroller	N	H	N		482	964.00	56.24			
Johnny Darter	D	I	C		28	56.00	3.27			
Rainbow Darter	D	I	S	M	106	212.00	12.37			
Fantail Darter	D	I	C		4	8.00	0.47			
	Mile Total				857	1,714.00				
	Number of Species				11					
	Number of Hybrids				0					

Species List

River Code: **19-020**	Stream: **Furnace Run**	Sample Date: **2009**
River Mile: **0.90**	Location: Everett Rd.	Date Range: 08/20/2009
Time Fished: 4200 sec	Drainage: 19.8 sq mi	
Dist Fished: 0.25 km	Basin: Cuyahoga River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Rainbow Trout	E		N		7	8.40	0.92			
Northern Hog Sucker	R	I	S	M	12	14.40	1.58			
White Sucker	W	O	S	T	71	85.20	9.33			
Western Blacknose Dace	N	G	S	T	43	51.60	5.65			
Creek Chub	N	G	N	T	83	99.60	10.91			
Striped Shiner	N	I	S		24	28.80	3.15			
Common Shiner	N	I	S		71	85.20	9.33			
Silverjaw Minnow	N	I	M		3	3.60	0.39			
Bluntnose Minnow	N	O	C	T	4	4.80	0.53			
Central Stoneroller	N	H	N		348	417.60	45.73			
Largemouth Bass	F	C	C		5	6.00	0.66			
Green Sunfish	S	I	C	T	11	13.20	1.45			
Bluegill Sunfish	S	I	C	P	4	4.80	0.53			
Pumpkinseed Sunfish	S	I	C	P	3	3.60	0.39			
Johnny Darter	D	I	C		4	4.80	0.53			
Rainbow Darter	D	I	S	M	64	76.80	8.41			
Fantail Darter	D	I	C		4	4.80	0.53			
	Mile Total				761	913.20				
	Number of Species				17					
	Number of Hybrids				0					

Species List

River Code: **19-020**	Stream: **Furnace Run**	Sample Date: **2009**
River Mile: **0.40**	Location: upst. RR bridge	Date Range: 09/01/2009
Time Fished: 1490 sec	Drainage: 19.9 sq mi	
Dist Fished: 0.15 km	Basin: Cuyahoga River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Rainbow Trout	E		N		6	12.00	0.56			
Northern Hog Sucker	R	I	S	M	12	24.00	1.11			
White Sucker	W	O	S	T	31	62.00	2.87			
Western Blacknose Dace	N	G	S	T	37	74.00	3.43			
Creek Chub	N	G	N	T	22	44.00	2.04			
Common Shiner	N	I	S		107	214.00	9.92			
Silverjaw Minnow	N	I	M		9	18.00	0.83			
Bluntnose Minnow	N	O	C	T	12	24.00	1.11			
Central Stoneroller	N	H	N		684	1,368.00	63.39			
Yellow Bullhead		I	C	T	1	2.00	0.09			
Green Sunfish	S	I	C	T	12	24.00	1.11			
Johnny Darter	D	I	C		10	20.00	0.93			
Greenside Darter	D	I	S	M	1	2.00	0.09			
Rainbow Darter	D	I	S	M	123	246.00	11.40			
Fantail Darter	D	I	C		12	24.00	1.11			
	Mile Total				1,079	2,158.00				
	Number of Species				15					
	Number of Hybrids				0					

River Mile	Drainage Area (sq mi)	Number of Total Taxa	Number of Mayfly Taxa	Number of Caddisfly Taxa	Number of Dipteran Taxa	Percent: Mayflies	Percent: Caddis-flies	Percent: Tany-tarsini	Percent: Other Dipt/NI	Percent: Tolerant Organisms	Qual. EPT	Eco-region	ICI
Furnace Run (19-020)													
Year: 2009													
1.10	19.7	34(4)	3(2)	2(4)	22(6)	2.3(2)	0.5(2)	46.0(6)	49.7(2)	8.6(4)	14(6)	3	38
0.40	19.9	32(4)	4(2)	4(6)	19(4)	1.1(2)	3.6(4)	45.0(6)	50.3(2)	11.5(4)	14(6)	3	40

Appendix Table 5. Ohio EPA macroinvertebrate results from Furnace Run, 2009.

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Furnace Run
dst. Rock Creek

Collection Date: 09/16/2009 River Code: 19-020 RM: 7.20

Taxa Code	Taxa	Quant/Qual
01320	*Hydra sp*	+
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
05800	*Caecidotea sp*	+
06700	*Crangonyx sp*	+
11120	*Baetis flavistriga*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23905	*Boyeria grafiana*	+
23909	*Boyeria vinosa*	+
50301	*Chimarra aterrima*	+
51400	*Nyctiophylax sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
63300	*Hydroporini*	+
69400	*Stenelmis sp*	+
71900	*Tipula sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
78655	*Procladius (Holotanypus) sp*	+
81650	*Parametriocnemus sp*	+
82200	*Tvetenia bavarica group*	+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*	+
84750	*Stictochironomus sp*	+
85500	*Paratanytarsus sp*	+
85821	*Tanytarsus glabrescens group sp 7*	+
96264	*Planorbella (Pierosoma) pilsbryi*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 28
No. Qualitative Taxa: 28 ICI:
Number of Organisms: 0 Qual EPT: 5

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Furnace Run
St. Rt. 21

Collection Date: 09/16/2009 River Code: 19-020 RM: 6.90

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
01900	*Nemertea*	+
03600	*Oligochaeta*	+
05800	*Caecidotea sp*	+
06700	*Crangonyx sp*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11651	*Procloeon sp (w/o hindwing pads)*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23600	*Aeshna sp*	+
23909	*Boyeria vinosa*	+
47600	*Sialis sp*	+
50301	*Chimarra aterrima*	+
51400	*Nyctiophylax sp*	+
52430	*Ceratopsyche morosa group*	+
52440	*Ceratopsyche slossonae*	+
52450	*Ceratopsyche sparna*	+
52530	*Hydropsyche depravata group*	+
68075	*Psephenus herricki*	+
68601	*Ancyronyx variegata*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
77120	*Ablabesmyia mallochi*	+
77750	*Hayesomyia senata or Thienemannimyia norena*	+
77800	*Helopelopia sp*	+
78655	*Procladius (Holotanypus) sp*	+
80750	*Eukiefferiella devonica group*	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	+
82220	*Tvetenia discoloripes group*	+
82300	*Xylotopus par*	+
82820	*Cryptochironomus sp*	+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*	+
84100	*Paracladopelma sp*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84470	*Polypedilum (P.) illinoense*	+
84750	*Stictochironomus sp*	+
85500	*Paratanytarsus sp*	+
85800	*Tanytarsus sp*	+
95100	*Physella sp*	+
96002	*Helisoma anceps anceps*	+
96900	*Ferrissia sp*	+

No. Quantitative Taxa: 0
No. Qualitative Taxa: 47
Number of Organisms: 0

Total Taxa: 47
ICI:
Qual EPT: 11

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/16/2009 River Code: 19-020 RM: 6.50

Site: Furnace Run
Brush Rd.

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
01900	*Nemertea*	+
05800	*Caecidotea sp*	+
05900	*Lirceus sp*	+
07701	*Cambaridae*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
13521	*Stenonema femoratum*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
23600	*Aeshna sp*	+
23909	*Boyeria vinosa*	+
48620	*Nigronia serricornis*	+
50301	*Chimarra aterrima*	+
50315	*Chimarra obscura*	+
51400	*Nyctiophylax sp*	+
52430	*Ceratopsyche morosa group*	+
52440	*Ceratopsyche slossonae*	+
52530	*Hydropsyche depravata group*	+
68075	*Psephenus herricki*	+
68601	*Ancyronyx variegata*	+
68708	*Dubiraphia vittata group*	+
68901	*Macronychus glabratus*	+
69400	*Stenelmis sp*	+
70600	*Antocha sp*	+
71100	*Hexatoma sp*	+
72700	*Anopheles sp*	+
74501	*Ceratopogonidae*	+
77120	*Ablabesmyia mallochi*	+
78140	*Labrundinia pilosella*	+
78350	*Meropelopia sp*	+
78402	*Natarsia baltimoreus*	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	+
82200	*Tvetenia bavarica group*	+
82820	*Cryptochironomus sp*	+
84100	*Paracladopelma sp*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
85261	*Cladotanytarsus vanderwulpi group Type 1*	+
87400	*Stratiomys sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0
No. Qualitative Taxa: 42
Number of Organisms: 0

Total Taxa: 42
ICI:
Qual EPT: 10

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Furnace Run
upst. Covered Bridge

Collection Date: 09/16/2009 River Code: 19-020 RM: 1.10

Taxa Code	Taxa	Quant/Qual	
03600	*Oligochaeta*	28	+
05800	*Caecidotea sp*		+
06700	*Crangonyx sp*		+
08200	*Orconectes sp*		+
11120	*Baetis flavistriga*	6	+
11130	*Baetis intercalaris*	2	+
13521	*Stenonema femoratum*	18	+
21200	*Calopteryx sp*	6	+
22001	*Coenagrionidae*		+
22300	*Argia sp*		+
23909	*Boyeria vinosa*	1	+
42700	*Belostoma sp*		+
50301	*Chimarra aterrima*		+
50315	*Chimarra obscura*		+
51400	*Nyctiophylax sp*	1	+
51600	*Polycentropus sp*		+
52200	*Cheumatopsyche sp*		+
52430	*Ceratopsyche morosa group*	4	+
52450	*Ceratopsyche sparna*		+
52530	*Hydropsyche depravata group*		+
53800	*Hydroptila sp*		+
59310	*Mystacides sepulchralis*		+
59720	*Triaenodes ignitus*		+
60900	*Peltodytes sp*		+
63300	*Hydroporini*		+
67100	*Hydrobius sp*		+
67700	*Paracymus sp*		+
68075	*Psephenus herricki*		+
68707	*Dubiraphia quadrinotata*		+
68708	*Dubiraphia vittata group*	4	+
68901	*Macronychus glabratus*		+
69400	*Stenelmis sp*	5	+
70600	*Antocha sp*	2	
71100	*Hexatoma sp*		+
71900	*Tipula sp*		+
72700	*Anopheles sp*		+
74100	*Simulium sp*		+
74501	*Ceratopogonidae*	1	+
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*	48	+
77800	*Helopelopia sp*	174	
80360	*Corynoneura "celeripes" (sensu Simpson & Bode, 1980)*	4	
80370	*Corynoneura lobata*	76	
80410	*Cricotopus (C.) sp*	29	
81650	*Parametriocnemus sp*	19	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	10	
82100	*Thienemanniella sp*		+
82141	*Thienemanniella xena*	4	
82820	*Cryptochironomus sp*		+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*	10	+
84100	*Paracladopelma sp*		+
84210	*Paratendipes albimanus or P. duplicatus*	19	+
84300	*Phaenopsectra obediens group*	10	
84450	*Polypedilum (Uresipedilum) flavum*	10	
84460	*Polypedilum (P.) fallax group*	48	
84470	*Polypedilum (P.) illinoense*		+
85261	*Cladotanytarsus vanderwulpi group Type 1*	10	
85500	*Paratanytarsus sp*	77	
85625	*Rheotanytarsus sp*	183	+
85752	*Sublettea coffmani*	10	
85800	*Tanytarsus sp*	29	
85821	*Tanytarsus glabrescens group sp 7*	203	
86501	*Stratiomyidae*		+
87400	*Stratiomys sp*		+
87540	*Hemerodromia sp*	41	
94400	*Fossaria sp*		+
95100	*Physella sp*	3	+
96900	*Ferrissia sp*	17	+
98001	*Sphaeriidae*		+

No. Quantitative Taxa: 34 Total Taxa: 69
No. Qualitative Taxa: 53 ICI: **38**
Number of Organisms: 1112 Qual EPT: 14

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Furnace Run

Collection Date: 09/16/2009 River Code: 19-020 RM: 0.80

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
05800	*Caecidotea sp*	+
06700	*Crangonyx sp*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11250	*Centroptilum sp (w/o hindwing pads)*	+
13521	*Stenonema femoratum*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23905	*Boyeria grafiana*	+
23909	*Boyeria vinosa*	+
25510	*Stylogomphus albistylus*	+
27500	*Somatochlora sp*	+
36100	*Alloperla sp*	+
44501	*Corixidae*	+
47600	*Sialis sp*	+
48600	*Nigronia sp*	+
50301	*Chimarra aterrima*	+
50315	*Chimarra obscura*	+
51400	*Nyctiophylax sp*	+
51600	*Polycentropus sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
59310	*Mystacides sepulchralis*	+
63300	*Hydroporini*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
71100	*Hexatoma sp*	+
71700	*Pilaria sp*	+
71900	*Tipula sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
74501	*Ceratopogonidae*	+
77120	*Ablabesmyia mallochi*	+
77800	*Helopelopia sp*	+
78350	*Meropelopia sp*	+
81650	*Parametriocnemus sp*	+
82220	*Tvetenia discoloripes group*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83003	*Dicrotendipes fumidus*	+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84440	*Polypedilum (Uresipedilum) aviceps*	+
84450	*Polypedilum (Uresipedilum) flavum*	+
84700	*Stenochironomus sp*	+
84750	*Stictochironomus sp*	+
85260	*Cladotanytarsus vanderwulpi group*	+
85625	*Rheotanytarsus sp*	+
85800	*Tanytarsus sp*	+
86100	*Chrysops sp*	+
87540	*Hemerodromia sp*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+

No. Quantitative Taxa: 0 Total Taxa: 60
No. Qualitative Taxa: 60 ICI:
Number of Organisms: 0 Qual EPT: 13

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Furnace Run
upst. RR bridge

Collection Date: 09/16/2009 River Code: 19-020 RM: 0.40

Taxa Code	Taxa	Quant	Qual
01801	*Turbellaria*	3	+
01900	*Nemertea*	8	
03600	*Oligochaeta*	64	+
05800	*Caecidotea sp*	17	+
06700	*Crangonyx sp*		+
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*	1	+
11250	*Centroptilum sp (w/o hindwing pads)*		+
13400	*Stenacron sp*		+
13521	*Stenonema femoratum*	2	+
13570	*Maccaffertium terminatum*	12	
16200	*Eurylophella sp*	1	
17200	*Caenis sp*		+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
45400	*Trichocorixa sp*		+
50301	*Chimarra aterrima*		+
50315	*Chimarra obscura*	4	+
51400	*Nyctiophylax sp*		+
52200	*Cheumatopsyche sp*	1	+
52430	*Ceratopsyche morosa group*	46	+
52450	*Ceratopsyche sparna*		+
52530	*Hydropsyche depravata group*		+
53800	*Hydroptila sp*	4	
59720	*Triaenodes ignitus*		+
60900	*Peltodytes sp*		+
67500	*Laccobius sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*		+
68708	*Dubiraphia vittata group*		+
69400	*Stenelmis sp*		+
70600	*Antocha sp*	45	
71100	*Hexatoma sp*		+
71900	*Tipula sp*		+
72700	*Anopheles sp*		+
74501	*Ceratopogonidae*		+
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*		+
77800	*Helopelopia sp*	189	+
78140	*Labrundinia pilosella*	14	
78450	*Nilotanypus fimbriatus*	14	
80310	*Cardiocladius obscurus*		+
80370	*Corynoneura lobata*	16	
80410	*Cricotopus (C.) sp*	58	
80430	*Cricotopus (C.) tremulus group*	29	
81465	*Orthocladius (O.) carlatus*	14	
82130	*Thienemanniella similis*		+
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*		+
83003	*Dicrotendipes fumidus*		+
83040	*Dicrotendipes neomodestus*		+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*	44	
84210	*Paratendipes albimanus or P. duplicatus*		+
84300	*Phaenopsectra obediens group*	44	+
84450	*Polypedilum (Uresipedilum) flavum*	14	+
84460	*Polypedilum (P.) fallax group*	102	
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*	44	+
85200	*Cladotanytarsus sp*		+
85500	*Paratanytarsus sp*	131	+
85625	*Rheotanytarsus sp*	232	+
85752	*Sublettea coffmani*	14	
85800	*Tanytarsus sp*	29	+
85821	*Tanytarsus glabrescens group sp 7*	276	+
87540	*Hemerodromia sp*	35	
94400	*Fossaria sp*		+
95100	*Physella sp*		+
96900	*Ferrissia sp*	9	+

No. Quantitative Taxa: 32 Total Taxa: 70
No. Qualitative Taxa: 55 ICI: **40**
Number of Organisms: 1516 Qual EPT: 14

LITTLE MIAMI RIVER RESTORATION AND SHAWNEE CREEK PRESERVATION

Project Baseline Stream Monitoring

PROJECT NAME: LITTLE MIAMI RIVER RESTORATION & SHAWNEE CREEK PRESERVATION
Project Baseline Stream Monitoring

PROJECT NUMBER: #09(h) EPA-16

STREAMS SAMPLED: Little Miami River

SUMMARY

The project will include restoration of 700 linear feet of stream channel, restoration of 2 acres of riparian buffer and preservation of approximately 30 acres of wooded riparian along the mainstem of the Little Miami River, a state and nationally designated scenic river in southwest Ohio. Streambank stabilization and restoration will include the installation of brush layering and other bioengineering techniques, including the treatment of invasive species and replanting 2 acres of riparian area with native tree and shrub species. The objective of the project is to preserve riparian habitat, reduce severe bank erosion in the project area, and reduce sediment loadings to the Little Miami River.

At all three stations sampled in the Little Miami River, excellent physical habitat conditions were present and exceptional biological communities were documented. These three sites (RMs 77.7, 77.1, and 76.5) fully attained the Exceptional Warmwater Habitat (EWH) biological criteria listed in the Ohio Water Quality Standards. Site conditions at the restoration area included a high bank with extensive erosion. Successful completion of this project will improve habitat where major threats to attainment should be eliminated, thereby insuring continued attainment in the immediate area.

AQUATIC LIFE USE ATTAINMENT - LITTLE MIAMI RIVER 2009.

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. Sampling sites are located in the Eastern Corn Belt Plains (ECBP) ecoregion. In the Ohio Water Quality Standards, this section of the Little Miami River is designated Exceptional Warmwater Habitat (EWH).

Sample Site River Mile	Attainment Status	IBI	MIwb	ICI	QHEI	Biological Assessment
77.7/ 77.4	**FULL**	48	10.6	48	88.0 (Excellent)	Exceptional
77.1	**FULL**	54	10.6	56	86.0 (Excellent)	Exceptional
76.5	**FULL**	50	10.2	56	78.5 (Excellent)	Exceptional

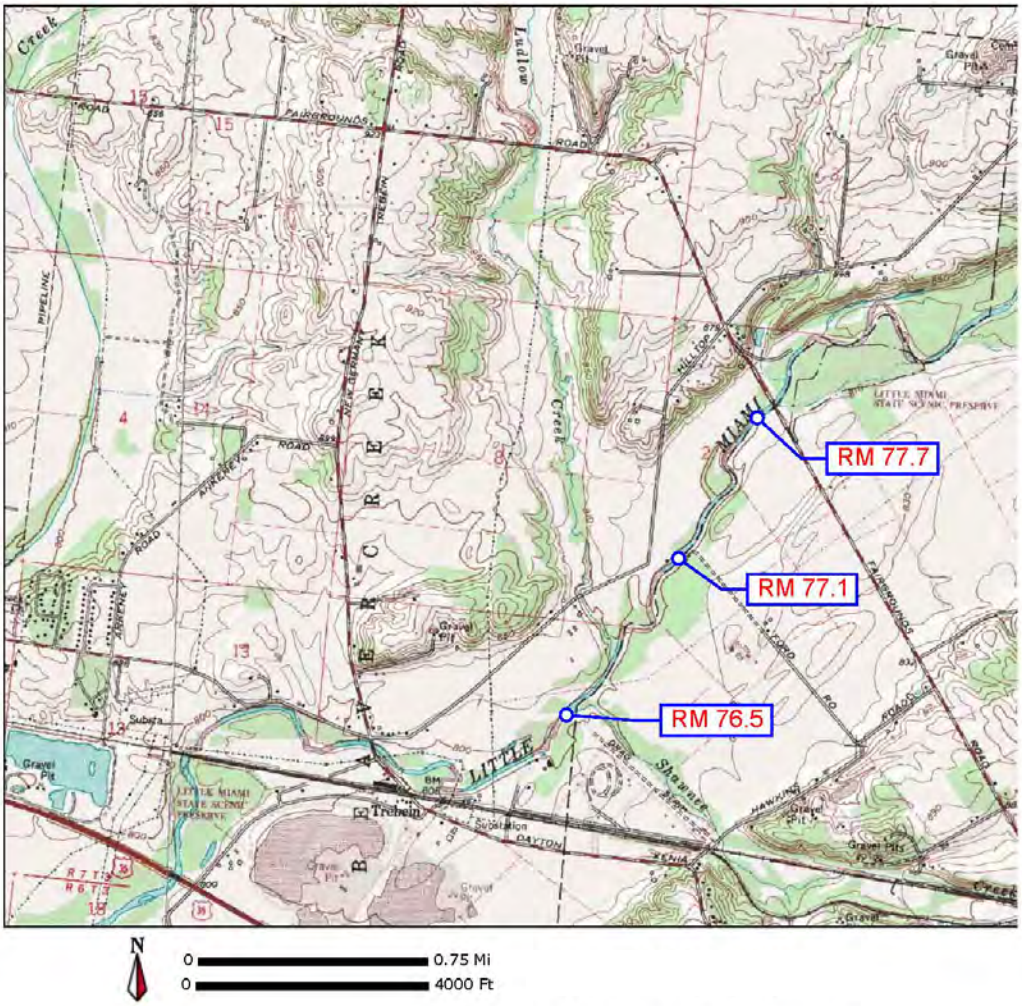
Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)		
INDEX – SITE TYPE	WWH	EWH
IBI: Boat	42	48
MIwb: Boat	8.5	9.6
ICI	36	46

[ns] Nonsignificant departure from biocriterion (≤4 IBI or ICI units; ≤0.5 MIwb units).
* Significant departure from biocriterion (>4 IBI or ICI units, >0.5 MIwb units).

