State of Ohio
Environmental Protection Agency

Division of Surface Water

Biological Assessment of the Rocky Fork Mohican River

Peabody Barnes Property

Richland County, Ohio

October 30, 2009

Ted Strickland, Governor
Chris Korleski, Director

Biological Assessment of the

Rocky Fork Mohican River
(Peabody Barnes Property)

2009

Richland County, Ohio
October 30, 2009
OEPA Report EAS/2009-10-7

prepared for
State of Ohio Environmental Protection Agency
Division of Emergency and Remedial Response

prepared by
Ohio Environmental Protection Agency
Lazarus Government Center
50 West Town Street, Suite 700
Columbus, Ohio 43215

TABLE OF CONTENTS

EXECUTIVE SUMMARY

One-half mile of the Rocky Fork Mohican River and one-half mile of an unnamed tributary adjacent to the Peabody Barnes property were biologically assessed by the Ohio EPA during 2009. Based on the performance of the biological communities, 0.3 miles of the Rocky Fork and 0.5 miles of the unnamed tributary were in full attainment of the Warmwater Habitat (WWH) aquatic life use. Partial attainment was recorded in the Rocky Fork upstream from Peabody Barnes, and non-attainment was documented further downstream (Table 1). The sites adjacent to the Peabody Barnes property were fully meeting the WWH aquatic life use. The non-attainment in the Rocky Fork was associated with reduced habitat conditions, excessive siltation of the river bottom, and urban/industrial runoff. The Peabody Barnes property was not contributing to impairment of biological and water resources in the Rocky Fork Mohican River.

RECOMMENDATIONS

The aquatic life use designation of Warmwater Habitat for the Rocky Fork Mohican River has been confirmed in previous Ohio EPA biological and water quality studies. This study verified continued WWH performance for the river mile 14 – 15 section of river. Physical habitat conditions and pool depths verified that the Primary Contact Recreation use is appropriate for the Rocky Fork Mohican River. The unnamed tributary to the Rocky Fork Mohican River (confluence at RM 14.43) is not currently a listed waterbody in the Ohio Water Quality Standards. Based on the performance of the biological communities and physical habitat features recorded during this study, the unnamed tributary should be assigned the Warmwater Habitat aquatic life use and Primary Contact Recreation use in the Ohio Water Quality Standards.

ACKNOWLEDGEMENTS

The following individuals are acknowledged for their contribution to this report.

Stream sampling: Mike Gray, David Altfater, Ben Nickley
Data support: Dennis Mishne
Report preparation and analysis: David Altfater, Mike Gray
Reviewers - Jeff DeShon, Marc Smith

INTRODUCTION

Biological and physical habitat quality were assessed in a one-half mile section of the Rocky Fork Mohican River and one-half mile section of an unnamed tributary to the Rocky Fork during 2009. This study was undertaken to assess water resource conditions in the Rocky Fork Mohican River and an unnamed tributary upstream, adjacent, and downstream from the Peabody Barnes property. This water resource project was undertaken as a Voluntary Action Program technical assistance request.

Specific objectives of the evaluation were to:

- Assess biological conditions in the Rocky Fork Mohican River and unnamed tributary by evaluating fish and macroinvertebrate communities,
- Determine the aquatic life use attainment status of the Rocky Fork Mohican River and unnamed tributary with regard to the Warmwater Habitat (WWH) aquatic life use designation codified in the Ohio Water Quality Standards, and
- Perform the work to satisfy the requirements of VAP rule OAC 3745-300-09.

The Rocky Fork Mohican River and unnamed tributary are located in the Erie-Ontario Lake Plain (EOLP) ecoregion. The Rocky Fork Mohican River is currently assigned the Warmwater Habitat (WWH) aquatic life use designation for its entire length. The unnamed tributary is not listed in the Ohio Water Quality Standards.

Aquatic life use attainment conditions are presented in Table 1, and sampling locations are detailed in Table 2 and graphically presented in Figure 1.

Table 1. Aquatic life use attainment status for sampling locations in the Rocky Fork Mohican River and an unnamed tributary, 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, the Rocky Fork Mohican River is designated Warmwater Habitat (WWH) and the unnamed tributary is recommended the WWH designation. If biological impairment has occurred, the cause(s) and source(s) of the impairment are noted.

Sample Site River Mile	Attainment Status	IBI	ICI[a]	QHEI	Location	Cause	Source
Rocky Fork Mohican River							
14.5	PARTIAL	38[ns]	26*	49.5	Upst. Peabody Barnes	Reduced habitat/ siltation	Channelization/ urban-industrial runoff
14.3	FULL	38[ns]	40	62.5	Adj. Peabody Barnes		
14.0	NON	33*	20*	55.0	Main Street	Reduced habitat/ siltation	Channelization/ urban-industrial runoff
Unnamed Tributary							
0.4	FULL	40	MG[ns]	51.0	State Route 13		
0.1	FULL	48	MG[ns]	69.5	Near mouth		