Sampling locations in the Little Miami River, 2009.

River Mile	Latitude	Longitude	Landmark
77.7	39.7208	83.9662	Fairgrounds Road
77.1	39.7167	83.9694	Between Xenia WWTP and Ford Rd., restoration area
76.5	39.7103	83.9747	0.5 mi. downstream Xenia WWTP, upst. Shawnee Cr.

Little Miami River sampling sites, 2009



APPENDICES – LITTLE MIAMI RIVER RESTORATION

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores for the Little Miami River.

Appendix Table 2. Index of Biotic Integrity (IBI) scores and metrics for the Little Miami River.

Appendix Table 3. Ohio EPA fish results for the Little Miami River.

Appendix Table 4. Invertebrate Community Index (ICI) scores and metrics for the Little Miami River.

Appendix Table 5. Ohio EPA macroinvertebrate results for the Little Miami River.

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores and physical attributes for fish sampling sites in the Little Miami River, 2009.

			WWH Attributes											MWH Attributes																				
														High Influence						*Moderate Influence*														
Key QHEI Components			No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max. Depth >40 cm	Low-Normal Riffle Embeddedness	**Total WWH Attributes**	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/ No Cover	Max. Depth <40 cm (WD,HW sites)	**Total High Influence Attributes**	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent & Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	**Total Moderate Influence Attributes**	**(MWH H.I.+1)/ (WWH+1) Ratio**	**(MWH M.I.+1)/ (WWH+1) Ratio**
River Mile	QHEI	Gradient (ft/mile)																																
Little Miami River (11-001) Year: 2009																																		
77.4	**88.0**	5.13	■	■		■	■	■	■		■	■	8						0		●								●	●		3	0.11	0.44
77.1	**86.0**	5.13	■	■		■	■	■			■	■	7						0		●			●				●	●			4	0.13	0.63
76.5	**78.5**	5.13	■	■		■		■		■	■	■	7						0						●			●		●		3	0.13	0.50

Appendix Table 2. Index of Biotic Integrity (IBI) metrics and scores for sampling locations in the Little Miami River, 2009.

				Number of				Percent of Individuals									
River Mile	Type	Date	Drainage area (sq mi)	Total species	Sunfish species	Sucker species	Intolerant species	Rnd-bodied suckers	Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(1.0 km)	IBI	Modified Iwb
Little Miami River - (11-001)																	
Year: 2009																	
77.40	A	09/11/2009	217	28(5)	4(5)	6(5)	6(5)	15(1)	39(3)	10(5)	9(5)	2(1)	54(3)	0.1(5)	2371(5)	48	10.6
77.10	A	09/17/2009	217	25(5)	4(5)	6(5)	4(5)	37(3)	66(5)	11(5)	9(5)	4(1)	81(5)	0.4(5)	1163(5)	54	10.6
76.50	A	09/11/2009	225	28(5)	5(5)	7(5)	6(5)	43(5)	71(5)	18(3)	16(3)	3(1)	77(5)	0.9(3)	702(5)	50	10.2

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

Appendix Table 3. Ohio EPA fish results from the Little Miami River, 2009.

Species List

River Code: **11-001**	Stream: **Little Miami River**	Sample Date: **2009**
River Mile: **77.40**	Location: dst. Fairgrounds Rd.	Date Range: 09/11/2009
Time Fished: 2310 sec	Drainage: 217.0 sq mi	
Dist Fished: 0.38 km	Basin: Little Miami River No of Passes: 1	Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Quillback	C	O	M		3	7.90	0.30	6.58	4.02	833.33
Black Redhorse	R	I	S	I	50	131.58	5.02	31.33	19.16	238.12
Golden Redhorse	R	I	S	M	42	110.53	4.22	19.66	12.02	177.90
Northern Hog Sucker	R	I	S	M	57	150.00	5.72	9.57	5.85	63.79
White Sucker	W	O	S	T	20	52.63	2.01	7.87	4.81	149.55
Smallmouth Redhorse	R	I	S	M	1	2.63	0.10	0.66	0.40	250.00
Common Carp	G	O	M	T	8	21.05	0.80	65.79	40.22	3,125.00
River Chub	N	I	N	I	8	21.05	0.80	0.54	0.33	25.63
Creek Chub	N	G	N	T	4	10.53	0.40	0.10	0.06	9.75
Silver Shiner	N	I	S	I	18	47.37	1.81	0.20	0.12	4.17
Rosyface Shiner	N	I	S	I	38	100.00	3.82	0.21	0.13	2.05
Scarlet Shiner	N	I	S	M	10	26.32	1.00	0.07	0.04	2.70
Striped Shiner	N	I	S		54	142.11	5.42	3.20	1.96	22.52
Spotfin Shiner	N	I	M		18	47.37	1.81	0.15	0.09	3.06
Sand Shiner	N	I	M	M	73	192.11	7.33	0.33	0.20	1.73
Bluntnose Minnow	N	O	C	T	56	147.37	5.62	0.53	0.33	3.61
Central Stoneroller	N	H	N		353	928.95	35.44	6.78	4.14	7.30
Stonecat Madtom		I	C	I	1	2.63	0.10	0.01	0.01	4.00
Northern Studfish	E	I	M		11	28.95	1.10	0.14	0.09	4.91
Rock Bass	S	C	C		13	34.21	1.31	3.54	2.16	103.38
Smallmouth Bass	F	C	C	M	3	7.90	0.30	3.95	2.41	500.00
Largemouth Bass	F	C	C		1	2.63	0.10	0.13	0.08	51.00
Green Sunfish	S	I	C	T	7	18.42	0.70	0.40	0.25	21.86
Bluegill Sunfish	S	I	C	P	6	15.79	0.60	0.28	0.17	17.50
Longear Sunfish	S	I	C	M	9	23.68	0.90	0.63	0.38	26.44
Johnny Darter	D	I	C		6	15.79	0.60	0.05	0.03	3.00
Greenside Darter	D	I	S	M	13	34.21	1.31	0.12	0.07	3.54
Banded Darter	D	I	S	I	6	15.79	0.60	0.06	0.04	4.00
Rainbow Darter	D	I	S	M	75	197.37	7.53	0.32	0.19	1.60
Mottled Sculpin		I	C		32	84.21	3.21	0.37	0.22	4.38
	Mile Total				996	2,621.05		163.56		
	Number of Species				30					
	Number of Hybrids				0					

River Code: **11-001**	Stream: **Little Miami River**	Sample Date: **2009**
River Mile: **77.10**	Location: upst. Xenia Ford Rd. WWTP	Date Range: 09/17/2009
Time Fished: 2659 sec	Drainage: 217.0 sq mi	
Dist Fished: 0.38 km	Basin: Little Miami River No of Passes: 1	Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Silver Redhorse	R	I	S	M	1	2.63	0.20	6.45	6.60	2,450.00
Black Redhorse	R	I	S	I	72	189.47	14.49	30.36	31.06	160.21
Golden Redhorse	R	I	S	M	47	123.68	9.46	27.11	27.74	219.15
Northern Hog Sucker	R	I	S	M	63	165.79	12.68	8.48	8.68	51.16
White Sucker	W	O	S	T	15	39.47	3.02	0.22	0.23	5.64
Smallmouth Redhorse	R	I	S	M	3	7.90	0.60	3.29	3.37	416.67
Common Carp	G	O	M	T	2	5.26	0.40	6.45	6.60	1,225.00
River Chub	N	I	N	I	7	18.42	1.41	0.16	0.17	8.86
Creek Chub	N	G	N	T	1	2.63	0.20	0.01	0.01	4.00
Silver Shiner	N	I	S	I	14	36.84	2.82	0.15	0.15	4.00
Rosyface Shiner	N	I	S	I	29	76.32	5.84	0.11	0.11	1.46
Scarlet Shiner	N	I	S	M	5	13.16	1.01	0.03	0.03	2.00
Striped Shiner	N	I	S		61	160.53	12.27	3.90	3.99	24.27
Spotfin Shiner	N	I	M		22	57.90	4.43	0.16	0.16	2.73
Sand Shiner	N	I	M	M	24	63.16	4.83	0.16	0.16	2.50
Bluntnose Minnow	N	O	C	T	30	78.95	6.04	0.26	0.27	3.33
Central Stoneroller	N	H	N		23	60.53	4.63	0.62	0.63	10.17
Northern Studfish	E	I	M		2	5.26	0.40	0.02	0.02	4.00
Rock Bass	S	C	C		11	28.95	2.21	3.69	3.77	127.36
Smallmouth Bass	F	C	C	M	7	18.42	1.41	4.74	4.85	257.14
Largemouth Bass	F	C	C		3	7.90	0.60	0.23	0.24	29.33
Green Sunfish	S	I	C	T	7	18.42	1.41	0.27	0.27	14.50
Bluegill Sunfish	S	I	C	P	9	23.68	1.81	0.42	0.43	17.78
Longear Sunfish	S	I	C	M	6	15.79	1.21	0.25	0.26	15.83
Green Sf X Bluegill Sf					1	2.63	0.20	0.10	0.11	39.00
Johnny Darter	D	I	C		13	34.21	2.62	0.05	0.05	1.46
Greenside Darter	D	I	S	M	8	21.05	1.61	0.03	0.03	1.50
Rainbow Darter	D	I	S	M	11	28.95	2.21	0.03	0.03	0.91
	Mile Total				497	1,307.90		97.72		
	Number of Species				27					
	Number of Hybrids				1					

River Code: **11-001**	Stream: **Little Miami River**	Sample Date: **2009**
River Mile: **76.50**	Location: upst. Shawnee Creek	Date Range: 09/11/2009
Time Fished: 3119 sec	Drainage: 225.0 sq mi	
Dist Fished: 0.50 km	Basin: Little Miami River No of Passes: 1	Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Quillback	C	O	M		4	8.00	0.94	6.80	4.49	850.00
Silver Redhorse	R	I	S	M	6	12.00	1.41	24.20	15.97	2,016.67
Black Redhorse	R	I	S	I	34	68.00	7.96	9.48	6.26	139.38
Golden Redhorse	R	I	S	M	89	178.00	20.84	58.20	38.41	326.97
Northern Hog Sucker	R	I	S	M	54	108.00	12.65	9.40	6.20	87.00
White Sucker	W	O	S	T	29	58.00	6.79	8.96	5.91	154.45
Smallmouth Redhorse	R	I	S	M	1	2.00	0.23	0.40	0.27	202.00
Common Carp	G	O	M	T	5	10.00	1.17	26.60	17.56	2,660.00
River Chub	N	I	N	I	1	2.00	0.23	0.03	0.02	13.00
Silver Shiner	N	I	S	I	27	54.00	6.32	0.30	0.20	5.56
Rosyface Shiner	N	I	S	I	14	28.00	3.28	0.06	0.04	2.29
Striped Shiner	N	I	S		45	90.00	10.54	1.70	1.12	18.89
Spotfin Shiner	N	I	M		8	16.00	1.87	0.04	0.03	2.38
Sand Shiner	N	I	M	M	8	16.00	1.87	0.02	0.02	1.50
Bluntnose Minnow	N	O	C	T	32	64.00	7.49	0.19	0.13	2.97
Central Stoneroller	N	H	N		16	32.00	3.75	0.81	0.53	25.31
Yellow Bullhead		I	C	T	1	2.00	0.23	0.62	0.41	310.00
Stonecat Madtom		I	C	I	1	2.00	0.23	0.25	0.16	125.00
Rock Bass	S	C	C		3	6.00	0.70	1.01	0.67	168.33
Smallmouth Bass	F	C	C	M	8	16.00	1.87	1.55	1.02	97.00
Largemouth Bass	F	C	C		1	2.00	0.23	0.02	0.01	10.00
Green Sunfish	S	I	C	T	9	18.00	2.11	0.19	0.13	10.56
Bluegill Sunfish	S	I	C	P	14	28.00	3.28	0.35	0.23	12.50
Longear Sunfish	S	I	C	M	8	16.00	1.87	0.30	0.20	18.63
Pumpkinseed Sunfish	S	I	C	P	1	2.00	0.23	0.02	0.01	9.00
Greenside Darter	D	I	S	M	2	4.00	0.47	0.01	0.01	2.00
Banded Darter	D	I	S	I	1	2.00	0.23	0.00	0.00	2.00
Rainbow Darter	D	I	S	M	3	6.00	0.70	0.01	0.01	1.33
Mottled Sculpin		I	C		2	4.00	0.47	0.01	0.00	1.50
	Mile Total				427	854.00		151.52		
	Number of Species				29					
	Number of Hybrids				0					

River Mile	Drainage Area (sq mi)	Number of Total Taxa	Number of Mayfly Taxa	Number of Caddisfly Taxa	Number of Dipteran Taxa	Percent: Mayflies	Percent: Caddis-flies	Percent: Tany-tarsini	Percent: Other Dipt/NI	Percent: Tolerant Organisms	Qual. EPT	Eco-region	ICI
Little Miami River (11-001)													
Year: 2009													
77.70	217.0	34(4)	7(4)	6(6)	15(4)	26.9(4)	44.7(6)	13.0(2)	14.7(6)	1.4(6)	24(6)	5	48
77.10	217.0	38(6)	9(6)	6(6)	16(4)	21.3(4)	29.9(6)	35.6(6)	12.7(6)	2.1(6)	27(6)	5	56
76.50	225.0	45(6)	12(6)	6(6)	17(6)	12.4(2)	36.5(6)	37.6(6)	13.3(6)	2.0(6)	22(6)	5	56

Appendix Table 5. Ohio EPA macroinvertebrate results from the Little Miami River, 2009.

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Little Miami River
Fairgrounds Rd.

Collection Date: 09/22/2009 River Code: 11-001 RM: 77.70

Taxa Code	Taxa	Quant/Qual	
01801	*Turbellaria*		+
01900	*Nemertea*		+
03360	*Plumatella sp*		+
03600	*Oligochaeta*		+
05900	*Lirceus sp*		+
06700	*Crangonyx sp*		+
08601	*Hydrachnidia*	56	+
11119	*Plauditus dubius or P. virilis*		+
11120	*Baetis flavistriga*	96	+
11130	*Baetis intercalaris*	472	+
11650	*Procloeon sp (w/ hindwing pads)*		+
12200	*Isonychia sp*	668	+
13100	*Nixe sp*		+
13400	*Stenacron sp*		+
13510	*Maccaffertium exiguum*	34	
13561	*Maccaffertium pulchellum*	108	+
13570	*Maccaffertium terminatum*	37	+
16700	*Tricorythodes sp*	42	+
17200	*Caenis sp*		+
18600	*Ephemera sp*		+
18700	*Hexagenia sp*		+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
24710	*Dromogomphus spinosus*		+
26700	*Macromia sp*		+
30000	*Plecoptera*	32	
42700	*Belostoma sp*		+
50315	*Chimarra obscura*	1	
50804	*Lype diversa*		+
51300	*Neureclipsis sp*		+
51600	*Polycentropus sp*		+
52200	*Cheumatopsyche sp*	527	+
52430	*Ceratopsyche morosa group*	1796	+
52530	*Hydropsyche depravata group*	90	+
53800	*Hydroptila sp*	1	+
55300	*Ptilostomis sp*		+
57400	*Neophylax sp*		+
58505	*Helicopsyche borealis*		+
59500	*Oecetis sp*	8	
59700	*Triaenodes sp*		+
68075	*Psephenus herricki*		+
68201	*Scirtidae*		+
68601	*Ancyronyx variegata*	1	+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	4	+
69400	*Stenelmis sp*	2	+
70600	*Antocha sp*		+
72700	*Anopheles sp*	11	+
74100	*Simulium sp*	9	+
77750	*Hayesomyia senata or Thienemannimyia norena*		+
80310	*Cardiocladius obscurus*	155	+
80351	*Corynoneura n.sp 1*	8	
80410	*Cricotopus (C.) sp*		+
80430	*Cricotopus (C.) tremulus group*	14	
80440	*Cricotopus (C.) trifascia*	71	
81825	*Rheocricotopus (Psilocricotopus) robacki*	113	+
82141	*Thienemanniella xena*	8	
82200	*Tvetenia bavarica group*	42	+
82220	*Tvetenia discoloripes group*	99	+
82730	*Chironomus (C.) decorus group*		+
84155	*Paralauterborniella nigrohalteralis*		+
84210	*Paratendipes albimanus or P. duplicatus*		+
84450	*Polypedilum (Uresipedilum) flavum*	127	+
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*		+
84700	*Stenochironomus sp*		+
84790	*Tribelos fuscicorne*		+
85261	*Cladotanytarsus vanderwulpi group Type 1*		+
85500	*Paratanytarsus sp*		+
85625	*Rheotanytarsus sp*	678	+
85752	*Sublettea coffmani*	14	
85800	*Tanytarsus sp*	14	+
87540	*Hemerodromia sp*	8	
93200	*Hydrobiidae*		+
93900	*Elimia sp*		+
94400	*Fossaria sp*		+
95100	*Physella sp*		+
96900	*Ferrissia sp*	77	+
97601	*Corbicula fluminea*		+

No. Quantitative Taxa:	34	Total Taxa:	81
No. Qualitative Taxa:	71	ICI:	**48**
Number of Organisms:	5423	Qual EPT:	24

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Little Miami River
upst. Xenia Ford Rd. WWTP

Collection Date: 09/22/2009 River Code: 11-001 RM: 77.10

Taxa Code	Taxa	Quant/Qual	
00401	*Spongillidae*		+
01320	*Hydra sp*	9	
01801	*Turbellaria*		+
01900	*Nemertea*		+
03600	*Oligochaeta*	32	+
05900	*Lirceus sp*		+
06201	*Hyalella azteca*		+
06700	*Crangonyx sp*		+
08250	*Orconectes (Procericambarus) rusticus*		+
08601	*Hydrachnidia*	1	+
11119	*Plauditus dubius or P. virilis*	17	+
11120	*Baetis flavistriga*	111	+
11130	*Baetis intercalaris*	393	+
11250	*Centroptilum sp (w/o hindwing pads)*		+
11650	*Procloeon sp (w/ hindwing pads)*		+
12200	*Isonychia sp*	528	+
13000	*Leucrocuta sp*		+
13100	*Nixe sp*		+
13400	*Stenacron sp*	71	+
13510	*Maccaffertium exiguum*	35	
13521	*Stenonema femoratum*		+
13561	*Maccaffertium pulchellum*	445	+
13570	*Maccaffertium terminatum*	104	+
16700	*Tricorythodes sp*	6	+
17200	*Caenis sp*		+
18600	*Ephemera sp*		+
18700	*Hexagenia sp*		+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
24900	*Gomphus sp*		+
44501	*Corixidae*		+
48620	*Nigronia serricornis*		+
49101	*Sisyridae*		+
50315	*Chimarra obscura*	1	+
50804	*Lype diversa*		+
51300	*Neureclipsis sp*	1	
51600	*Polycentropus sp*		+
52200	*Cheumatopsyche sp*	1082	+
52430	*Ceratopsyche morosa group*	1286	+
52530	*Hydropsyche depravata group*	27	+
53501	*Hydroptilidae*	1	+
57400	*Neophylax sp*		+
57900	*Pycnopsyche sp*		+
58505	*Helicopsyche borealis*		+
59720	*Triaenodes ignitus*		+
60900	*Peltodytes sp*		+
65800	*Berosus sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	1	+
68702	*Dubiraphia bivittata*		+
68707	*Dubiraphia quadrinotata*		+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	38	+
69400	*Stenelmis sp*	4	+
70600	*Antocha sp*	60	
71900	*Tipula sp*		+
74100	*Simulium sp*	1	
80310	*Cardiocladius obscurus*	276	+
80351	*Corynoneura n.sp 1*	8	
80370	*Corynoneura lobata*	16	
80410	*Cricotopus (C.) sp*	46	+
80420	*Cricotopus (C.) bicinctus*	92	+
80430	*Cricotopus (C.) tremulus group*	46	
80440	*Cricotopus (C.) trifascia*		+
81270	*Nanocladius (N.) spiniplenus*	46	
81825	*Rheocricotopus (Psilocricotopus) robacki*	230	
82101	*Thienemanniella taurocapita*	72	
82300	*Xylotopus par*		+
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*		+
82885	*Cryptotendipes pseudotener*		+
83003	*Dicrotendipes fumidus*		+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*		+
84155	*Paralauterborniella nigrohalteralis*		+
84210	*Paratendipes albimanus or P. duplicatus*		+
84470	*Polypedilum (P.) illinoense*	46	+
85230	*Cladotanytarsus mancus group*		+
85500	*Paratanytarsus sp*		+
85625	*Rheotanytarsus sp*	2488	+
85752	*Sublettea coffmani*	323	
85821	*Tanytarsus glabrescens group sp 7*	46	+
87540	*Hemerodromia sp*	35	
93900	*Elimia sp*	1	+
95100	*Physella sp*		+
96900	*Ferrissia sp*		+

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Little Miami River
upst. Xenia Ford Rd. WWTP

Collection Date: 09/22/2009 River Code: 11-001 RM: 77.10

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
97601	*Corbicula fluminea*	+			
98600	*Sphaerium sp*	+			

No. Quantitative Taxa:	38	Total Taxa:	90
No. Qualitative Taxa:	77	ICI:	**56**
Number of Organisms:	8025	Qual EPT:	27

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Little Miami River
upst. Shawnee Creek

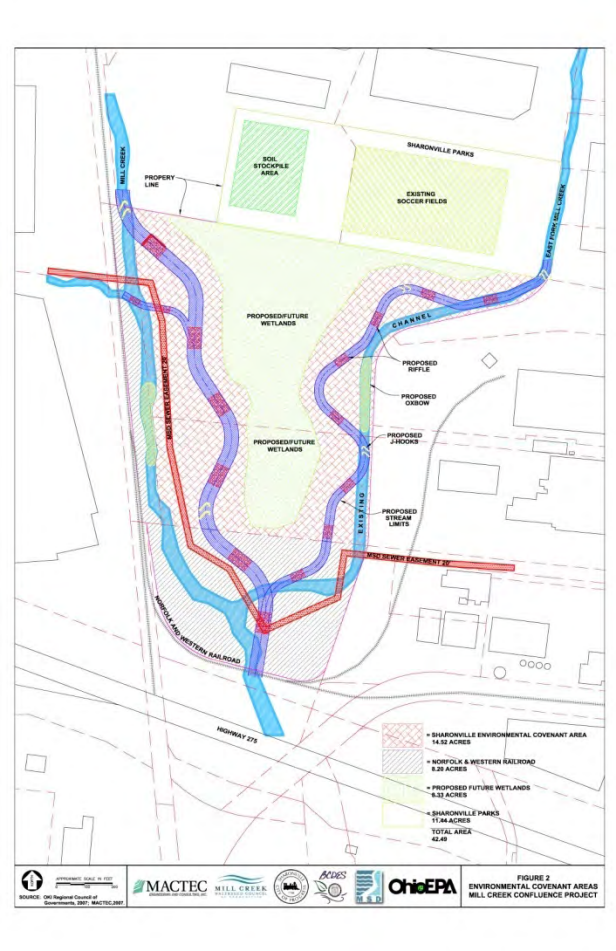
Collection Date: 09/22/2009 River Code: 11-001 RM: 76.50

Taxa Code	Taxa	Quant/Qual	
01900	*Nemertea*	8	
03360	*Plumatella sp*		+
03600	*Oligochaeta*	16	+
05900	*Lirceus sp*		+
06201	*Hyalella azteca*		+
08250	*Orconectes (Procericambarus) rusticus*		+
08601	*Hydrachnidia*	8	+
11119	*Plauditus dubius or P. virilis*	19	
11120	*Baetis flavistriga*	26	+
11130	*Baetis intercalaris*	73	+
11651	*Procloeon sp (w/o hindwing pads)*		+
12200	*Isonychia sp*	232	+
13100	*Nixe sp*		+
13400	*Stenacron sp*	58	+
13521	*Stenonema femoratum*	19	+
13540	*Maccaffertium mediopunctatum*	2	
13561	*Maccaffertium pulchellum*	122	+
13570	*Maccaffertium terminatum*	65	+
16700	*Tricorythodes sp*	61	+
17200	*Caenis sp*	44	+
18100	*Anthopotamus sp*		+
18600	*Ephemera sp*	1	+
18700	*Hexagenia sp*		+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*	1	+
23909	*Boyeria vinosa*	2	+
24900	*Gomphus sp*		+
45400	*Trichocorixa sp*		+
47600	*Sialis sp*		+
48620	*Nigronia serricornis*	1	
50315	*Chimarra obscura*		+
50804	*Lype diversa*		+
51300	*Neureclipsis sp*	1	+
51600	*Polycentropus sp*		+
52200	*Cheumatopsyche sp*	1081	+
52430	*Ceratopsyche morosa group*	923	+
52530	*Hydropsyche depravata group*	71	+
52560	*Hydropsyche orris*	2	
53800	*Hydroptila sp*	57	
59700	*Triaenodes sp*		+
64800	*Uvarus sp*		+
68075	*Psephenus herricki*		+
68130	*Helichus sp*		+
68201	*Scirtidae*		+
68601	*Ancyronyx variegata*		+
68702	*Dubiraphia bivittata*		+
68708	*Dubiraphia vittata group*		+
68901	*Macronychus glabratus*	4	+
69400	*Stenelmis sp*	2	+
70600	*Antocha sp*	17	
71900	*Tipula sp*		+
72700	*Anopheles sp*		+
80310	*Cardiocladius obscurus*	32	+
80420	*Cricotopus (C.) bicinctus*	65	+
80440	*Cricotopus (C.) trifascia*	32	
81650	*Parametriocnemus sp*	97	
81690	*Paratrichocladius sp*	32	
81825	*Rheocricotopus (Psilocricotopus) robacki*	259	+
82100	*Thienemanniella sp*	16	
82730	*Chironomus (C.) decorus group*		+
83003	*Dicrotendipes fumidus*		+
83040	*Dicrotendipes neomodestus*		+
83840	*Microtendipes pedellus group*	32	+
84155	*Paralauterborniella nigrohalteralis*		+
84210	*Paratendipes albimanus or P. duplicatus*		+
84450	*Polypedilum (Uresipedilum) flavum*	129	
84460	*Polypedilum (P.) fallax group*	32	
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*		+
84750	*Stictochironomus sp*		+
85261	*Cladotanytarsus vanderwulpi group Type 1*	32	+
85500	*Paratanytarsus sp*	65	+
85625	*Rheotanytarsus sp*	1424	+
85752	*Sublettea coffmani*	485	
85821	*Tanytarsus glabrescens group sp 7*	194	+
87540	*Hemerodromia sp*	1	
93900	*Elimia sp*	1	+
95100	*Physella sp*		+
96100	*Menetus (Micromenetus) sp*		+
96900	*Ferrissia sp*	1	+

No. Quantitative Taxa: 45 Total Taxa: 81
No. Qualitative Taxa: 66 ICI: **56**
Number of Organisms: 5845 Qual EPT: 22

MILL CREEK CONFLUENCE WETLANDS RESTORATION AND NPS EDUCATIONAL PROJECT

Project Baseline Stream Monitoring



PROJECT NAME: MILL CREEK CONFLUENCE WETLANDS RESTORATION
Project Baseline Stream Monitoring

PROJECT NUMBER: #09(h) EPA-15
STREAMS SAMPLED: Mill Creek and East Fork Mill Creek

SUMMARY

Restoration of 8.3 acres of wetlands in the vicinity of the confluence of Mill Creek, East Fork and Beaver Run will be completed in association with a concurrent stream restoration project funded by another program. The project will restore 8.3 acres of wetlands, 834 linear feet of stream channel and 3 acres of riparian areas. Restored wetland areas will be replanted with a variety of native wetland plant species, resulting in a variety of wetland habitat conditions. Stream restoration activities will involve natural channel design methods and restore functionality and natural stream flow to this highly modified area of Mill Creek.

Sampling sites in Mill Creek and the East Fork Mill Creek had good stream habitat scores, with QHEI values ranging from 61.5 to 70.5. However, all five sites had previously been channelized, with some recovery to natural conditions. Biological results from the three sites in Mill Creek did not attain the WWH biocriteria, and this resulted from poor fish results. The two sites in the East Fork Mill Creek partially attained the Warmwater Habitat (WWH) biological criteria listed in the Ohio Water Quality Standards. The partial attainment was driven by the fair quality fish communities at both sampling stations. Macroinvertebrate community results from all five sampling stations were reflective of good to exceptional water quality. Substantial improvement in fish and macroinvertebrate scores has occurred in the East Fork Mill Creek from 2002 to 2009. This appears directly related to improved effluent quality (reduced ammonia and phosphorus concentrations) at the Upper Mill Creek Water Reclamation Plant, which discharges into the East Fork Mill Creek at river mile 1.07. The Upper Mill Creek WWTP was upgraded to meet new phosphorus and nitrite+nitrate limits in 2006.

AQUATIC LIFE USE ATTAINMENT - MILL CREEK/ EAST FORK MILL CREEK 2009.

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 located in the Interior Plateau (IP) *ecoregion. In the Ohio Water Quality Standards, both streams are designated Warmwater Habitat (WWH).*

Sample Site River Mile	Attainment Status	IBI	MIwb	ICI	QHEI	Biological Assessment
Mill Creek						
18.7	**NON**	30*	5.4*	40	67.5 (Good)	Poor to Good
18.1	**NON**	26*	6.0*	36	70.5 (Good)	Poor to Good
17.6/16.6	**NON**	30*	5.6*	42	67.5 (Good)	Poor to Very Good
East Fork Mill Creek						
0.7	**PARTIAL**	34*	NA	44	61.5 (Good)	Fair to Very Good
0.2	**PARTIAL**	30*	NA	48	63.0 (Good)	Fair to Exceptional

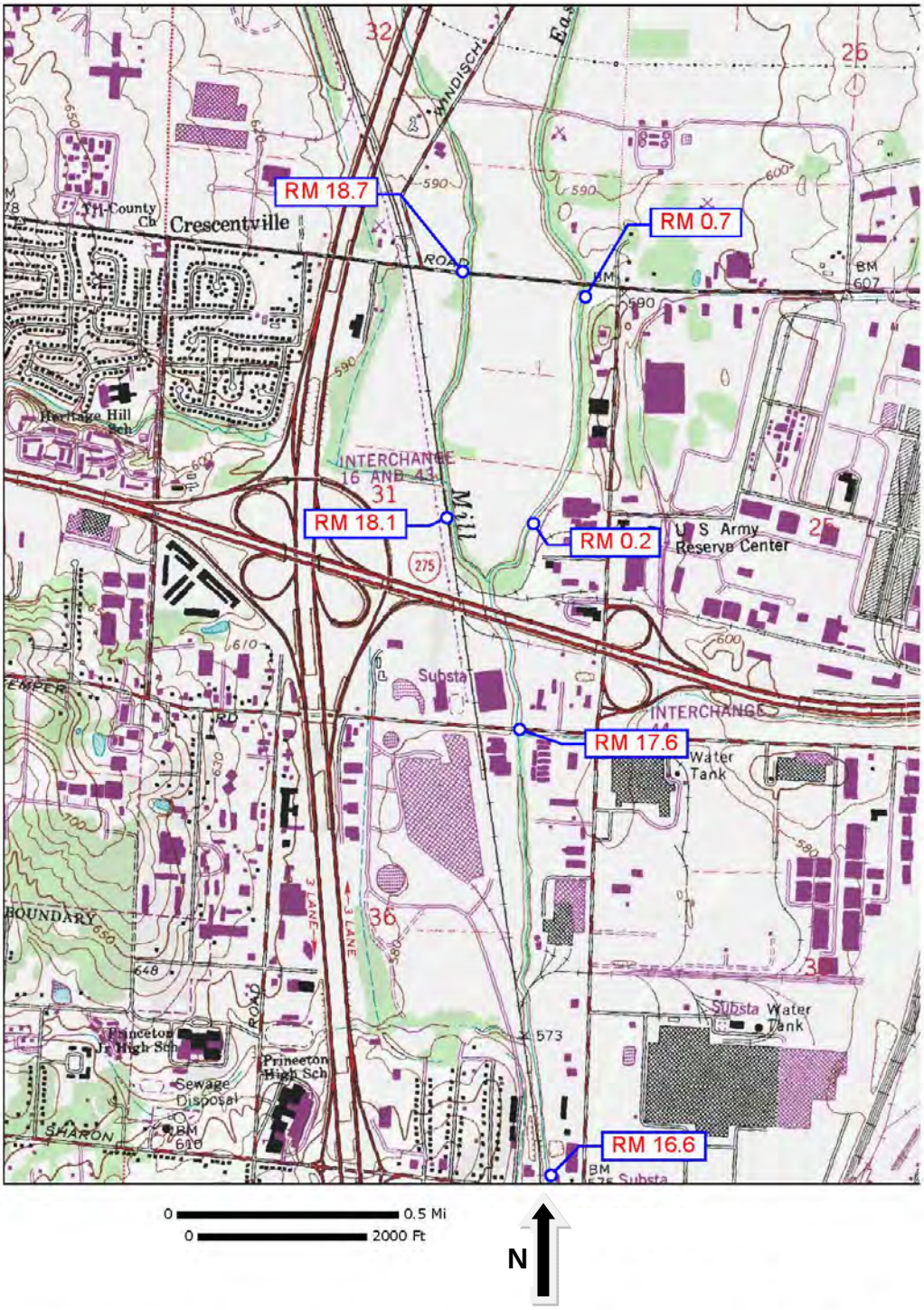
Ecoregion Biocriteria: Interior Plateau (IP)		
INDEX – SITE TYPE	WWH	EWH
IBI: Headwater/ Wading	40	50
MIwb: Wading	8.1	9.4
ICI	30	46

[ns] Nonsignificant departure from biocriterion (≤4 IBI or ICI units, ≤0.5 MIwb units). Poor results are underlined.
* Significant departure from biocriterion (>4 IBI or ICI units, >0.5 MIwb units).

Sampling locations in Mill Creek and East Fork Mill Creek, 2009.

River Mile	Latitude	Longitude	Landmark
Mill Creek			
18.7	39.2992	84.4344	Cresentville Road
18.1	39.2911	84.4353	Just upstream from East Fork Mill Creek confluence
17.6	39.2844	84.4331	Kemper Road (macroinvertebrate sample only)
16.6	39.2700	84.4322	Sharon Road (fish sample only)
East Fork Mill Creek			
0.7	39.2980	84.4297	Cresentville Road
0.2	39.2911	84.4319	Near mouth

Mill Creek and East Fork Mill Creek sampling sites, 2009



APPENDICES – MILL CREEK CONFLUENCE WETLAND RESTORATION

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores for Mill Creek and East Fork Mill Creek.

Appendix Table 2. Index of Biotic Integrity (IBI) scores and metrics for the Mill Creek and East Fork Mill Creek.

Appendix Table 3. Ohio EPA fish results for the Mill Creek and East Fork Mill Creek.

Appendix Table 4. Invertebrate Community Index (ICI) scores and metrics for the Mill Creek and East Fork Mill Creek.

Appendix Table 5. Ohio EPA macroinvertebrate results for the Mill Creek and East Fork Mill Creek.

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores and physical attributes for fish sampling sites in Mill Creek and East Fork Mill Creek, 2009.

			WWH Attributes											MWH Attributes: *High Influence*						MWH Attributes: *Moderate Influence*															
Key QHEI Components			No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max. Depth >40 cm	Low-Normal Riffle Embeddedness	**Total WWH Attributes**	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/ No Cover	Max. Depth <40 cm (WD,HW sites)	**Total High Influence Attributes**	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent & Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	**Total Moderate Influence Attributes**	**(MWH H.I.+1)/ (WWH+1) Ratio**	**(MWH M.I.+1)/ (WWH+1) Ratio**
River Mile	QHEI	Gradient (ft/mile)																																	
Mill Creek Year: 2009																																			
18.7	**67.5**	6.67	■	■			■	■			■		5						0	●	●		●	●	●			●	●	●		8	0.17	1.50
18.1	**70.5**	6.67	■	■		■	■	■	■		■		7						0	●			●	●					●	●		5	0.13	0.75
16.6	**67.5**	5.10	■	■		■	■	■	■		■		7						0	●			●	●	●				●	●		6	0.13	0.88
East Fork Mill Creek Year: 2009																																			
0.7	**61.5**	8.40		■				■	■		■		4			◆			1	●			●	●					●	●		5	0.40	1.40
0.2	**63.0**	8.40		■				■	■		■	■	5			◆	◆		2	●			●	●					●	●		5	0.50	1.33

Appendix Table 2. Index of Biotic Integrity (IBI) metrics and scores for sampling locations in Mill Creek and East Fork Mill Creek, 2009.

				Number of					Percent of Individuals								
River Mile	Type	Date	Drainage area (sq mi)	Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb
Mill Creek - (23001)																	
Year: 2009																	
18.70	D	09/09/2009	27	11(3)	2(3)	1(1)	0(1)	2(3)	4(1)	68(1)	6(5)	0.7(1)	81(5)	0.7(5)	88(1)	30	5.4
18.10	D	09/09/2009	32	12(3)	2(3)	1(1)	0(1)	2(1)	34(3)	40(3)	27(3)	1.6(3)	16(1)	2.2(1)	386(3)	26	6.0
16.60	D	09/09/2009	50	14(3)	3(3)	1(1)	0(1)	2(1)	9(1)	61(1)	3(5)	2.7(3)	90(5)	0.0(5)	116(1)	30	5.6

na - Qualitative data, Modified Iwb not applicable.

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table 2. Index of Biotic Integrity (IBI) metrics and scores for sampling locations in Mill Creek and East Fork Mill Creek, 2009.

				Number of						Percent of Individuals						
River Mile	Type	Date	Drainage area (sq mi)	Total species	Minnow species	Headwater species	Sensitive species	Darter & Sculpin species	Simple Lithophils	Tolerant fishes	Omni-vores	Pioneering fishes	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI
East Fork Mill Creek - (23-006)																
Year: 2009																
0.70	D	09/09/2009	9.2	11(3)	4(3)	0(1)	1(1)	2(3)	3(3)	64(1)	15(5)	45(3)	69(5)	0.0(5)	100(1)	34
0.20	D	09/09/2009	9.4	10(3)	4(3)	0(1)	1(1)	1(1)	3(3)	65(1)	23(3)	42(3)	52(5)	0.0(5)	92(1)	30

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table 3. Ohio EPA fish results from Mill Creek and the East Fork Mill Creek, 2009.

Species List

River Code: **23-001**	Stream: **Mill Creek**	Sample Date: **2009**
River Mile: **18.70**	Location: Crescentville Rd.	Date Range: 09/09/2009
Time Fished: 1800 sec	Drainage: 27.5 sq mi	
Dist Fished: 0.15 km	Basin: Mill Creek No of Passes: 1	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	2	4.00	1.45	0.88	19.78	220.00
Common Carp	G	O	M	T	1	2.00	0.72	0.88	19.78	440.00
Creek Chub	N	G	N	T	10	20.00	7.25	0.04	0.99	2.20
Striped Shiner	N	I	S		1	2.00	0.72	0.00	0.04	1.00
Bluntnose Minnow	N	O	C	T	5	10.00	3.62	0.02	0.54	2.40
Central Stoneroller	N	H	N		2	4.00	1.45	0.01	0.22	2.50
Yellow Bullhead		I	C	T	2	4.00	1.45	0.22	4.90	54.50
Largemouth Bass	F	C	C		1	2.00	0.72	0.62	13.94	310.00
Green Sunfish	S	I	C	T	74	148.00	53.62	1.02	23.02	6.92
Bluegill Sunfish	S	I	C	P	31	62.00	22.46	0.59	13.26	9.52
Hybrid X Sunfish					5	10.00	3.62	0.15	3.28	14.60
Johnny Darter	D	I	C		1	2.00	0.72	0.00	0.04	1.00
Rainbow Darter	D	I	S	M	3	6.00	2.17	0.01	0.18	1.33
	Mile Total				138	276.00		4.45		
	Number of Species				12					
	Number of Hybrids				1					

Species List

River Code: **23-001**	Stream: **Mill Creek**	Sample Date: **2009**
River Mile: **18.10**	Location: upst. East Fork Mill Creek	Date Range: 09/09/2009
Time Fished: 1800 sec	Drainage: 32.8 sq mi	
Dist Fished: 0.15 km	Basin: Mill Creek No of Passes: 1	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	81	162.00	25.39	4.67	62.72	28.85
Common Carp	G	O	M	T	1	2.00	0.31	0.09	1.21	45.00
Creek Chub	N	G	N	T	21	42.00	6.58	0.72	9.63	17.10
Striped Shiner	N	I	S		3	6.00	0.94	0.16	2.09	26.00
Sand Shiner	N	I	M	M	1	2.00	0.31	0.00	0.05	2.00
Bluntnose Minnow	N	O	C	T	5	10.00	1.57	0.01	0.13	1.00
Central Stoneroller	N	H	N		154	308.00	48.28	0.81	10.87	2.63
Yellow Bullhead		I	C	T	3	6.00	0.94	0.18	2.42	30.00
Largemouth Bass	F	C	C		5	10.00	1.57	0.18	2.42	18.00
Green Sunfish	S	I	C	T	15	30.00	4.70	0.53	7.06	17.53
Bluegill Sunfish	S	I	C	P	5	10.00	1.57	0.04	0.54	4.00
Johnny Darter	D	I	C		1	2.00	0.31	0.00	0.03	1.00
Rainbow Darter	D	I	S	M	24	48.00	7.52	0.06	0.83	1.29
	Mile Total				319	638.00		7.45		
	Number of Species				13					
	Number of Hybrids				0					

Species List

River Code: **23-001**	Stream: **Mill Creek**	Sample Date: **2009**
River Mile: **16.60**	Location: Sharon Rd.	Date Range: 09/09/2009
Time Fished: 1800 sec	Drainage: 50.0 sq mi	
Dist Fished: 0.15 km	Basin: Mill Creek No of Passes: 1	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	2	4.00	1.35	0.75	6.97	187.50
Common Carp	G	O	M	T	1	2.00	0.68	3.70	34.38	1,850.00
Western Blacknose Dace	N	G	S	T	1	2.00	0.68	0.00	0.02	1.00
Creek Chub	N	G	N	T	1	2.00	0.68	0.00	0.04	2.00
Striped Shiner	N	I	S		8	16.00	5.41	0.22	2.04	13.75
Spotfin Shiner	N	I	M		9	18.00	6.08	0.10	0.91	5.44
Bluntnose Minnow	N	O	C	T	1	2.00	0.68	0.00	0.02	1.00
Central Stoneroller	N	H	N		2	4.00	1.35	0.06	0.56	15.00
Yellow Bullhead		I	C	T	13	26.00	8.78	1.53	14.22	58.85
Largemouth Bass	F	C	C		4	8.00	2.70	0.04	0.33	4.50
Green Sunfish	S	I	C	T	71	142.00	47.97	3.55	32.99	25.00
Bluegill Sunfish	S	I	C	P	26	52.00	17.57	0.56	5.20	10.77
Pumpkinseed Sunfish	S	I	C	P	1	2.00	0.68	0.01	0.13	7.00
Hybrid X Sunfish					3	6.00	2.03	0.22	2.04	36.67
Johnny Darter	D	I	C		2	4.00	1.35	0.01	0.06	1.50
Rainbow Darter	D	I	S	M	3	6.00	2.03	0.01	0.09	1.67
	Mile Total				148	296.00		10.76		
	Number of Species				15					
	Number of Hybrids				1					

Species List

River Code: **23-006**	Stream: **East Fork Mill Creek**	Sample Date: **2009**
River Mile: **0.70**	Location: dst. Crescentville Rd.	Date Range: 09/09/2009
Time Fished: 1800 sec	Drainage: 9.2 sq mi	
Dist Fished: 0.15 km	Basin: Mill Creek No of Passes: 1	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	21	42.00	15.33	2.98	45.09	71.05
Creek Chub	N	G	N	T	10	20.00	7.30	0.51	7.71	25.50
Striped Shiner	N	I	S		2	4.00	1.46	0.11	1.72	28.50
Spotfin Shiner	N	I	M		1	2.00	0.73	0.01	0.12	4.00
Central Stoneroller	N	H	N		8	16.00	5.84	0.07	1.00	4.13
Yellow Bullhead		I	C	T	7	14.00	5.11	0.85	12.87	60.86
Largemouth Bass	F	C	C		3	6.00	2.19	0.06	0.94	10.33
Green Sunfish	S	I	C	T	49	98.00	35.77	1.92	29.07	19.63
Bluegill Sunfish	S	I	C	P	4	8.00	2.92	0.02	0.27	2.25
Johnny Darter	D	I	C		2	4.00	1.46	0.01	0.09	1.50
Rainbow Darter	D	I	S	M	30	60.00	21.90	0.07	1.12	1.23
	Mile Total				137	274.00		6.62		
	Number of Species				11					
	Number of Hybrids				0					

Species List

River Code: **23-006**	Stream: **East Fork Mill Creek**	Sample Date: **2009**
River Mile: **0.20**	Location: near mouth	Date Range: 09/09/2009
Time Fished: 1800 sec	Drainage: 9.4 sq mi	
Dist Fished: 0.15 km	Basin: Mill Creek No of Passes: 1	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	30	60.00	22.73	4.22	58.95	70.27
Creek Chub	N	G	N	T	11	22.00	8.33	0.48	6.66	21.64
Striped Shiner	N	I	S		6	12.00	4.55	0.09	1.23	7.33
Spotfin Shiner	N	I	M		3	6.00	2.27	0.02	0.34	4.00
Central Stoneroller	N	H	N		19	38.00	14.39	0.14	1.96	3.68
Yellow Bullhead		I	C	T	1	2.00	0.76	0.20	2.80	100.00
Largemouth Bass	F	C	C		3	6.00	2.27	0.05	0.73	8.67
Green Sunfish	S	I	C	T	44	88.00	33.33	1.88	26.31	21.39
Bluegill Sunfish	S	I	C	P	4	8.00	3.03	0.05	0.67	6.00
Rainbow Darter	D	I	S	M	11	22.00	8.33	0.03	0.36	1.18
	Mile Total				132	264.00		7.15		
	Number of Species				10					
	Number of Hybrids				0					

Appendix Table 4. Invertebrate Community Index (ICI) scores and metrics for Mill Creek and the East Fork Mill Creek, 2009.

River Mile	Drainage Area (sq mi)	Number of: Total Taxa	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Percent: Mayflies	Caddis-flies	Tany-tarsini	Other Dipt/NI	Tolerant Organisms	Qual. EPT	Eco-region	ICI
Mill Creek (23-001)													
Year: 2009													
18.70	27.5	35(4)	5(4)	2(4)	17(4)	7.1(2)	3.9(4)	37.9(6)	50.0(2)	5.7(6)	8(4)	2	40
18.10	32.8	35(4)	4(2)	2(4)	19(4)	2.5(2)	3.6(2)	53.9(6)	39.5(4)	4.4(6)	8(2)	2	36
17.60	44.8	37(4)	4(2)	4(6)	19(4)	6.6(2)	20.0(6)	30.8(6)	41.4(4)	6.3(6)	8(2)	2	42
East Fork Mill Creek (23-006)													
Year: 2009													
0.70	9.2	35(4)	3(2)	5(6)	16(4)	0.8(2)	26.7(6)	42.9(6)	29.4(4)	7.0(6)	9(4)	2	44
0.20	9.4	36(4)	5(4)	5(6)	15(4)	1.4(2)	26.8(6)	54.2(6)	17.3(6)	3.5(6)	8(4)	2	48

Appendix Table 5. Ohio EPA macroinvertebrate results from Mill Creek and the East Fork Mill Creek, 2009.

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Mill Creek
Crescentville Rd.

Collection Date: 09/24/2009 River Code: 23-001 RM: 18.70

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	21	
01801	*Turbellaria*	165	+
03360	*Plumatella sp*	1	+
03600	*Oligochaeta*	37	+
04960	*Mooreobdella sp*		+
08250	*Orconectes (Procericambarus) rusticus*		+
11120	*Baetis flavistriga*	1	+
11130	*Baetis intercalaris*	72	+
13400	*Stenacron sp*	3	+
13521	*Stenonema femoratum*	91	+
17200	*Caenis sp*	12	+
22001	*Coenagrionidae*	1	+
22300	*Argia sp*	2	+
23700	*Anax sp*		+
50315	*Chimarra obscura*	2	+
52200	*Cheumatopsyche sp*	97	+
52530	*Hydropsyche depravata group*		+
65800	*Berosus sp*	1	
68075	*Psephenus herricki*		+
68700	*Dubiraphia sp*	19	+
69400	*Stenelmis sp*	3	+
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*	22	
77750	*Hayesomyia senata or Thienemannimyia norena*	199	
78350	*Meropelopia sp*	22	+
78450	*Nilotanypus fimbriatus*	44	
80370	*Corynoneura lobata*	36	
82820	*Cryptochironomus sp*		+
83040	*Dicrotendipes neomodestus*	22	
83300	*Glyptotendipes (G.) sp*	265	+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*		+
83840	*Microtendipes pedellus group*	44	
84210	*Paratendipes albimanus or P. duplicatus*		+
84450	*Polypedilum (Uresipedilum) flavum*	66	+
84470	*Polypedilum (P.) illinoense*	88	
84540	*Polypedilum (Tripodura) scalaenum group*	66	
84960	*Pseudochironomus sp*	22	
85500	*Paratanytarsus sp*	44	+
85625	*Rheotanytarsus sp*	243	+
85720	*Stempellinella fimbriata*		+
85800	*Tanytarsus sp*	88	+
85821	*Tanytarsus glabrescens group sp 7*	575	+
87540	*Hemerodromia sp*	18	
96900	*Ferrissia sp*	17	
97601	*Corbicula fluminea*	100	+

No. Quantitative Taxa: 35 Total Taxa: 45
No. Qualitative Taxa: 32 ICI: **40**
Number of Organisms: 2509 Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Mill Creek
upst. East Fork Mill Creek

Collection Date: 09/24/2009 River Code: 23-001 RM: 18.10

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	35	
01801	*Turbellaria*	114	+
03600	*Oligochaeta*	65	+
04664	*Helobdella stagnalis*		+
04964	*Mooreobdella microstoma*		+
11120	*Baetis flavistriga*	3	+
11130	*Baetis intercalaris*	38	+
13521	*Stenonema femoratum*	4	+
17200	*Caenis sp*	36	+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*	6	+
52200	*Cheumatopsyche sp*	116	+
52430	*Ceratopsyche morosa group*	2	+
52530	*Hydropsyche depravata group*		+
53800	*Hydroptila sp*		+
65800	*Berosus sp*	1	
68700	*Dubiraphia sp*	1	
69400	*Stenelmis sp*	9	+
74100	*Simulium sp*		+
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*	24	+
77750	*Hayesomyia senata or Thienemannimyia norena*	192	
78450	*Nilotanypus fimbriatus*	48	
80370	*Corynoneura lobata*	32	
80410	*Cricotopus (C.) sp*	24	+
80430	*Cricotopus (C.) tremulus group*	312	
81200	*Nanocladius sp*	24	
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*		+
83003	*Dicrotendipes fumidus*		+
83040	*Dicrotendipes neomodestus*	72	+
83300	*Glyptotendipes (G.) sp*	144	
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*	24	+
84300	*Phaenopsectra obediens group*		+
84450	*Polypedilum (Uresipedilum) flavum*	24	+
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*	24	+
85261	*Cladotanytarsus vanderwulpi group Type 1*	24	
85500	*Paratanytarsus sp*	120	
85625	*Rheotanytarsus sp*	780	+
85800	*Tanytarsus sp*	96	+
85821	*Tanytarsus glabrescens group sp 7*	720	+
85840	*Tanytarsus sepp*	24	
87540	*Hemerodromia sp*	32	
96100	*Menetus (Micromenetus) sp*	17	
96900	*Ferrissia sp*	80	
97601	*Corbicula fluminea*	3	+
98600	*Sphaerium sp*		+

No. Quantitative Taxa: 35 Total Taxa: 49
No. Qualitative Taxa: 34 ICI: **36**
Number of Organisms: 3270 Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Mill Creek
Kemper Rd.

Collection Date: 10/01/2009 River Code: 23-001 RM: 17.60

Taxa Code	Taxa	Quant/Qual	
01801	*Turbellaria*	165	+
03360	*Plumatella sp*	1	+
03600	*Oligochaeta*	141	+
04664	*Helobdella stagnalis*		+
04666	*Helobdella triserialis*		+
04964	*Mooreobdella microstoma*		+
11120	*Baetis flavistriga*	18	+
11130	*Baetis intercalaris*	124	+
13521	*Stenonema femoratum*	21	+
17200	*Caenis sp*	96	+
21300	*Hetaerina sp*	1	+
22001	*Coenagrionidae*		+
22300	*Argia sp*	22	+
52200	*Cheumatopsyche sp*	559	+
52430	*Ceratopsyche morosa group*	153	+
52530	*Hydropsyche depravata group*	26	+
53800	*Hydroptila sp*	44	+
65800	*Berosus sp*	1	
68708	*Dubiraphia vittata group*	17	+
69400	*Stenelmis sp*	3	+
74100	*Simulium sp*	18	+
77750	*Hayesomyia senata or Thienemannimyia norena*	497	+
78350	*Meropelopia sp*		+
80370	*Corynoneura lobata*	8	
80410	*Cricotopus (C.) sp*	157	+
80420	*Cricotopus (C.) bicinctus*	52	+
80430	*Cricotopus (C.) tremulus group*	78	+
81200	*Nanocladius sp*	26	
82101	*Thienemanniella taurocapita*	8	
82121	*Thienemanniella lobapodema*	8	
82141	*Thienemanniella xena*	8	
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*		+
83003	*Dicrotendipes fumidus*		+
83040	*Dicrotendipes neomodestus*	157	
83300	*Glyptotendipes (G.) sp*	26	
84470	*Polypedilum (P.) illinoense*	26	+
84540	*Polypedilum (Tripodura) scalaenum group*	131	+
85500	*Paratanytarsus sp*	26	
85625	*Rheotanytarsus sp*	862	+
85800	*Tanytarsus sp*	52	+
85821	*Tanytarsus glabrescens group sp 7*	261	
87540	*Hemerodromia sp*	72	
96900	*Ferrissia sp*	25	
97601	*Corbicula fluminea*	11	+
98200	*Pisidium sp*		+

No. Quantitative Taxa: 37 Total Taxa: 46
No. Qualitative Taxa: 34 ICI: **42**
Number of Organisms: 3901 Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: East Fork Mill Creek
dst. Crescentville Rd.

Collection Date: 09/24/2009 River Code: 23-006 RM: 0.70

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	284	
01801	*Turbellaria*	68	+
03360	*Plumatella sp*	1	
03600	*Oligochaeta*	518	+
04664	*Helobdella stagnalis*		+
05900	*Lirceus sp*		+
06700	*Crangonyx sp*		+
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*	8	+
13521	*Stenonema femoratum*	1	+
17200	*Caenis sp*	74	+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*	2	+
27610	*Epitheca (Tetragoneuria) cynosura*		+
44501	*Corixidae*		+
50315	*Chimarra obscura*	1	+
52200	*Cheumatopsyche sp*	2627	+
52430	*Ceratopsyche morosa group*	53	+
52530	*Hydropsyche depravata group*	212	+
53800	*Hydroptila sp*	5	+
60900	*Peltodytes sp*		+
65800	*Berosus sp*	2	+
68700	*Dubiraphia sp*	1	
69400	*Stenelmis sp*	22	+
71900	*Tipula sp*	1	+
74100	*Simulium sp*		+
77500	*Conchapelopia sp*	79	
77750	*Hayesomyia senata or Thienemannimyia norena*	316	
80410	*Cricotopus (C.) sp*	79	+
80420	*Cricotopus (C.) bicinctus*	79	
80430	*Cricotopus (C.) tremulus group*	79	
82820	*Cryptochironomus sp*		+
83040	*Dicrotendipes neomodestus*	158	+
83045	*Dicrotendipes nervosus*	158	
83300	*Glyptotendipes (G.) sp*	473	+
83900	*Nilothauma sp*		+
84210	*Paratendipes albimanus or P. duplicatus*		+
84300	*Phaenopsectra obediens group*		+
84450	*Polypedilum (Uresipedilum) flavum*	158	+
84470	*Polypedilum (P.) illinoense*	158	+
84540	*Polypedilum (Tripodura) scalaenum group*	394	
85501	*Paratanytarsus n.sp 1*	79	
85625	*Rheotanytarsus sp*	4102	+
85821	*Tanytarsus glabrescens group sp 7*	473	
87540	*Hemerodromia sp*	66	
95100	*Physella sp*	3	
97601	*Corbicula fluminea*	122	+
98600	*Sphaerium sp*	1	+

No. Quantitative Taxa: 35 Total Taxa: 49
No. Qualitative Taxa: 36 ICI: **44**
Number of Organisms: 10857 Qual EPT: 9

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: East Fork Mill Creek
near mouth

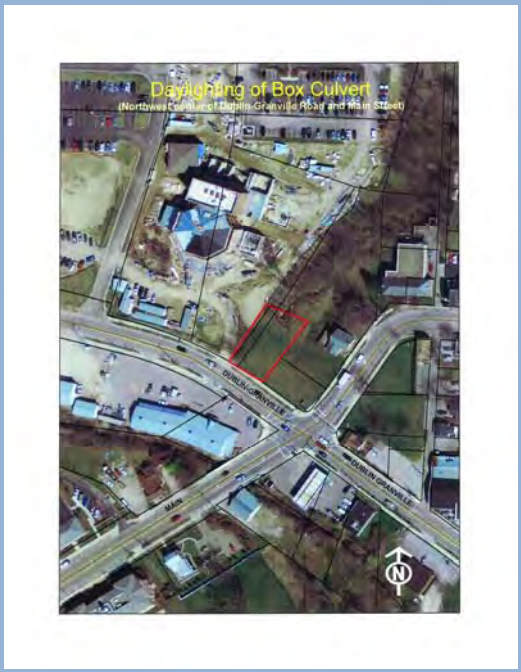
Collection Date: 10/01/2009 River Code: 23-006 RM: 0.20

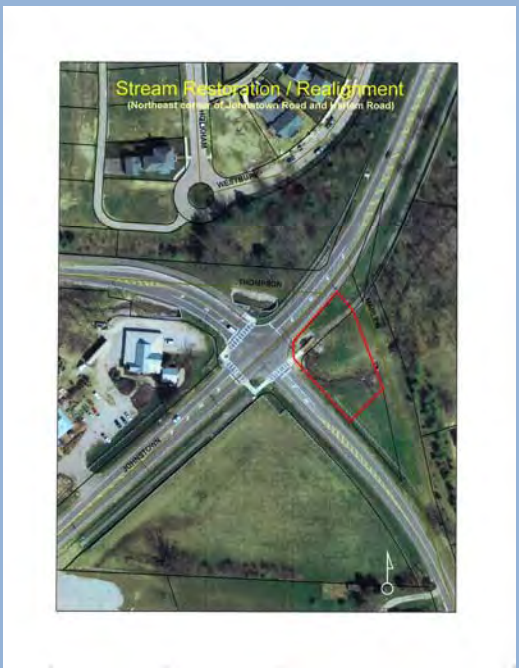
Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	81	+
01801	*Turbellaria*	74	+
03360	*Plumatella sp*	1	
03600	*Oligochaeta*	49	+
05900	*Lirceus sp*	1	
11120	*Baetis flavistriga*	5	+
11130	*Baetis intercalaris*	18	+
13521	*Stenonema femoratum*	5	+
16700	*Tricorythodes sp*	1	
17200	*Caenis sp*	106	+
21200	*Calopteryx sp*	1	+
22001	*Coenagrionidae*		+
22300	*Argia sp*	18	+
50315	*Chimarra obscura*	1	
52200	*Cheumatopsyche sp*	2204	+
52430	*Ceratopsyche morosa group*	47	+
52530	*Hydropsyche depravata group*	218	+
53800	*Hydroptila sp*	73	+
60900	*Peltodytes sp*		+
65800	*Berosus sp*	1	
67500	*Laccobius sp*		+
69400	*Stenelmis sp*	12	+
71900	*Tipula sp*	1	+
74100	*Simulium sp*		+
77500	*Conchapelopia sp*	188	
77750	*Hayesomyia senata or Thienemannimyia norena*	502	
80370	*Corynoneura lobata*	16	
80410	*Cricotopus (C.) sp*		+
80420	*Cricotopus (C.) bicinctus*		+
81240	*Nanocladius (N.) distinctus*	63	
81825	*Rheocricotopus (Psilocricotopus) robacki*	63	
82101	*Thienemanniella taurocapita*	8	
82141	*Thienemanniella xena*	16	
82820	*Cryptochironomus sp*		+
83000	*Dicrotendipes sp*	63	
83003	*Dicrotendipes fumidus*		+
83040	*Dicrotendipes neomodestus*	126	+
84450	*Polypedilum (Uresipedilum) flavum*	126	+
84470	*Polypedilum (P.) illinoense*	188	
85625	*Rheotanytarsus sp*	5021	+
85821	*Tanytarsus glabrescens group sp 7*	126	+
87540	*Hemerodromia sp*	26	
95100	*Physella sp*		+
96264	*Planorbella (Pierosoma) pilsbryi*		+
96900	*Ferrissia sp*	37	
97601	*Corbicula fluminea*	17	+

No. Quantitative Taxa: 36 Total Taxa: 46
No. Qualitative Taxa: 30 ICI: **48**
Number of Organisms: 9503 Qual EPT: 8

VILLAGE OF NEW ALBANY STREAM RESTORATION PROJECT

Project Baseline Stream Monitoring





PROJECT NAME: VILLAGE OF NEW ALBANY STREAM RESTORATION
Project Baseline Stream Monitoring

PROJECT NUMBER: #09(h) EPA-17

STREAMS SAMPLED: Tributary to Rose Run/ Tributary to Rocky Fork

SUMMARY

The Village of New Albany will restore two unnamed tributaries within the Rose Run and Rocky Fork Creek watersheds. Natural channel design restoration methods will be used along 340 linear feet and include the removal of more than 130 linear feet of box culverts, enhancement of riparian habitat conditions and the construction of riffles and runs to improve in-stream aquatic habitat conditions. Completion of these restoration projects is consistent with habitat improvements identified as needed within the Rocky Fork Creek watershed action plan which is nearing completion but not yet endorsed.

Unnamed Tributary to Rocky Fork
The unnamed tributary to Rocky Fork was assessed at two locations (RMs 0.7 and 0.8). RM 0.7 is located within a section of stream previously covered by a box culvert at the upstream side of US Route 62. At RM 0.7 the stream channel was recently relocated and appeared to be reconstructed using natural stream design guidelines. The upstream site at RM 0.8 had a natural channel. Both stream sites had good or better physical habitat conditions, and the drainage area was very small (1.2 square miles). Both sites (RMs 0.7 and 0.8) did not attain the recommended Warmwater Habitat (WWH) biological criteria listed in the Ohio Water Quality Standards. The non-attainment was due to the poor macroinvertebrate results, and appears related to nutrient enrichment.

Unnamed Tributary to Rose Run
Tributary to Rose Run @ RM 2.02 is a PHWH stream with a drainage area of 0.1 sq mi that confluences with Rose Run in downtown New Albany. It was evaluated at RM 0.1 using PHWH methods (OEPA 2009) on 13 August 2009. The stream was intermittent at this time with only two small pools remaining in the sampling segment immediately upstream from the culverted part that goes under Dublin-Granville Road. Results of the biological sampling classify this stream as a Class 2 PHWH stream.

AQUATIC LIFE USE ATTAINMENT – TRIBUTARY TO ROCKY FORK 2009.

The Index of Biotic Integrity (IBI), 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 located in the Eastern Corn Belt Plains (ECBP) ecoregion. The unnamed tributary to Rocky Fork is not listed with an aquatic life use designation in the Ohio Water Quality Standards. The Warmwater Habitat (WWH) aquatic life use is recommended.

Sample Site River Mile	Attainment Status	IBI	ICI[a]	QHEI	Biological Assessment
0.8	**NON**	38[ns]	Poor*	70.5 (Excellent)	Poor/ Marginally Good
0.7	**NON**	46	Poor*	61.0 (Good)	Poor/ Very Good

Ecoregion Biocriteria: Easter Corn Belt Plains (ECBP)		
INDEX – SITE TYPE	WWH	EWH
IBI: Headwaters	40	50
ICI	36	46

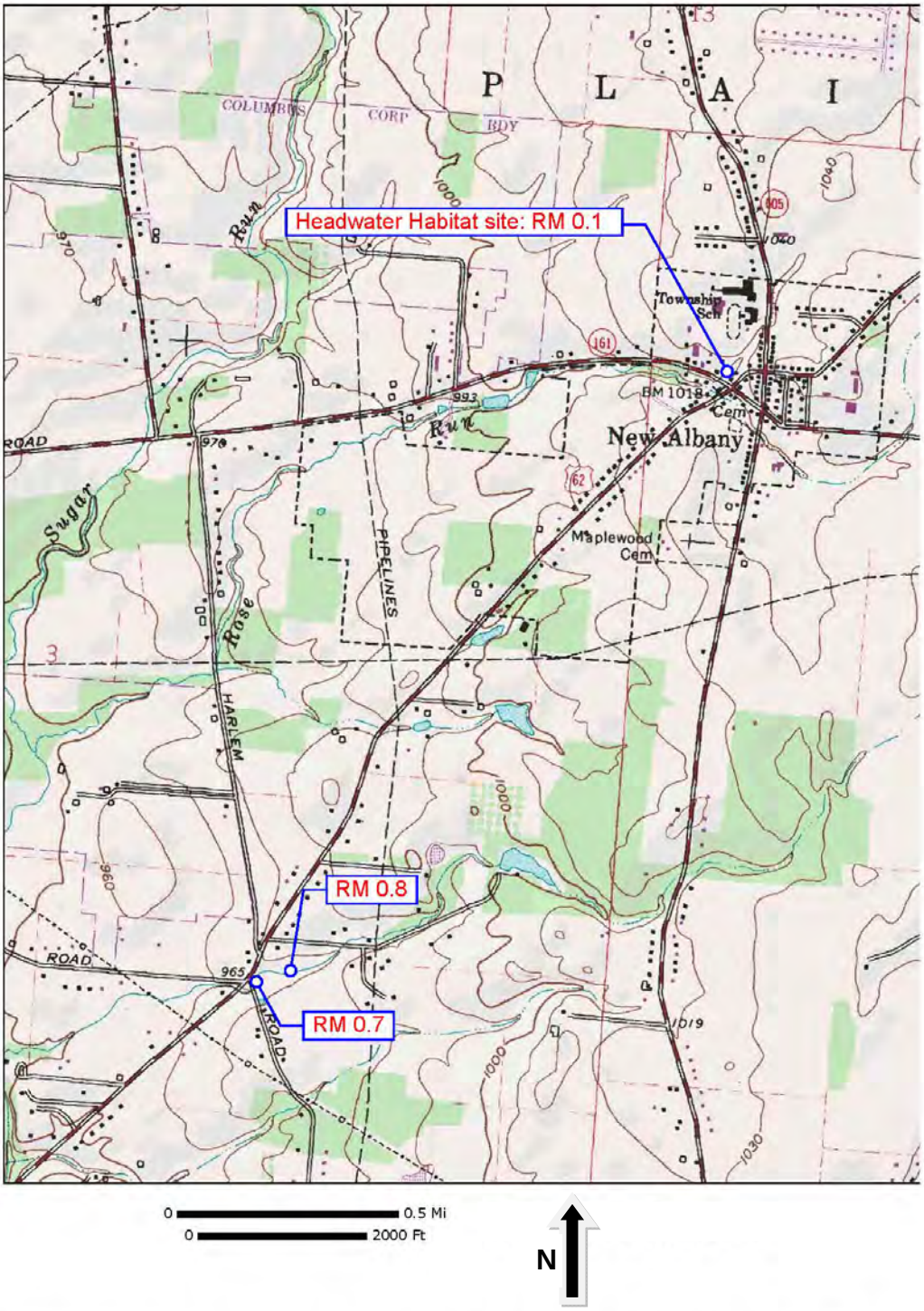
* Significant departure from biocriterion (>4 IBI or ICI units).
[a] Narrative evaluation used in lieu of ICI.

PRIMARY HEADWATER HABITAT (PHWH) STREAM SAMPLING RESULTS- TRIBUTARY TO ROSE RUN							
Stream	**HHEI**	**Fish Observed**	**Salamanders**	**Macroinvertebrates**			
				No. Taxa	**EPT**	**CW Taxa**	**HMFEI**
Trib. to Rose Run (2.02)	72	None	None	12	0	0	9

Sampling locations in Tributary to Rocky Fork and Tributary to Rose Run, 2009.

River Mile	Latitude	Longitude	Landmark
Tributary to Rocky Fork			
0.8	40.0629	82.8273	Upstream Harlem Rd./ New Albany, upstream
0.7	40.0625	82.8292	Upstream Harlem Rd./ New Albany, restoration area
Tributary to Rose Run			
0.1	40.0826	82.8095	Upstream SR 161/ New Albany

Tributary to Rocky Fork sampling sites, 2009
Tributary to Rose Run sample site, 2009



APPENDICES – NEW ALBANY STREAM RESTORATION

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores for the Unnamed Trib. to Rocky Fork.

Appendix Table 2. Index of Biotic Integrity (IBI) scores and metrics for the Unnamed Trib. to Rocky Fork.

Appendix Table 3. Ohio EPA fish results for the Unnamed Trib. to Rocky Fork.

Appendix Table 4. Ohio EPA macroinvertebrate results for the Unnamed Tribs. to Rocky Fork and Rose Run.

Appendix Table 5. Primary Headwater Habitat Evaluation Form – Tributary to Rose Run

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores and physical attributes for fish sampling sites in the tributary to Rocky Fork (RM 5.40), 2009.

Key QHEI Components

			WWH Attributes											MWH Attributes: High Influence						MWH Attributes: Moderate Influence														
River Mile	QHEI	Gradient (ft/mile)	No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max. Depth >40 cm	Low-Normal Riffle Embeddedness	**Total WWH Attributes**	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/ No Cover	Max. Depth <40 cm (WD,HW sites)	**Total High Influence Attributes**	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent & Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	**Total Moderate Influence Attributes**	**(MWH H.I.+1)/ (WWH+1) Ratio**	**(MWH M.I.+1)/ (WWH+1) Ratio**
Tributary to Rocky Fork (RM 5.40) Year: 2009																																		
0.8	**70.5**	15.38	■	■		■	■	■			■		6						0		●			●				●	●	●		5	0.14	0.86
0.7	**61.0**	15.38		■			■	■			■		4				◆		1	●	●			●				●	●	●		6	0.40	1.60

Appendix Table 2. Index of Biotic Integrity (IBI) metrics and scores for sampling locations in the tributary to Rocky Fork, 2009.

				Number of						Percent of Individuals						
River Mile	Type	Date	Drainage area (sq mi)	Total species	Minnow species	Headwater species	Sensitive species	Darter & Sculpin species	Simple Lithophils	Tolerant fishes	Omni-vores	Pioneering fishes	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI
Rocky Fork trib 5.40 - (02-397)																
Year: 2009																
0.80	E	09/03/2009	1.2	9(5)	2(3)	1(1)	0(1)	2(5)	1(1)	62(1)	2(5)	63(1)	25(5)	0.0(5)	195(5)	38
0.70	E	09/03/2009	1.2	10(5)	3(3)	2(3)	0(1)	2(5)	2(3)	54(3)	1(5)	54(3)	29(5)	0.0(5)	266(5)	46

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table 3. Ohio EPA fish results from the Tributary to Rocky Fork, 2009.

River Code: **02-397**	Stream: **Trib. to Rocky Fork (RM 5.40)**	Sample Date: **2009**
River Mile: **0.80**	Location: upst. U.S. Rt. 62/Harlem Rd.	Date Range: 09/03/2009
Time Fished: 1295 sec	Drainage: 1.2 sq mi	
Dist Fished: 0.10 km	Basin: Scioto River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	3	9.00	1.75	1.53	15.11	170.00
Creek Chub	N	G	N	T	80	240.00	46.78	4.67	46.11	19.46
Central Stoneroller	N	H	N		38	114.00	22.22	1.81	17.86	15.87
Yellow Bullhead		I	C	T	4	12.00	2.34	0.34	3.32	28.00
Largemouth Bass	F	C	C		8	24.00	4.68	0.17	1.63	6.88
Green Sunfish	S	I	C	T	19	57.00	11.11	1.12	11.03	19.60
Bluegill Sunfish	S	I	C	P	10	30.00	5.85	0.45	4.47	15.10
Johnny Darter	D	I	C		8	24.00	4.68	0.04	0.41	1.75
Fantail Darter	D	I	C		1	3.00	0.58	0.01	0.06	2.00
	Mile Total				171	513.00		10.13		
	Number of Species				9					
	Number of Hybrids				0					

River Code: **02-397**	Stream: **Trib. to Rocky Fork (RM 5.40)**	Sample Date: **2009**
River Mile: **0.70**	Location: U.S. Rt. 62/Harlem Rd.	Date Range: 09/03/2009
Time Fished: 1471 sec	Drainage: 1.2 sq mi	
Dist Fished: 0.15 km	Basin: Scioto River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	2	4.00	0.69	0.05	0.93	13.00
Western Blacknose Dace	N	G	S	T	9	18.00	3.10	0.11	2.01	6.22
Creek Chub	N	G	N	T	118	236.00	40.69	2.67	47.97	11.31
Central Stoneroller	N	H	N		75	150.00	25.86	1.30	23.36	8.67
Yellow Bullhead		I	C	T	6	12.00	2.07	0.22	4.02	18.67
Largemouth Bass	F	C	C		2	4.00	0.69	0.02	0.36	5.00
Green Sunfish	S	I	C	T	22	44.00	7.59	0.76	13.62	17.23
Bluegill Sunfish	S	I	C	P	36	72.00	12.41	0.34	6.04	4.67
Johnny Darter	D	I	C		15	30.00	5.17	0.06	1.01	1.87
Fantail Darter	D	I	C		5	10.00	1.72	0.04	0.68	3.80
	Mile Total				290	580.00		5.57		
	Number of Species				10					
	Number of Hybrids				0					

Appendix Table 4. Ohio EPA macroinvertebrate results from the tributaries to the Rocky Fork and Rose Run, 2009.

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Trib. to Rocky Fork (RM 5.40)
upst. U.S. Rt. 62/Harlem Rd.

Collection Date: 08/13/2009 River Code: 02-397 RM: 0.80

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
04664	*Helobdella stagnalis*	+
04666	*Helobdella triserialis*	+
04960	*Mooreobdella sp*	+
06700	*Crangonyx sp*	+
07800	*Cambarus sp*	+
22001	*Coenagrionidae*	+
23600	*Aeshna sp*	+
23700	*Anax sp*	+
52200	*Cheumatopsyche sp*	+
53501	*Hydroptilidae*	+
60900	*Peltodytes sp*	+
68707	*Dubiraphia quadrinotata*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
71300	*Limonia sp*	+
71900	*Tipula sp*	+
74100	*Simulium sp*	+
82820	*Cryptochironomus sp*	+
82880	*Cryptotendipes sp*	+
83002	*Dicrotendipes modestus*	+
83040	*Dicrotendipes neomodestus*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84315	*Phaenopsectra flavipes*	+
84450	*Polypedilum (Uresipedilum) flavum*	+
84470	*Polypedilum (P.) illinoense*	+
85500	*Paratanytarsus sp*	+
85625	*Rheotanytarsus sp*	+
93200	*Hydrobiidae*	+
96002	*Helisoma anceps anceps*	+
98200	*Pisidium sp*	+
98600	*Sphaerium sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 33
No. Qualitative Taxa: 33 ICI:
Number of Organisms: 0 Qual EPT: 2

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Trib. to Rocky Fork (RM 5.40)
U.S. Rt. 62/Harlem Rd.

Collection Date: 08/13/2009 River Code: 02-397 RM: 0.70

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+			
03360	*Plumatella sp*	+			
03600	*Oligochaeta*	+			
04960	*Mooreobdella sp*	+			
07820	*Cambarus (Cambarus) sp A*	+			
22001	*Coenagrionidae*	+			
23600	*Aeshna sp*	+			
52200	*Cheumatopsyche sp*	+			
53800	*Hydroptila sp*	+			
60900	*Peltodytes sp*	+			
68707	*Dubiraphia quadrinotata*	+			
68708	*Dubiraphia vittata group*	+			
71300	*Limonia sp*	+			
71900	*Tipula sp*	+			
74100	*Simulium sp*	+			
74501	*Ceratopogonidae*	+			
77500	*Conchapelopia sp*	+			
80420	*Cricotopus (C.) bicinctus*	+			
83002	*Dicrotendipes modestus*	+			
83040	*Dicrotendipes neomodestus*	+			
84210	*Paratendipes albimanus or P. duplicatus*	+			
84450	*Polypedilum (Uresipedilum) flavum*	+			
84470	*Polypedilum (P.) illinoense*	+			
85625	*Rheotanytarsus sp*	+			
85821	*Tanytarsus glabrescens group sp 7*	+			
86501	*Stratiomyidae*	+			
93900	*Elimia sp*	+			
95100	*Physella sp*	+			
96100	*Menetus (Micromenetus) sp*	+			

No. Quantitative Taxa: 0 Total Taxa: 29
No. Qualitative Taxa: 29 ICI:
Number of Organisms: 0 Qual EPT: 2

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Trib. to Rose Run (RM 2.02)

Collection Date: 08/13/2009 River Code: 02-399 RM: 0.10

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
04664	*Helobdella stagnalis*	+
05800	*Caecidotea sp*	+
21604	*Archilestes grandis*	+
22001	*Coenagrionidae*	+
23950	*Epiaeschna heros*	+
71300	*Limonia sp*	+
72700	*Anopheles sp*	+
72900	*Culex sp*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
85821	*Tanytarsus glabrescens group sp 7*	+
93900	*Elimia sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 12

No. Qualitative Taxa: 12 ICI:

Number of Organisms: 0 Qual EPT: 0

Appendix Table 5. Primary headwater habitat evaluation form for the tributary to Rose Run, 2009.

Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 72

SITE NAME/LOCATION Trib. to Rose Run @ RM ust culverted area

SITE NUMBER _____ RIVER BASIN _____ DRAINAGE AREA (mi²) _____

LENGTH OF STREAM REACH (ft) 200 LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE 13 Aug, 2009 SCORER MJB, AAD COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☒ NONE / NATURAL CHANNEL ☐ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B.

TYPE		PERCENT	TYPE		PERCENT
☐ ☐	BLDR SLABS [16 pts]		☐ ☐	SILT [3 pt]	2
☐ ☐	BOULDER (>256 mm) [16 pts]	3	☐ ☐	LEAF PACK/WOODY DEBRIS [3 pts]	
☐ ☐	BEDROCK [16 pt]		☐ ☐	FINE DETRITUS [3 pts]	
☒ ☐	COBBLE (65-256 mm) [12 pts]	30	☐ ☐	CLAY or HARDPAN [0 pt]	5
☒ ☐	GRAVEL (2-64 mm) [9 pts]	40	☐ ☐	MUCK [0 pts]	
☐ ☐	SAND (<2 mm) [6 pts]	20	☐ ☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 33

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: (A) 27

TOTAL NUMBER OF SUBSTRATE TYPES: (B) 6

HHEI Metric Points — Substrate Max = 40: 27 — A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

- ☐ > 30 centimeters [20 pts]
- ☐ > 22.5 - 30 cm [30 pts]
- ☒ > 10 - 22.5 cm [25 pts]
- ☐ > 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5 pts]
- ☐ NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS 11-14-0-0

MAXIMUM POOL DEPTH (centimeters): 14

Pool Depth Max = 30: 25

3. BANK FULL WIDTH (Measured as the average of 3-4 measurements) (Check *ONLY one box*):

- ☐ > 4.0 meters (> 13') [30 pts]
- ☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
- ☒ > 1.5 m - 3.0 m (> 9' 7" - 4' 8") [20 pts]
- ☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
- ☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS 2.3 - 1.7 - 1.75 - 1.9

AVERAGE BANKFULL WIDTH (meters) 1.9

Bankfull Width Max=30: 20

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY ☆NOTE: River Left (L) and Right (R) as looking downstream☆

RIPARIAN WIDTH (Per Bank) L	R		FLOODPLAIN QUALITY (Most Predominant per Bank) L	R		L	R	
☐	☒	Wide >10m	☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☒	☐	Moderate 5-10m	☐	☐	Immature Forest, Shrub or Old Field	☒	☒	Urban or Industrial
☐	☐	Narrow <5m	☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME *(At Time of Evaluation)* (Check *ONLY* one box):

- ☐ Stream Flowing
- ☒ Subsurface flow with isolated pools (Interstitial) ?
- ☐ Moist Channel, isolated pools, no flow (Intermittent)
- ☐ Dry channel, no water (Ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check *ONLY* one box):

- ☐ None
- ☐ 0.5
- ☐ 1.0
- ☐ 1.5
- ☒ 2.0
- ☐ 2.5
- ☐ 3.0
- ☐ >3

STREAM GRADIENT ESTIMATE

☐ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? - ☐ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI Form)

DOWNSTREAM DESIGNATED USE(S)

☐ WWH Name: _____ Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order _____

County: _____ Township / City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: _____ Quantity: _____

Photograph Information: u+d in dry channel, u+d at pools

Elevated Turbidity? (Y/N): N Canopy (% open): 0

Were samples collected for water chemistry? (Y/N): _____ (Note lab sample no. or id. and attach results) Lab Number: _____

Field Measures: Temp (°C) 20 Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (µmhos/cm) _____

Is the sampling reach representative of the stream (Y/N) Y If not, please explain: _____

Additional comments/description of pollution impacts: _____

BIOTIC EVALUATION

Performed? (Y/N): _____ (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

Fish Observed? (Y/N)_____ Voucher? (Y/N)_____ Salamanders Observed? (Y/N)_____ Voucher? (Y/N)_____

Frogs or Tadpoles Observed? (Y/N)____ Voucher? (Y/N)____ Aquatic Macroinvertebrates Observed? (Y/N)____ Voucher? (Y/N)____

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed):

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location

FLOW →

Trib. to Rose Run (@ RM ust. culverted area

13 Aug. 2009

PHWH STREAM BIOLOGICAL CHARACTERISTICS FIELD SHEET:

No fish observed

1. Fish:

Voucher Specimens Retained? (circle) Y / N Time Spent (minutes):_____

Sample Method _____ Stream Length Assessed (meters) _____

Species	Number Caught	Notes

2. Salamanders:

Voucher Specimens Retained? (circle) Y / N Time Spent (minutes):_____

Sample Method visual Stream Length Assessed (meters) 30'

Species *(Genus)*	# Larvae	# Juveniles/Adults	Total Number
Mountain Dusky (*Desmognathus ochrophaeus*)			
Northern Dusky (*Desmognathus fuscus*)			
Two-lined (*Eurycea bislineata*)			
Long-tailed (*Eurycea longicauda*)			
Cave (*Eurycea lucifuga*)			
Red (*Pseudotriton ruber*)			
Mud (*Pseudotriton montanus*)			
Spring (*Gyrinophilus porphyriticus*)			
Mole spp. (*Ambystoma spp.*)			
Four-toed (*Hemidactylium scutatum*)			
Other (name)			
Total			

Notes on Vertebrates: No salamanders found

Trib. to Rose Run (@ RM
ust. culverted area
13 Aug, 2009

3. Macroinvertebrate Scoring Sheet:

THE HEADWATER MACROINVERTEBRATE FIELD EVALUATION INDEX (HMFEI) SCORING SHEET

Indicate Abundance of Each Taxa Above each White Box.

Record HMFEI Scoring Value Points Within each Box.

For EPT taxa, also indicate the different taxa present.

Key: V = Very Abundant (> 50); **A** = Abundant (10 -50); **C** = Common (3 -9); **R** = Rare (< 3)

Sessile Animals (**Porifera, Cnidaria, Bryozoa**) (HMFEI pts = 1)	Crayfish (**Decapoda**) observed (HMFEI pts = 2) 2	Fishfly Larvae (**Corydalidae**) (HMFEI pts = 3)
Aquatic Worms (**Turbellaria, Oligochaeta, Hirudinea**) - A R (HMFEI pts = 1) 1	Dragonfly Nymphs (**Anisoptera**) R (HMFEI pts = 2) 2	Water Penny Beetles (**Psephenidae**) (HMFEI pts = 3)
Sow Bugs (**Isopoda**) R C (HMFEI pts = 1) 1	Riffle Beetles (**Dryopidae, Elimidae, Ptilodactylidae**) (HMFEI pts = 2)	Cranefly Larvae (**Tipulidae**) (HMFEI pts = 3)
Scuds (**Amphipoda**) (HMFEI pts = 1)	Larvae of other Flies (**Diptera**) Name: mosquito R (HMFEI pts = 1) 1	**EPT TAXA*** Total No. EPT Taxa = ____
Water Mites (**Hydracarina**) (HMFEI pts = 1)	Midges (**Chironomidae**) (HMFEI pts = 1)	Mayfly Nymphs (**Ephemeroptera**) Taxa Present: [HMFEI pts = No. Taxa (x) 3]
Damselfly Nymphs (**Zygoptera**) C (HMFEI pts = 1) 1	Snails (**Gastropoda**) A (HMFEI pts = 1) 1	
Alderfly Larvae (**Sialidae**) (HMFEI pts = 1)	Clams (**Bivalvia**) (HMFEI pts = 1)	Stonefly Nymphs (**Plecoptera**) Taxa Present: [HMFEI pts = No. Taxa (x) 3]
Other Beetles (**Coleoptera**) (HMFEI pts = 1)	Other Taxa :	
Other Taxa:	Other Taxa:	Caddisfly Larvae (**Trichoptera**) Taxa Present: [HMFEI pts = No. Taxa (x) 3]
Other Taxa:	Other Taxa	

*Note: EPT identification based upon Family or Genus level of taxonomy

Voucher Sample ID yes

Time Spent (minutes): 2:50-3:12 AAD, MJB

Notes on Macroinvertebrates: (Predominant Organisms; Other Common Organisms; Diversity Estimate)

stream dry except for 4 two pools, ust of culvert. Very limited community.

Final HMFEI Calculated Score (Sum of All White Box Scores) = 9

IF Final HMFEI Score is > 19, Then CLASS III PHWH STREAM
IF Final HMFEI Score is 7 to 19, Then CLASS II PHWH STREAM
IF Final HMFEI Score is < 7, Then CLASS I PHWH STREAM

WOLF CREEK WATERSHED
319 PROJECT

Project Baseline Stream Monitoring

PROJECT NAME: WOLF CREEK WATERSHED 319 PROJECT
Project Baseline Stream Monitoring

PROJECT NUMBER: #09(h) EPA-10
STREAMS SAMPLED: South Branch Wolf Creek

SUMMARY

A total of 18,054 linear feet of stream will be protected using BMPs such as livestock exclusion fencing, alternative watering supplies, manure storage facility construction and other activities effective at preventing sediment and nutrients from leaving livestock operations. These actions are consistent with items identified within the state endorsed watershed action plan for Wolf Creek.

Three biological sites were sampled in the lower ten miles of the South Branch Wolf Creek and at one site on Wolf Creek during 2009. At all three stations sampled in the South Branch Wolf Creek, good to excellent physical habitat conditions were present and good to exceptional biological communities were documented. Two of the three South Branch Wolf Creek sites fully attained the Exceptional Warmwater Habitat (EWH) biological criteria listed in the Ohio Water Quality Standards. The narrative evaluation of the qualitative macroinvertebrate results was used in place of the ICI score at RM 10.0 due to very low stream flows. The South Branch Wolf Creek site at RM 0.8 was partially attaining the EWH use due to a slightly degraded fish community. One sampling site in Wolf Creek (RM 1.1) downstream from the confluence with the South Branch Wolf Creek was assessed using only macroinvertebrate results. Non-attainment of the unverified EWH use was documented in Wolf Creek based on the macroinvertebrate community. Successful completion of this project will improve habitat where major threats to attainment should be eliminated.

AQUATIC LIFE USE ATTAINMENT – SOUTH BRANCH WOLF CREEK 2009.

The Index of Biotic Integrity (IBI) 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 located in the Western Allegheny Plateau (WAP) ecoregion. In the Ohio Water Quality Standards, the South Branch Wolf Creek and Wolf Creek are designated Exceptional Warmwater Habitat (EWH). This unverified EWH designation should be maintained until a complete watershed survey is completed.

Sample Site River Mile	Attainment Status	IBI	MIwb	ICI[a]	QHEI	Biological Assessment
10.0	**FULL**	46[ns]	9.4	VG[ns]	74.5 (good)	Very good/Exceptional
4.8	**FULL**	50	9.6	42[ns]	75.0 (excellent)	Very good/Exceptional
0.8	**PARTIAL**	52	8.5*	VG[ns]	63.0 (good)	Good/Exceptional
Wolf Creek 1.1	**NON**	-	-	36*	-	Good

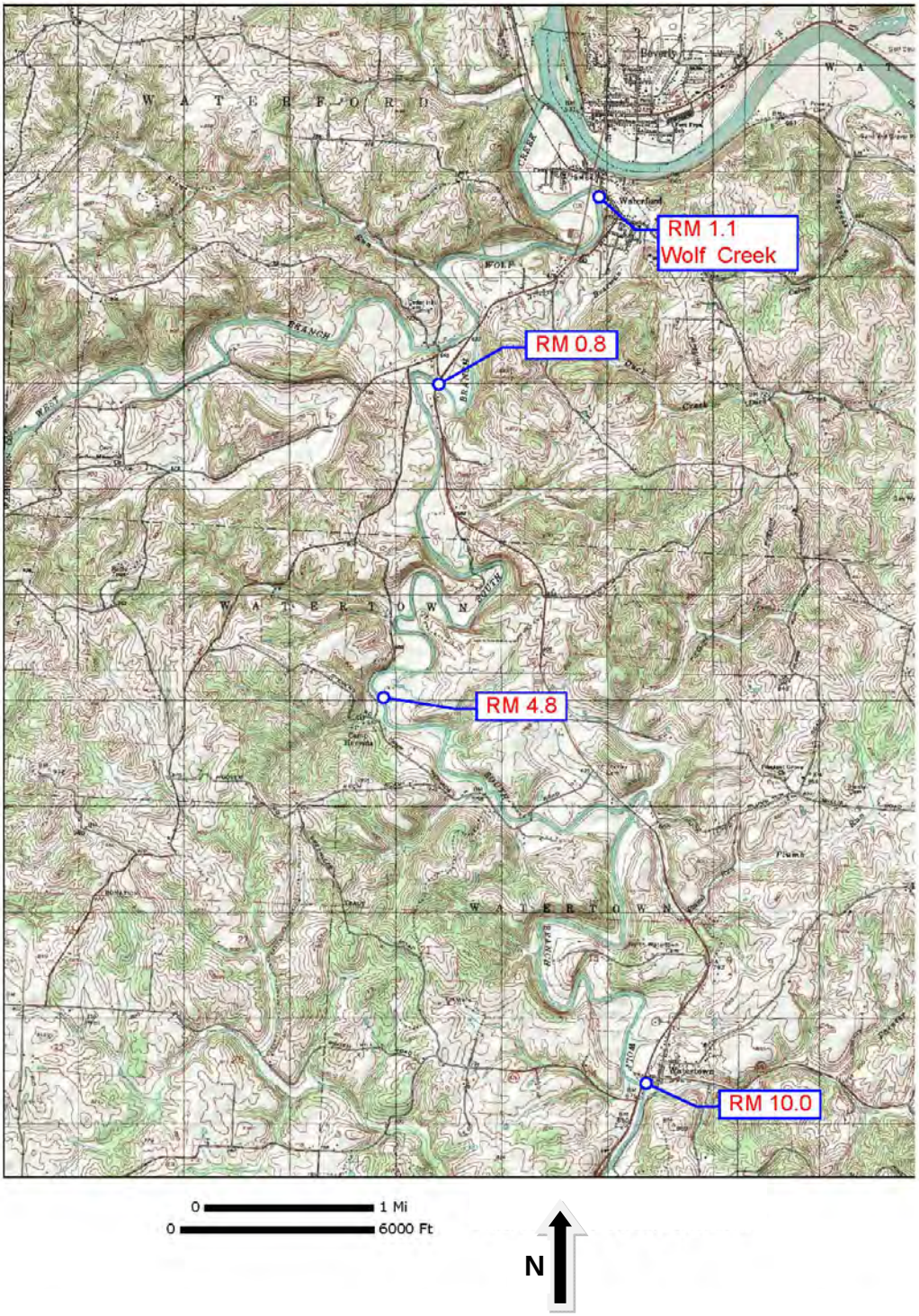
Ecoregion Biocriteria: Western Allegheny Plateau (WAP)		
INDEX – SITE TYPE	WWH	EWH
IBI: Wading	44	50
MIwb: Wading	8.4	9.4
ICI	36	46

[ns] Nonsignificant departure from biocriterion (≤4 IBI or ICI units, ≤0.5 MIwb units).
* Significant departure from biocriterion (>4 IBI or ICI units, >0.5 MIwb units).
[a] Narrative evaluation used in lieu of ICI (G= Good, VG=Very Good).

Sampling locations in the South Branch Wolf Creek, 2009.

River Mile	Latitude	Longitude	Landmark
10.0	39.4648	81.6354	State Route 339- Watertown
4.8	39.4982	81.6648	Farmer road off Camp Hervida Road
0.8	39.5247	81.6584	State Route 339 – Near Waterford
Wolf Creek 1.1	39.5412	81.6418	State Route 339 – Near Waterford

South Branch Wolf Creek sampling sites, 2009



APPENDICES – SOUTH BRANCH WOLF CREEK PROJECT

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores for South Branch Wolf Creek.

Appendix Table 2. Index of Biotic Integrity (IBI) scores and metrics for South Branch Wolf Creek.

Appendix Table 3. Ohio EPA fish results for South Branch Wolf Creek.

Appendix Table 4. Invertebrate Community Index (ICI) scores and metrics for South Branch Wolf Creek.

Appendix Table 5. Ohio EPA macroinvertebrate results for South Branch Wolf Creek.

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores and physical attributes for fish sampling sites in the South Branch Wolf Creek, 2009.

Key QHEI Components

			WWH Attributes											MWH Attributes: *High Influence*						MWH Attributes: *Moderate Influence*														
River Mile	QHEI	Gradient (ft/mile)	No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max. Depth >40 cm	Low-Normal Riffle Embeddedness	**Total WWH Attributes**	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/ No Cover	Max. Depth <40 cm (WD,HW sites)	**Total High Influence Attributes**	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent & Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	**Total Moderate Influence Attributes**	**(MWH H.I.+1)/ (WWH+1) Ratio**	**(MWH M.I.+1)/ (WWH+1) Ratio**
South Branch Wolf Creek (17-035) Year: 2009																																		
10.0	**74.5**	3.17	■	■		■	■	■		■	■	■	8						0		●							●	●	●		4	0.11	0.56
4.8	**75.0**	4.00	■	■		■	■	■			■	■	7						0		●							●	●			3	0.13	0.50
0.8	**63.0**	4.66	■	■		■	■	■					5					◆	1		●							●	●	●		4	0.33	1.00

Appendix Table 2. Index of Biotic Integrity (IBI) scores and metrics for the South Branch Wolf Creek, 2009.

				Number of					Percent of Individuals								
River Mile	Type	Date	Drainage area (sq mi)	Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Simple Lithophils	Tolerant fishes	Omni-vores	Top carnivores	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb
S. Br. Wolf Creek - (17035)																	
Year: 2009																	
10.00	E	08/31/2009	66	24(5)	4(5)	5(5)	2(1)	6(5)	30(3)	37(3)	22(3)	1.2(3)	57(5)	0.2(5)	719(3)	46	9.4
4.80	E	08/19/2009	76	26(5)	2(3)	2(3)	4(3)	7(5)	76(5)	7(5)	7(5)	0.4(1)	86(5)	0.0(5)	5172(5)	50	9.6
0.80	E	08/19/2009	79	28(5)	3(3)	4(5)	5(3)	5(5)	66(5)	19(5)	18(5)	0.3(1)	72(5)	0.0(5)	1914(5)	52	8.5

na - Qualitative data, Modified Iwb not applicable.

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table 3. Ohio EPA fish results from the South Branch Wolf Creek, 2009.

River Code: **17-035**	Stream: **South Branch Wolf Creek**	Sample Date: **2009**
River Mile: **10.00**	Location: St. Rt. 339	Date Range: 08/31/2009
Time Fished: 3660 sec	Drainage: 66.0 sq mi	
Dist Fished: 0.20 km	Basin: Muskingum River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Silver Redhorse	R	I	S	M	4	6.00	0.53	0.35	2.30	58.50
Golden Redhorse	R	I	S	M	16	24.00	2.11	1.58	10.36	65.92
Northern Hog Sucker	R	I	S	M	27	40.50	3.55	2.11	13.79	52.00
White Sucker	W	O	S	T	11	16.50	1.45	0.80	5.23	48.44
Spotted Sucker	R	I	S		4	6.00	0.53	0.35	2.28	58.00
Common Carp	G	O	M	T	1	1.50	0.13	1.95	12.77	1,300.00
Creek Chub	N	G	N	T	53	79.50	6.97	0.78	5.13	9.85
Silver Shiner	N	I	S	I	1	1.50	0.13	0.01	0.05	5.00
Redfin Shiner	N	I	N		32	48.00	4.21	0.04	0.26	0.81
Striped Shiner	N	I	S		130	195.00	17.11	1.05	6.87	5.38
Silverjaw Minnow	N	I	M		6	9.00	0.79	0.02	0.10	1.80
Bluntnose Minnow	N	O	C	T	152	228.00	20.00	0.45	2.93	1.97
Central Stoneroller	N	H	N		86	129.00	11.32	0.50	3.29	3.90
Yellow Bullhead		I	C	T	6	9.00	0.79	1.11	7.25	123.00
Rock Bass	S	C	C		1	1.50	0.13	0.02	0.12	12.00
Spotted Bass	F	C	C		8	12.00	1.05	0.42	2.75	35.00
Green Sunfish	S	I	C	T	58	87.00	7.63	2.11	13.84	24.30
Bluegill Sunfish	S	I	C	P	37	55.50	4.87	0.34	2.21	6.08
Longear Sunfish	S	I	C	M	8	12.00	1.05	0.30	1.98	25.13
Redear Sunfish	E	I	C		6	9.00	0.79	0.44	2.85	48.40
Green Sf X Bluegill Sf					18	27.00	2.37	0.19	1.22	6.88
Blackside Darter	D	I	S		1	1.50	0.13	0.01	0.03	3.00
Logperch	D	I	S	M	9	13.50	1.18	0.11	0.71	8.00
Johnny Darter	D	I	C		7	10.50	0.92	0.02	0.11	1.57
Greenside Darter	D	I	S	M	25	37.50	3.29	0.12	0.81	3.28
Banded Darter	D	I	S	I	1	1.50	0.13	0.00	0.02	2.00
Fantail Darter	D	I	C		52	78.00	6.84	0.12	0.75	1.48
	Mile Total				760	1,140.00		15.27		
	Number of Species				26					
	Number of Hybrids				1					

River Code: **17-035**	Stream: **South Branch Wolf Creek**	Sample Date: **2009**
River Mile: **4.80**	Location:	Date Range: 08/19/2009
Time Fished: 3455 sec	Drainage: 76.0 sq mi	
Dist Fished: 0.20 km	Basin: Muskingum River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		36	54.00	0.98	1.13	7.80	21.00
Golden Redhorse	R	I	S	M	8	12.00	0.22	0.65	4.44	53.75
Northern Hog Sucker	R	I	S	M	36	54.00	0.98	2.77	19.02	51.21
Bigeye Chub	N	I	S	I	1	1.50	0.03	0.01	0.03	3.00
Gravel Chub	N	I	S	M	1	1.50	0.03	0.00	0.02	2.00
Creek Chub	N	G	N	T	1	1.50	0.03	0.00	0.02	2.00
Emerald Shiner	N	I	M		132	198.00	3.58	0.21	1.44	1.06
Silver Shiner	N	I	S	I	387	580.50	10.48	1.05	7.19	1.80
Rosyface Shiner	N	I	S	I	2,158	3,237.00	58.47	2.91	20.04	0.90
Striped Shiner	N	I	S		31	46.50	0.84	0.09	0.64	2.00
Spotfin Shiner	N	I	M		28	42.00	0.76	0.10	0.67	2.32
Sand Shiner	N	I	M	M	122	183.00	3.31	0.29	1.98	1.57
Silverjaw Minnow	N	I	M		15	22.50	0.41	0.05	0.36	2.33
Bluntnose Minnow	N	O	C	T	235	352.50	6.37	0.77	5.31	2.19
Central Stoneroller	N	H	N		236	354.00	6.39	1.12	7.69	3.16
Yellow Bullhead		I	C	T	2	3.00	0.05	0.38	2.60	126.00
Spotted Bass	F	C	C		14	21.00	0.38	1.91	13.16	91.07
Green Sunfish	S	I	C	T	5	7.50	0.14	0.22	1.50	29.00
Bluegill Sunfish	S	I	C	P	2	3.00	0.05	0.02	0.12	5.50
Blackside Darter	D	I	S		1	1.50	0.03	0.01	0.03	3.00
Logperch	D	I	S	M	7	10.50	0.19	0.09	0.62	8.57
Johnny Darter	D	I	C		3	4.50	0.08	0.01	0.06	2.00
Greenside Darter	D	I	S	M	131	196.50	3.55	0.54	3.73	2.76
Banded Darter	D	I	S	I	42	63.00	1.14	0.05	0.33	0.76
Rainbow Darter	D	I	S	M	1	1.50	0.03	0.01	0.03	3.00
Fantail Darter	D	I	C		56	84.00	1.52	0.17	1.16	2.00
	Mile Total				3,691	5,536.50		14.53		
	Number of Species				26					
	Number of Hybrids				0					

River Code: **17-035**	Stream: **South Branch Wolf Creek**	Sample Date: **2009**
River Mile: **0.80**	Location: St. Rt. 339	Date Range: 08/19/2009
Time Fished: 3205 sec	Drainage: 79.0 sq mi	
Dist Fished: 0.20 km	Basin: Muskingum River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		1	1.50	0.06	0.03	0.49	20.00
Black Redhorse	R	I	S	I	1	1.50	0.06	0.00	0.05	2.00
Golden Redhorse	R	I	S	M	1	1.50	0.06	0.00	0.05	2.00
Northern Hog Sucker	R	I	S	M	6	9.00	0.38	0.17	2.73	18.50
White Sucker	W	O	S	T	1	1.50	0.06	0.01	0.08	3.00
Bigeye Chub	N	I	S	I	1	1.50	0.06	0.01	0.08	3.00
Gravel Chub	N	I	S	M	1	1.50	0.06	0.00	0.05	2.00
Creek Chub	N	G	N	T	2	3.00	0.13	0.00	0.05	1.00
Suckermouth Minnow	N	I	S		4	6.00	0.26	0.01	0.18	1.75
Silver Shiner	N	I	S	I	162	243.00	10.34	0.47	7.75	1.95
Rosyface Shiner	N	I	S	I	753	1,129.50	48.08	1.11	18.16	0.98
Striped Shiner	N	I	S		35	52.50	2.23	0.10	1.60	1.88
Spotfin Shiner	N	I	M		29	43.50	1.85	0.09	1.39	1.95
Sand Shiner	N	I	M	M	4	6.00	0.26	0.01	0.20	2.00
Silverjaw Minnow	N	I	M		14	21.00	0.89	0.02	0.39	1.14
Bluntnose Minnow	N	O	C	T	285	427.50	18.20	0.43	7.07	1.01
Central Stoneroller	N	H	N		134	201.00	8.56	1.50	24.54	7.46
Channel Catfish	F		C		3	4.50	0.19	1.36	22.18	301.33
Flathead Catfish	F	P	C		1	1.50	0.06	0.01	0.13	5.00
Spotted Bass	F	C	C		4	6.00	0.26	0.15	2.40	24.50
Green Sunfish	S	I	C	T	2	3.00	0.13	0.15	2.45	50.00
Bluegill Sunfish	S	I	C	P	7	10.50	0.45	0.03	0.52	3.00
Orangespotted Sunfish	S	I	C		1	1.50	0.06	0.00	0.05	2.00
Johnny Darter	D	I	C		2	3.00	0.13	0.01	0.10	2.00
Greenside Darter	D	I	S	M	67	100.50	4.28	0.33	5.45	3.31
Banded Darter	D	I	S	I	8	12.00	0.51	0.02	0.34	1.71
Rainbow Darter	D	I	S	M	1	1.50	0.06	0.01	0.08	3.00
Fantail Darter	D	I	C		36	54.00	2.30	0.09	1.47	1.67
	Mile Total				1,566	2,349.00		6.11		
	Number of Species				28					
	Number of Hybrids				0					

Appendix Table 4. Invertebrate Community Index (ICI) scores and metrics for the South Branch Wolf Creek and Wolf Creek, 2009. . Page 11

River Mile	Drainage Area (sq mi)	Number of Total Taxa	Number of Mayfly Taxa	Number of Caddisfly Taxa	Number of Dipteran Taxa	Percent: Mayflies	Percent: Caddis-flies	Percent: Tany-tarsini	Percent: Other Dipt/NI	Percent: Tolerant Organisms	Qual. EPT	Eco-region	ICI
Wolf Creek (17-030)													
Year: 2009													
1.08	227.0	52(6)	9(6)	5(6)	22(6)	5.3(2)	0.5(2)	30.2(4)	63.0(0)	23.2(0)	11(4)	4	36
South Branch Wolf Creek (17-035)													
Year: 2009													
10.00	66.0	37(4)	3(2)	3(4)	19(4)	3.4(2)	6.5(2)	20.7(4)	68.0(0)	8.9(4)	17(6)	4	32
4.80	76.0	43(6)	4(2)	5(6)	22(6)	34.3(6)	12.5(4)	4.4(2)	47.0(2)	12.5(2)	18(6)	4	42

Appendix Table 4. Ohio EPA macroinvertebrate results from the South Branch Wolf Creek, 2009.

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: South Branch Wolf Creek
St. Rt. 339

Collection Date: 09/25/2009 River Code: 17-035 RM: 10.00

Taxa Code	Taxa	Quant/Qual	
01320	*Hydra sp*	165	
01801	*Turbellaria*	10	
03360	*Plumatella sp*	1	+
03600	*Oligochaeta*	16	+
06201	*Hyalella azteca*		+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*		+
08601	*Hydrachnidia*		+
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*		+
11200	*Callibaetis sp*		+
11670	*Procloeon viridoculare*		+
12200	*Isonychia sp*		+
13400	*Stenacron sp*	44	+
13521	*Stenonema femoratum*	11	+
13590	*Maccaffertium vicarium*		+
14950	*Leptophlebia sp or Paraleptophlebia sp*		+
17200	*Caenis sp*	18	+
18750	*Hexagenia limbata*		+
21200	*Calopteryx sp*		+
21300	*Hetaerina sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*	11	+
23804	*Basiaeschna janata*		+
23905	*Boyeria grafiana*		+
23909	*Boyeria vinosa*		+
27500	*Somatochlora sp*		+
44501	*Corixidae*		+
47600	*Sialis sp*	1	
50315	*Chimarra obscura*	2	+
51600	*Polycentropus sp*	39	+
52200	*Cheumatopsyche sp*	101	+
52530	*Hydropsyche depravata group*		+
59580	*Oecetis persimilis*		+
59730	*Triaenodes melaca*		+
67800	*Tropisternus sp*		+
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	2	+
68708	*Dubiraphia vittata group*	1	+
68901	*Macronychus glabratus*	10	+
69400	*Stenelmis sp*	5	+
71100	*Hexatoma sp*		+
71900	*Tipula sp*		+
71910	*Tipula abdominalis*		+
72340	*Dixella sp*		+
72700	*Anopheles sp*		+
74100	*Simulium sp*		+
77115	*Ablabesmyia janta*	145	
77120	*Ablabesmyia mallochi*	145	+
77500	*Conchapelopia sp*	81	
77750	*Hayesomyia senata or Thienemannimyia norena*	242	+
78402	*Natarsia baltimoreus*		+
81200	*Nanocladius sp*		+
81825	*Rheocricotopus (Psilocricotopus) robacki*		+
82121	*Thienemanniella lobapodema*	8	+
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*		+
83002	*Dicrotendipes modestus*	32	
83200	*Endotribelos hesperium*		+
83300	*Glyptotendipes (G.) sp*	177	+
83840	*Microtendipes pedellus group*	32	
83900	*Nilothauma sp*	32	
84210	*Paratendipes albimanus or P. duplicatus*	48	+
84300	*Phaenopsectra obediens group*	32	+
84450	*Polypedilum (Uresipedilum) flavum*		+
84460	*Polypedilum (P.) fallax group*	177	
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*	64	
84700	*Stenochironomus sp*		+
84800	*Tribelos jucundum*	64	+
85500	*Paratanytarsus sp*	16	
85625	*Rheotanytarsus sp*	161	+
85800	*Tanytarsus sp*	64	+
85821	*Tanytarsus glabrescens group sp 7*	161	+
85840	*Tanytarsus sepp*	48	+
86100	*Chrysops sp*		+
87540	*Hemerodromia sp*		+
96100	*Menetus (Micromenetus) sp*	1	
97601	*Corbicula fluminea*		+
98600	*Sphaerium sp*	2	+

No. Quantitative Taxa: 37 Total Taxa: 79
No. Qualitative Taxa: 67 ICI: **32**
Number of Organisms: 2169 Qual EPT: 17

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: South Branch Wolf Creek

Collection Date: 09/25/2009 River Code: 17-035 RM: 4.80

Taxa Code	Taxa	Quant/Qual	
00401	*Spongillidae*		+
01801	*Turbellaria*	5	
03073	*Lophopodella carteri*		+
03121	*Paludicella articulata*		+
03360	*Plumatella sp*		+
03600	*Oligochaeta*	2	+
06201	*Hyalella azteca*	11	+
06700	*Crangonyx sp*		+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*		+
08601	*Hydrachnidia*		+
11120	*Baetis flavistriga*		+
11130	*Baetis intercalaris*		+
11670	*Procloeon viridoculare*		+
12200	*Isonychia sp*		+
13400	*Stenacron sp*	410	+
13521	*Stenonema femoratum*	1	+
13590	*Maccaffertium vicarium*	6	+
16700	*Tricorythodes sp*		+
17200	*Caenis sp*	62	+
18750	*Hexagenia limbata*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*	11	+
23804	*Basiaeschna janata*		+
26700	*Macromia sp*	1	
48410	*Corydalus cornutus*	2	
50315	*Chimarra obscura*	1	+
51600	*Polycentropus sp*	15	+
52200	*Cheumatopsyche sp*	146	+
52530	*Hydropsyche depravata group*		+
52570	*Hydropsyche simulans*	1	+
53501	*Hydroptilidae*		+
59120	*Ceraclea flava complex*		+
59580	*Oecetis persimilis*	12	+
60300	*Dineutus sp*		+
68130	*Helichus sp*	2	+
68601	*Ancyronyx variegata*	2	+
68901	*Macronychus glabratus*	7	+
69400	*Stenelmis sp*		+
71100	*Hexatoma sp*		+
71900	*Tipula sp*		+
71910	*Tipula abdominalis*		+
72340	*Dixella sp*		+
72700	*Anopheles sp*		+
74100	*Simulium sp*		+
74501	*Ceratopogonidae*		+
77115	*Ablabesmyia janta*	48	
77120	*Ablabesmyia mallochi*	14	+
77500	*Conchapelopia sp*	62	
77750	*Hayesomyia senata or Thienemannimyia norena*	109	+
77800	*Helopelopia sp*	7	
78140	*Labrundinia pilosella*	7	
78402	*Natarsia baltimoreus*		+
78450	*Nilotanypus fimbriatus*		+
80370	*Corynoneura lobata*	8	
80430	*Cricotopus (C.) tremulus group*	7	
81631	*Parakiefferiella n.sp 1*	14	
81825	*Rheocricotopus (Psilocricotopus) robacki*		+
82730	*Chironomus (C.) decorus group*		+
82820	*Cryptochironomus sp*		+
83003	*Dicrotendipes fumidus*	34	
83300	*Glyptotendipes (G.) sp*	34	+
83840	*Microtendipes pedellus group*	34	+
83900	*Nilothauma sp*	7	
84300	*Phaenopsectra obediens group*	7	+
84450	*Polypedilum (Uresipedilum) flavum*		+
84460	*Polypedilum (P.) fallax group*	150	
84540	*Polypedilum (Tripodura) scalaenum group*	48	+
84700	*Stenochironomus sp*		+
84750	*Stictochironomus sp*		+
84790	*Tribelos fuscicorne*	7	
84800	*Tribelos jucundum*	7	
85625	*Rheotanytarsus sp*	14	+
85821	*Tanytarsus glabrescens group sp 7*	21	
85840	*Tanytarsus sepp*	27	
87540	*Hemerodromia sp*	4	+
95100	*Physella sp*	22	
96900	*Ferrissia sp*	1	
97601	*Corbicula fluminea*		+
98600	*Sphaerium sp*	8	+
99180	*Strophitus undulatus undulatus*		+
99240	*Lasmigona complanata*		+

No. Quantitative Taxa:	43	Total Taxa:	81
No. Qualitative Taxa:	62	ICI:	**42**
Number of Organisms:	1398	Qual EPT:	18

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: South Branch Wolf Creek
St. Rt. 339

Collection Date: 10/06/2009 River Code: 17-035 RM: 0.80

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
06201	*Hyalella azteca*	+
08260	*Orconectes (Crokerinus) sanbornii sanbornii*	+
11130	*Baetis intercalaris*	+
11150	*Pseudocloeon propinquum*	+
12200	*Isonychia sp*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	+
13561	*Maccaffertium pulchellum*	+
13590	*Maccaffertium vicarium*	+
14950	*Leptophlebia sp or Paraleptophlebia sp*	+
17200	*Caenis sp*	+
21300	*Hetaerina sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
44501	*Corixidae*	+
50315	*Chimarra obscura*	+
51600	*Polycentropus sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
52540	*Hydropsyche dicantha*	+
59120	*Ceraclea flava complex*	+
60300	*Dineutus sp*	+
63900	*Laccophilus sp*	+
68075	*Psephenus herricki*	+
68130	*Helichus sp*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
71900	*Tipula sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
74501	*Ceratopogonidae*	+
78500	*Paramerina fragilis*	+
78655	*Procladius (Holotanypus) sp*	+
80351	*Corynoneura n.sp 1*	+
80410	*Cricotopus (C.) sp*	+
80420	*Cricotopus (C.) bicinctus*	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	+
82141	*Thienemanniella xena*	+
84450	*Polypedilum (Uresipedilum) flavum*	+
84470	*Polypedilum (P.) illinoense*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
84800	*Tribelos jucundum*	+
85261	*Cladotanytarsus vanderwulpi group Type 1*	+
85625	*Rheotanytarsus sp*	+
85800	*Tanytarsus sp*	+
85840	*Tanytarsus sepp*	+
93900	*Elimia sp*	+
96900	*Ferrissia sp*	+
98600	*Sphaerium sp*	+

No. Quantitative Taxa: 0 Total Taxa: 54
No. Qualitative Taxa: 54 ICI:
Number of Organisms: 0 Qual EPT: 16

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Wolf Creek

Collection Date: 09/25/2009 River Code: 17-030 RM: 1.08

Taxa Code	Taxa	Quant/Qual	
00653	*Eunapius fragilis*		+
01801	*Turbellaria*	19	+
03073	*Lophopodella carteri*	1	
03121	*Paludicella articulata*	1	+
03221	*Pectinatella magnifica*	1	
03360	*Plumatella sp*	1	+
03600	*Oligochaeta*	624	+
08601	*Hydrachnidia*	8	
11250	*Centroptilum sp (w/o hindwing pads)*		+
12200	*Isonychia sp*	2	
13400	*Stenacron sp*	108	+
13521	*Stenonema femoratum*	3	+
13561	*Maccaffertium pulchellum*	24	+
13570	*Maccaffertium terminatum*	1	
13590	*Maccaffertium vicarium*	12	+
16220	*Eurylophella temporalis*	1	
16700	*Tricorythodes sp*	84	
17200	*Caenis sp*	8	+
22001	*Coenagrionidae*		+
22300	*Argia sp*	18	+
23804	*Basiaeschna janata*		+
23909	*Boyeria vinosa*	1	+
27406	*Neurocordulia obsoleta*		+
44501	*Corixidae*		+
47600	*Sialis sp*		+
49400	*Sisyra sp*		+
51206	*Cyrnellus fraternus*	2	+
51600	*Polycentropus sp*	1	+
52200	*Cheumatopsyche sp*	7	+
53501	*Hydroptilidae*	6	+
59120	*Ceraclea flava complex*		+
59500	*Oecetis sp*	8	
65800	*Berosus sp*	1	
68075	*Psephenus herricki*		+
68601	*Ancyronyx variegata*	3	+
68901	*Macronychus glabratus*	9	+
69400	*Stenelmis sp*	15	+
74501	*Ceratopogonidae*		+
77120	*Ablabesmyia mallochi*	32	+
77500	*Conchapelopia sp*	225	+
77750	*Hayesomyia senata or Thienemannimyia norena*	321	+
78655	*Procladius (Holotanypus) sp*		+
80370	*Corynoneura lobata*	16	
80410	*Cricotopus (C.) sp*	96	
80420	*Cricotopus (C.) bicinctus*	64	+
80430	*Cricotopus (C.) tremulus group*	192	+
82121	*Thienemanniella lobapodema*		+
82730	*Chironomus (C.) decorus group*	32	+
83002	*Dicrotendipes modestus*	160	+
83040	*Dicrotendipes neomodestus*	32	+
83050	*Dicrotendipes lucifer*		+
83300	*Glyptotendipes (G.) sp*	449	+
83670	*Lipiniella sp*		+
84020	*Parachironomus carinatus*	64	+
84450	*Polypedilum (Uresipedilum) flavum*	96	+
84460	*Polypedilum (P.) fallax group*	96	
84470	*Polypedilum (P.) illinoense*	160	+
84520	*Polypedilum (Tripodura) halterale group*		+
84540	*Polypedilum (Tripodura) scalaenum group*	32	
84790	*Tribelos fuscicorne*	32	
84888	*Xenochironomus xenolabis*		+
85625	*Rheotanytarsus sp*	481	+
85800	*Tanytarsus sp*	257	+
85821	*Tanytarsus glabrescens group sp 7*	321	+
85840	*Tanytarsus sepp*	321	+
87540	*Hemerodromia sp*	16	
93900	*Elimia sp*		+
95100	*Physella sp*	27	+
96100	*Menetus (Micromenetus) sp*	25	
96900	*Ferrissia sp*	60	+
97601	*Corbicula fluminea*		+
97710	*Dreissena polymorpha*		+
98600	*Sphaerium sp*		+

No. Quantitative Taxa: 52 Total Taxa: 73
No. Qualitative Taxa: 57 ICI: **36**
Number of Organisms: 4576 Qual EPT: 11

HUDSON HIGH SCHOOL/TINKERS CREEK STREAM RESTORATION PROJECT

Project Baseline Stream Monitoring

PROJECT NAME: Hudson High School/Tinker's Creek Stream Restoration Project Project Baseline Stream Monitoring

PROJECT NUMBER: #09(h) EPA-07

STREAM SAMPLED: Tributary to Tributary to Tinkers Creek

SUMMARY

This project if successful will result in the restoration of 2,000 linear feet of severely incised and unstable stream channel. The project will also result in the rehabilitation of 4,000 linear feet of streambank and the reconnection of this small headwater stream with its natural floodplain. Successful completion will reduce sedimentation from severely eroding stream banks and improve riparian and wetland functions while reducing downstream flooding potential. The project site is located upstream by the Ohio Turnpike and will conclude at the northern boundary of the Hudson High School property. The project site will be protected in perpetuity as a result of a conservation easement that will be placed upon the 3 acre restoration project site.

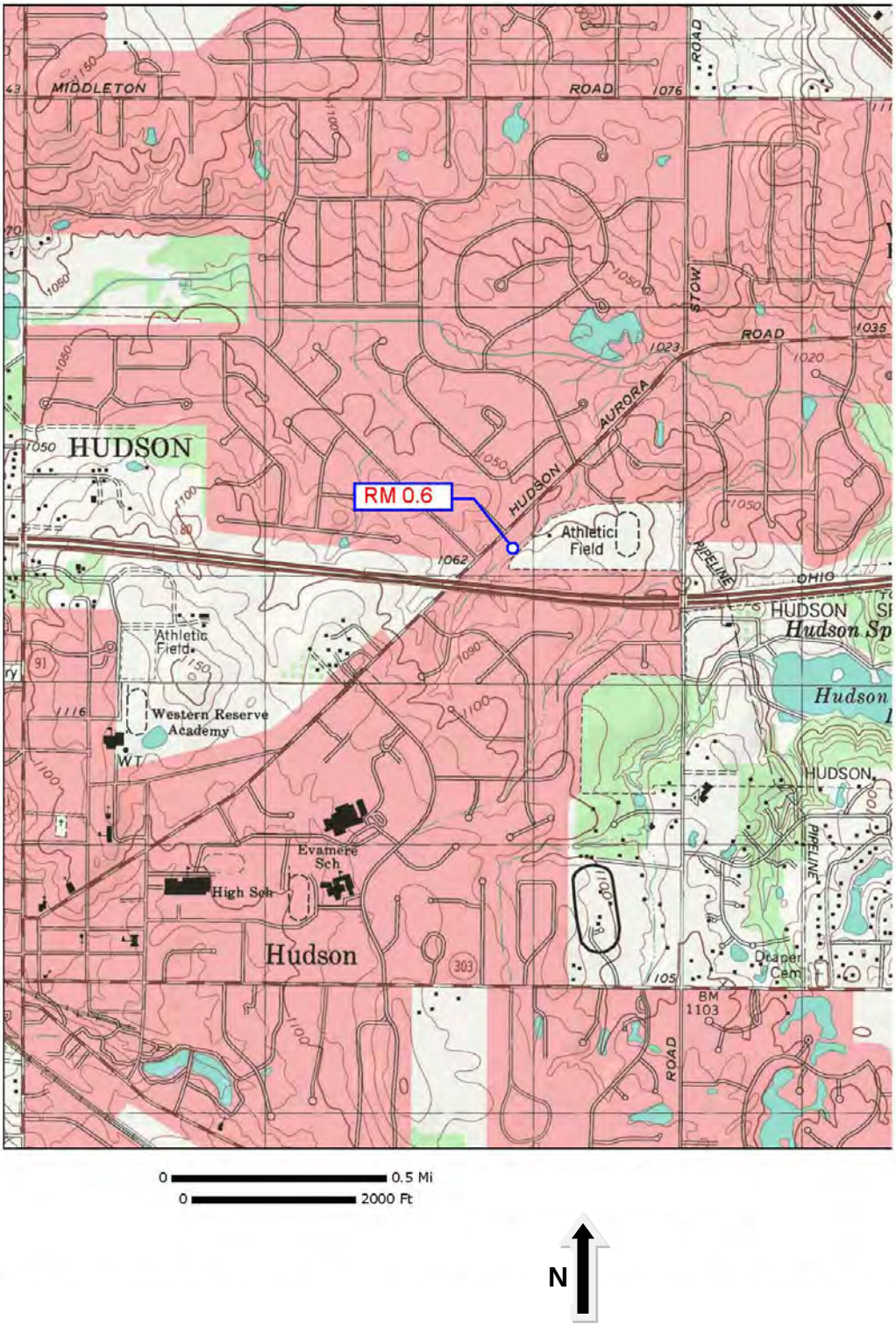
Tributary to Tributary to Tinkers Creek @ RM 25.44, 0.93 is a channelized PHWH stream with a drainage area of 0.2 sq mi. It was evaluated at RM 0.6 adjacent to the high school athletic field on 12 August 2009. Results of the biological sampling classify this stream as a Modified Class 2 PHWH stream.

PRIMARY HEADWATER HABITAT (PHWH) STREAM SAMPLING RESULTS- TRIBUTARY TO TINKERS CREEK							
Stream	HHEI	Fish Observed	Salamanders	Macroinvertebrates			
				No. Taxa	EPT	CW Taxa	HMFEI
Trib. to Trib. To Tinkers Cr. (RM 25.44, 0.93)	55	Fathead Minnow Creek Chub	None	23	1	1	14

Sampling location in Tributary to Tributary to Tinkers Creek, 2009.

River Mile	Latitude	Longitude	Landmark
0.6	41.2542	81.4188	Adjacent Hudson High School athletic fields

Tributary to Tributary to Tinkers Creek sampling site, 2009



APPENDICES – Hudson High School/Tinker's Creek Stream Restoration Project

Appendix Table 1. Ohio EPA macroinvertebrate results for the tributary to tributary to Tinkers Creek, 2009.

Appendix Table 2. Primary Headwater Habitat Evaluation Form – tributary to tributary to Tinkers Creek, 2009.

Appendix Table 1. Ohio EPA macroinvertebrate results from the tributary to tributary to Tinkers Creek, 2009.

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Trib. to Tinkers Creek (25.44/0.18/0.93)

Collection Date: 08/12/2009 River Code: 19-128 RM: 0.60

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+			
22001	*Coenagrionidae*	+			
22300	*Argia sp*	+			
23600	*Aeshna sp*	+			
45900	*Notonecta sp*	+			
52200	*Cheumatopsyche sp*	+			
60900	*Peltodytes sp*	+			
68708	*Dubiraphia vittata group*	+			
72700	*Anopheles sp*	+			
77250	*Alotanypus venustus*	+			
77500	*Conchapelopia sp*	+			
79400	*Zavrelimyia sp*	+			
80420	*Cricotopus (C.) bicinctus*	+			
80430	*Cricotopus (C.) tremulus group*	+			
80510	*Cricotopus (Isocladius) sylvestris group*	+			
82730	*Chironomus (C.) decorus group*	+			
83003	*Dicrotendipes fumidus*	+			
83040	*Dicrotendipes neomodestus*	+			
84210	*Paratendipes albimanus or P. duplicatus*	+			
84470	*Polypedilum (P.) illinoense*	+			
85500	*Paratanytarsus sp*	+			
85821	*Tanytarsus glabrescens group sp 7*	+			
86501	*Stratiomyidae*	+			
95100	*Physella sp*	+			

No. Quantitative Taxa: 0 Total Taxa: 24

No. Qualitative Taxa: 24 ICI:

Number of Organisms: 0 Qual EPT: 1

Appendix Table 1. Primary headwater habitat evaluation form for the tributary to tributary to Tinkers Creek, 2009.

Modified Class II

Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 55

SITE NAME/LOCATION Trib. to Trib. to Tinkers Cr. (RM 25.44, 0.93), RM 0.6 adj. Athletic field SITE NUMBER _____ RIVER BASIN _____ DRAINAGE AREA (mi²) _____

LENGTH OF STREAM REACH (ft) 200 ft. LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE 12 Aug. 2009 SCORER MJB COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☒ RECOVERING ☐ RECENT OR NO RECOVERY

1. **SUBSTRATE (Estimate percent of every type of substrate present.** Check *ONLY* two predominant substrate *TYPE* boxes (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B.

TYPE		PERCENT	TYPE		PERCENT
☐ ☐	BLDR SLABS **[16 pts]**		☐ ☐	SILT **[3 pt]**	10
☐ ☐	BOULDER (>256 mm) **[16 pts]**		☐ ☐	LEAF PACK/WOODY DEBRIS **[3 pts]**	
☐ ☐	BEDROCK **[16 pt]**		☐ ☐	FINE DETRITUS **[3 pts]**	
☐ ☐	COBBLE (65-256 mm) **[12 pts]**	5	☐ ☐	CLAY or HARDPAN **[0 pt]**	15%
☒ ☐	GRAVEL (2-64 mm) **[9 pts]**	50	☐ ☐	MUCK **[0 pts]**	
☒ ☐	SAND (<2 mm) **[6 pts]**	20	☐ ☐	ARTIFICIAL **[3 pts]**	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 5

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: (A) 15 **TOTAL NUMBER OF SUBSTRATE TYPES:** (B) 5

HHEI Metric Points — Substrate Max = 40: 20 (A + B)

2. **Maximum Pool Depth** ***(Measure the maximum pool depth within the 61 meter (200 ft)*** evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

☒ > 30 centimeters **[20 pts]** [redacted]
☐ > 22.5 - 30 cm **[30 pts]**
☐ > 10 - 22.5 cm **[25 pts]**
☐ > 5 cm - 10 cm **[15 pts]**
☐ < 5 cm **[5 pts]**
☐ NO WATER OR MOIST CHANNEL **[0 pts]**

COMMENTS 33-27-20.5-20 **MAXIMUM POOL DEPTH (centimeters):** 33

Pool Depth Max = 30: 20

3. **BANK FULL WIDTH (Measured as the average of 3-4 measurements)** **(Check *ONLY* one box):**

☐ > 4.0 meters (> 13') **[30 pts]**
☐ > 3.0 m - 4.0 m (> 9' 7" - 13') **[25 pts]**
☐ > 1.5 m - 3.0 m (> 9' 7" - 4' 8") **[20 pts]**
☒ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") **[15 pts]**
☐ ≤ 1.0 m (≤ 3' 3") **[5 pts]**

COMMENTS 0.78m-0.76m-1.45m-1.2m **AVERAGE BANKFULL WIDTH (meters)** 1.04

Bankfull Width Max=30: 15

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY ☆NOTE: River Left (L) and Right (R) as looking downstream☆

L R	RIPARIAN WIDTH (Per Bank)	L R	FLOODPLAIN QUALITY (Most Predominant per Bank)	L R	
☐ ☐	Wide >10m	☐ ☐	Mature Forest, Wetland	☐ ☐	Conservation Tillage
☒ ☒	Moderate 5-10m shrubs	☐ ☐	Immature Forest, Shrub or Old Field	☐ ☐	Urban or Industrial
☐ ☐	Narrow <5m	☐ ☐	Residential, Park, New Field	☐ ☐	Open Pasture, Row Crop
☐ ☐	None	☐ ☐	Fenced Pasture	☐ ☐	Mining or Construction

COMMENTS _____

FLOW REGIME *(At Time of Evaluation)* (Check *ONLY* one box):

☒ Stream Flowing
☐ Subsurface flow with isolated pools (Interstitial)
☐ Moist Channel, isolated pools, no flow (Intermittent)
☐ Dry channel, no water (Ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check *ONLY* one box):

☐ None ☐ 1.0 ☐ 2.0 ☐ 3.0
☐ 0.5 ☐ 1.5 ☐ 2.5 ☐ >3

- straight channel with only sinuosity on bottom of channel

STREAM GRADIENT ESTIMATE

☐ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

October 24, 2002 Revision

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? - ☐ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI Form)

DOWNSTREAM DESIGNATED USE(S)

☐ WWH Name: _____ Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION

USGS Quadrangle Name: _____ NRCS Soil Map Page: _____ NRCS Soil Map Stream Order _____

County: _____ Township / City: _____

MISCELLANEOUS

Base Flow Conditions? (Y/N): Y Date of last precipitation: _____ Quantity: _____

Photograph Information: u + d

Elevated Turbidity? (Y/N): N Canopy (% open): 20% open

Were samples collected for water chemistry? (Y/N): N (Note lab sample no. or id. and attach results) Lab Number: _____

Field Measures: Temp (°C) 20 Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (µmhos/cm) _____

Is the sampling reach representative of the stream (Y/N) _____ If not, please explain: _____

Additional comments/description of pollution impacts: Embedded substrates. Riffles present and of fair to good quality.

BIOTIC EVALUATION

Performed? (Y/N): _____ (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

Fish Observed? (Y/N) _____ Voucher? (Y/N) _____ Salamanders Observed? (Y/N) _____ Voucher? (Y/N) _____

Frogs or Tadpoles Observed? (Y/N) _____ Voucher? (Y/N) _____ Aquatic Macroinvertebrates Observed? (Y/N) _____ Voucher? (Y/N) _____

Comments Regarding Biology: _____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed):

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location

FLOW →

PHWH STREAM BIOLOGICAL CHARACTERISTICS FIELD SHEET:

1. Fish:

Voucher Specimens Retained? (circle) Y / N Time Spent (minutes): —

Sample Method casual Stream Length Assessed (meters) —

Species	Number Caught	Notes
fathead minnow	1	
creek chub	1	

field IDed by AAD

2. Salamanders:

Voucher Specimens Retained? (circle) Y / N Time Spent (minutes): _____

Sample Method 30 ft hand search Stream Length Assessed (meters) 30'

MJB

Species *(Genus)*	# Larvae	# Juveniles/Adults	Total Number
Mountain Dusky (*Desmognathus ochrophaeus*)			
Northern Dusky (*Desmognathus fuscus*)			
Two-lined (*Eurycea bislineata*)			
Long-tailed (*Eurycea longicauda*)			
Cave (*Eurycea lucifuga*)			
Red (*Pseudotriton ruber*)			
Mud (*Pseudotriton montanus*)			
Spring (*Gyrinophilus porphyriticus*)			
Mole spp. (*Ambystoma spp.*)			
Four-toed (*Hemidactylium scutatum*)			
Other (name)			
Total			

Notes on Vertebrates: No salamanders found.

Trib. to Trib. to Tinkers Cr, (RM 25.44, 0.93)
Adj. Athletic Field, RM 0.6
12 Aug. 2009

3. Macroinvertebrate Scoring Sheet:

THE HEADWATER MACROINVERTEBRATE FIELD EVALUATION INDEX (HMFEI) SCORING SHEET

Indicate Abundance of Each Taxa Above each White Box.

Record HMFEI Scoring Value Points Within each Box.

For EPT taxa, also indicate the different taxa present.

Key: V = Very Abundant (> 50); **A** = Abundant (10 -50); **C** = Common (3 -9); **R** = Rare (< 3)

Sessile Animals (**Porifera, Cnidaria, Bryozoa**) R (HMFEI pts = 1) [1]	Crayfish (**Decapoda**) (HMFEI pts = 2) [ ]	Fishfly Larvae (**Corydalidae**) (HMFEI pts = 3) [ ]
Aquatic Worms (**Turbellaria, Oligochaeta, Hirudinea**) A (HMFEI pts = 1) [1]	Dragonfly Nymphs (**Anisoptera**) C (HMFEI pts = 2) [2]	Water Penny Beetles (**Psephenidae**) (HMFEI pts = 3) [ ]
Sow Bugs (**Isopoda**) (HMFEI pts = 1) [ ]	Riffle Beetles (**Dryopidae, Elimidae, Ptilodactylidae**) R (HMFEI pts = 2) [2]	Cranefly Larvae (**Tipulidae**) (HMFEI pts = 3) [ ]
Scuds (**Amphipoda**) (HMFEI pts = 1) [ ]	Larvae of other Flies (**Diptera**) Name: C (HMFEI pts = 1) [1]	**EPT TAXA*** Total No. EPT Taxa = ____
Water Mites (**Hydracarina**) (HMFEI pts = 1) [ ]	Midges (**Chironomidae**) A (HMFEI pts = 1) [1]	Mayfly Nymphs (**Ephemeroptera**) Taxa Present: [HMFEI pts = No. Taxa (x) 3] [ ]
Damselfly Nymphs (**Zygoptera**) A (HMFEI pts = 1) [1]	Snails (**Gastropoda**) physella - A (HMFEI pts = 1) [1]	
Alderfly Larvae (**Sialidae**) (HMFEI pts = 1) [ ]	Clams (**Bivalvia**) (HMFEI pts = 1) [ ]	Stonefly Nymphs (**Plecoptera**) Taxa Present: [HMFEI pts = No. Taxa (x) 3] [ ]
Other Beetles (**Coleoptera**) R (HMFEI pts = 1) [1]	Other Taxa :	
Other Taxa:	Other Taxa:	Caddisfly Larvae (**Trichoptera**) Taxa Present: Hydropsyhid R [HMFEI pts = No. Taxa (x) 3] [3]
Other Taxa:	Other Taxa	

*Note: EPT identification based upon Family or Genus level of taxonomy

Voucher Sample ID yes

Time Spent (minutes): 11:00 - 11:51 AAD, MJB

Notes on Macroinvertebrates: (Predominant Organisms; Other Common Organisms; Diversity Estimate)

Community is low diversity and low density. Riffles were adequate to support more EPT diversity.

Final HMFEI Calculated Score (Sum of All White Box Scores) = 15

IF Final HMFEI Score is > 19, Then CLASS III PHWH STREAM
IF Final HMFEI Score is 7 to 19, Then CLASS II PHWH STREAM
IF Final HMFEI Score is < 7, Then CLASS I PHWH STREAM

MARYSVILLE TOWN RUN RESTORATION PROJECT

Project Baseline Stream Monitoring

PROJECT NAME: MARYSVILLE TOWN RUN RESTORATION
Project Baseline Stream Monitoring

PROJECT NUMBER: #09(h) EPA-13

STREAMS SAMPLED: Town Run

SUMMARY

The existing 340 linear feet of stream has been channelized and straightened and its banks have been hardened with patches of concrete, asphalt, discarded concrete, bricks and rubble. There is no in-stream or riparian habitat of value. Natural channel design techniques will be employed to attain restoration goals of a QHEI of at least 60, which is the minimum needed to attain the Warmwater Habitat (WWH) biocriteria. Current QHEI scores in the area are no higher than 46 and the segment is in non-attainment of its designated WWH aquatic life use. The conceptual design and plans that have been completed will restore the stream and riparian corridor using natural channel design and bio-engineering methods. Natural features that will be restored include meanders, riffles & pools and restored riparian conditions using native plant species.

Fair physical habitat conditions were present at both biological sampling stations in Town Run. Town Run currently has an aquatic life use of Wamwater Habitat (WWH). Based on the biological sampling results, both stations were in non-attainment of the WWH use designation. Both fish and macroinvertebrate populations were reflective of poor or very poor water resource conditions. Although reduced habitat quality (channel modification, very shallow riffles, poor to fair channel development, sparse instream cover) was an influence on the poor biological communities, both sites were largely impacted by sewage solids and sewage organic enrichment.

AQUATIC LIFE USE ATTAINMENT - TOWN RUN 2009.

The Index of Biotic Integrity (IBI), 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 located in the Eastern Corn Belt Plains (ECBP) ecoregion. In the Ohio Water Quality Standards, Town Run is designated Warmwater Habitat (MWH).

Sample Site River Mile	Attainment Status	IBI	ICI[a]	QHEI	Biological Assessment
0.7	**NON**	22*	Poor	44.0 (Fair)	Poor
0.2	**NON**	20*	Very Poor	50.0 (Fair)	Very Poor/Poor

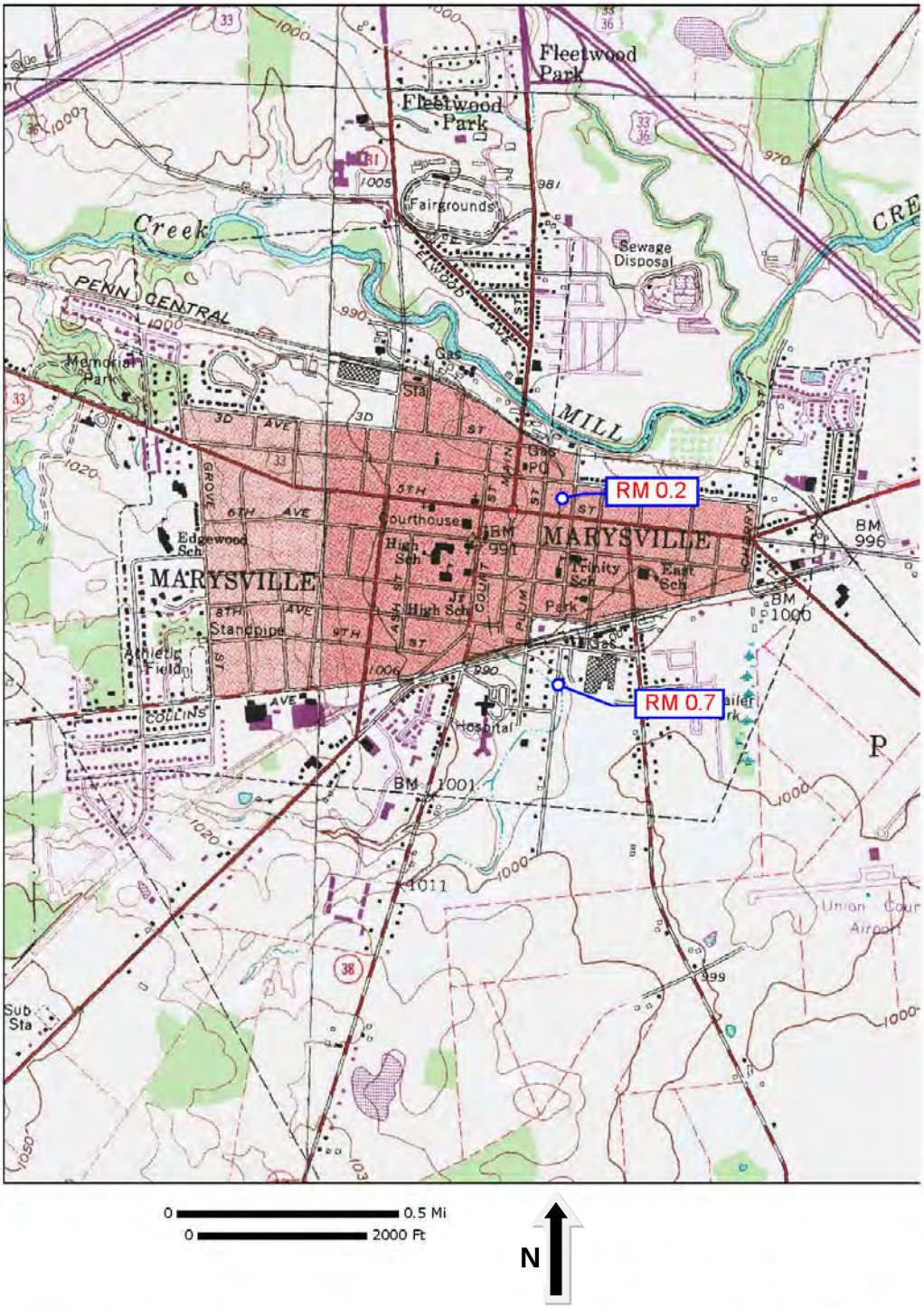
Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)		
INDEX – SITE TYPE	MWH	WWH
IBI: Headwaters	24	40
ICI	22	36

* Significant departure from biocriterion (>4 IBI or ICI units).
[a] Narrative evaluation used in lieu of ICI.

Sampling locations in Town Run, 2009.

River Mile	Latitude	Longitude	Landmark
0.7	40.2297	83.3647	Eljier Park/ Walnut Street, Marysville
0.2	40.2358	83.3650	Between E. 4th and E. 5th Streets, Marysville

Town Run sampling sites, 2009



APPENDICES – TOWN RUN STREAM RESTORATION PROJECT

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores for Town Run.

Appendix Table 2. Index of Biotic Integrity (IBI) scores and metrics for Town Run.

Appendix Table 3. Ohio EPA fish results for Town Run.

Appendix Table 4. Ohio EPA macroinvertebrate results for Town Run.

Appendix Table 1. Qualitative Habitat Evaluation Index (QHEI) scores and physical attributes for fish sampling sites in Town Run, 2009.

Key QHEI Components

			WWH Attributes											MWH Attributes – High Influence						MWH Attributes – Moderate Influence														
River Mile	QHEI	Gradient (ft/mile)	No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max. Depth >40 cm	Low-Normal Riffle Embeddedness	**Total WWH Attributes**	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/ No Cover	Max. Depth <40 cm (WD,HW sites)	**Total High Influence Attributes**	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent & Poor Pools	No Fast Current	High/Mod. Overall Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	**Total Moderate Influence Attributes**	**(MWH H.I.+1)/ (WWH+1) Ratio**	**(MWH M.I.+1)/ (WWH+1) Ratio**
Town Run Year: 2009																																		
0.7	**44.0**	8.77		■				■			■		3			◆	◆		2	●	●			●				●	●	●		6	0.75	2.25
0.2	**50.0**	8.77		■						■	■	■	4	◆		◆	◆		3					●				●				2	0.80	1.20

Appendix Table 2. Index of Biotic Integrity (IBI) metrics and scores for sampling locations in Town Run, 2009.

				Number of						Percent of Individuals						
River Mile	Type	Date	Drainage area (sq mi)	Total species	Minnow species	Headwater species	Sensitive species	Darter & Sculpin species	Simple Lithophils	Tolerant fishes	Omni-vores	Pioneering fishes	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI
Town Run - (02-239)																
Year: 2009																
0.70	E	08/26/2009	1.3	5(3)	3(3)	0(1)	0(1)	0(1)	1(1)	89(1)	9(3)	85(1)	2(1)	0.0(5)	18(1) *	22
0.20	E	08/26/2009	1.7	5(3)	3(3)	0(1)	0(1)	0(1)	1(1)	90(1)	31(1)	86(1)	0(1)	0.0(5)	24(1)	20

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table 3. Ohio EPA fish results from Town Run, 2009.

Species List

River Code: **02-239**	Stream: **Town Run**	Sample Date: **2009**
River Mile: **0.70**	Location: S. Walnut St.	Date Range: 08/26/2009
Time Fished: 651 sec	Drainage: 1.3 sq mi	
Dist Fished: 0.10 km	Basin: Scioto River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	2	6.00	3.77			
Creek Chub	N	G	N	T	41	123.00	77.36			
Bluntnose Minnow	N	O	C	T	3	9.00	5.66			
Central Stoneroller	N	H	N		6	18.00	11.32			
Green Sunfish	S	I	C	T	1	3.00	1.89			
	Mile Total				53	159.00				
	Number of Species				5					
	Number of Hybrids				0					

Species List

River Code: **02-239**	Stream: **Town Run**	Sample Date: **2009**
River Mile: **0.20**	Location: between 4th St./5th St.	Date Range: 08/26/2009
Time Fished: 636 sec	Drainage: 1.7 sq mi	
Dist Fished: 0.10 km	Basin: Scioto River No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	3	9.00	3.75			
Creek Chub	N	G	N	T	47	141.00	58.75			
Bluntnose Minnow	N	O	C	T	22	66.00	27.50			
Central Stoneroller	N	H	N		7	21.00	8.75			
Largemouth Bass	F	C	C		1	3.00	1.25			
	Mile Total				80	240.00				
	Number of Species				5					
	Number of Hybrids				0					

Appendix Table 4. Ohio EPA macroinvertebrate results from Town Run, 2009.

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Town Run
S. Walnut St.

Collection Date: 08/05/2009 River Code: 02-239 RM: 0.70

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	*Hydra sp*	+			
01801	*Turbellaria*	+			
03600	*Oligochaeta*	+			
04664	*Helobdella stagnalis*	+			
04666	*Helobdella triserialis*	+			
04935	*Erpobdella punctata punctata*	+			
06700	*Crangonyx sp*	+			
07850	*Cambarus (Lacunicambarus) diogenes diogenes*	+			
22001	*Coenagrionidae*	+			
23600	*Aeshna sp*	+			
45300	*Sigara sp*	+			
52200	*Cheumatopsyche sp*	+			
53800	*Hydroptila sp*	+			
60900	*Peltodytes sp*	+			
69400	*Stenelmis sp*	+			
71900	*Tipula sp*	+			
72700	*Anopheles sp*	+			
72900	*Culex sp*	+			
74100	*Simulium sp*	+			
78655	*Procladius (Holotanypus) sp*	+			
78702	*Psectrotanypus dyari*	+			
80430	*Cricotopus (C.) tremulus group*	+			
80510	*Cricotopus (Isocladius) sylvestris group*	+			
83002	*Dicrotendipes modestus*	+			
83040	*Dicrotendipes neomodestus*	+			
84210	*Paratendipes albimanus or P. duplicatus*	+			
84450	*Polypedilum (Uresipedilum) flavum*	+			
85400	*Micropsectra sp*	+			
85800	*Tanytarsus sp*	+			
95100	*Physella sp*	+			
96264	*Planorbella (Pierosoma) pilsbryi*	+			

No. Quantitative Taxa: 0 Total Taxa: 31
No. Qualitative Taxa: 31 ICI:
Number of Organisms: 0 Qual EPT: 2

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Town Run
between 4th St./5th St.

Collection Date: 08/05/2009 River Code: 02-239 RM: 0.20

Taxa Code	Taxa	Quant/Qual
03600	*Oligochaeta*	+
04664	*Helobdella stagnalis*	+
04935	*Erpobdella punctata punctata*	+
04964	*Mooreobdella microstoma*	+
22001	*Coenagrionidae*	+
63900	*Laccophilus sp*	+
78702	*Psectrotanypus dyari*	+
80510	*Cricotopus (Isocladius) sylvestris group*	+
82820	*Cryptochironomus sp*	+
95100	*Physella sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0 Total Taxa: 10
No. Qualitative Taxa: 10 ICI:
Number of Organisms: 0 Qual EPT: 0