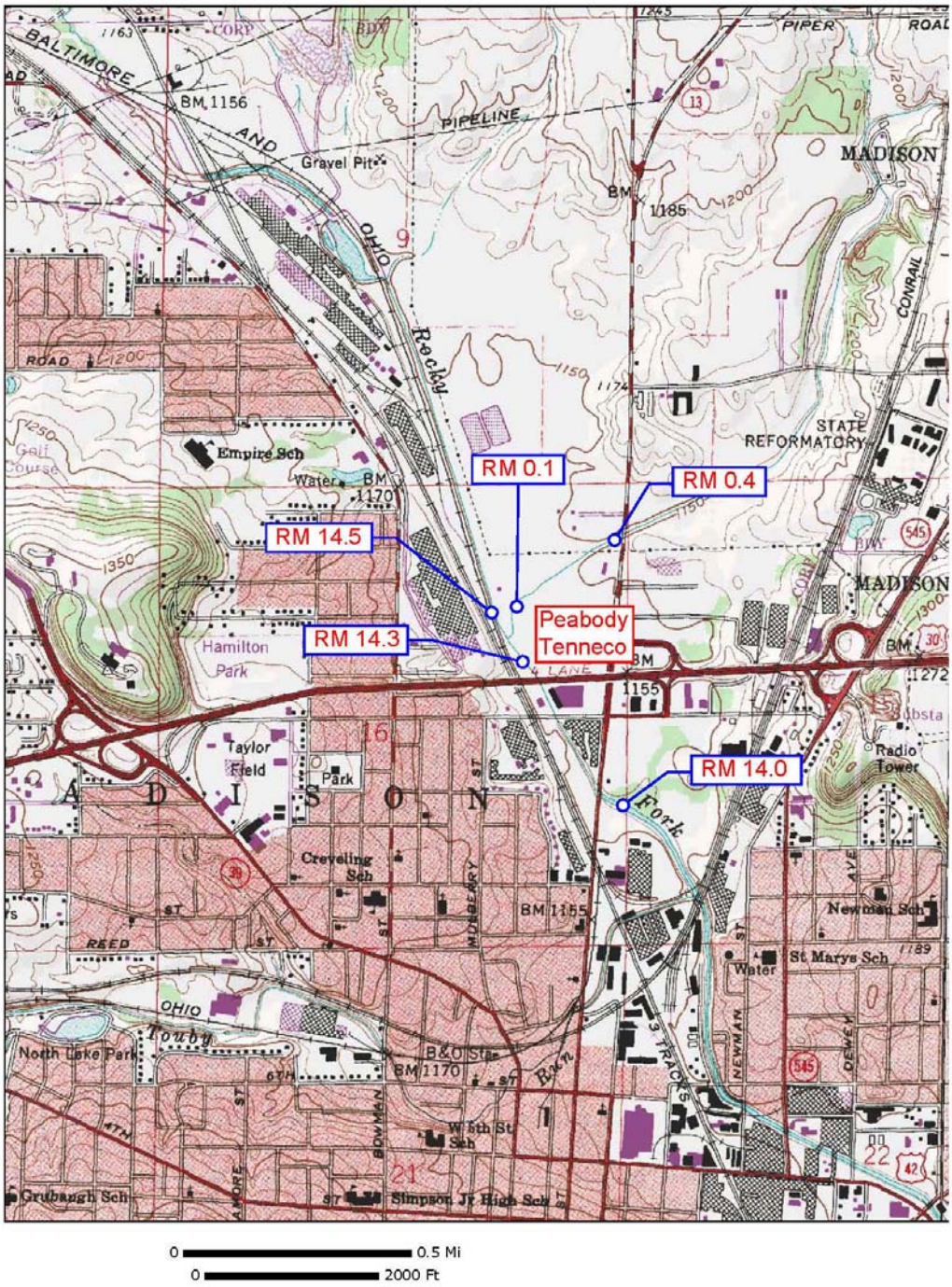
BIOCRITERIA		
INDEX - Site Type	MWH	WWH
IBI: Headwater	24	40
ICI	22	34

* Significant departure from ecoregion biocriterion; poor and very poor results are underlined.
ns Nonsignificant departure from biocriterion (≤4 IBI or ICI units).
a The narrative evaluation using the qualitative sample is based on best professional judgement utilizing sample attributes such as taxa richness, EPT taxa richness, and community composition and is used in lieu of the ICI when artificial substrates are lost or deemed not useable. MG = marginally good.

Table 2. Sampling locations in Rocky Fork Mohican River and unnamed tributary, 2009. Type of sampling included fish community (F), and macroinvertebrate community (M).

Stream/ River Mile	Type of Sampling	Latitude	Longitude	Landmark
Rocky Fork Mohican River				
14.5	F,M	40.7797	82.5186	Upstream Peabody Barnes/Unnamed Tributary
14.3	F,M	40.7781	82.5169	Adjacent Peabody Barnes property
14.0	F,M	40.7744	82.5144	Downstream Peabody Barnes @ Main Street
Unnamed Tributary				
0.4	F,M	40.7828	82.5136	Downstream State Route 13
0.1	F,M	40.7799	82.5181	Near mouth

Figure 1. Sampling locations in the Rocky Fork Mohican River and unnamed tributary, 2009.



METHODS

Biological field, data processing, and data analysis methods and procedures adhere to those specified in the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio Environmental Protection Agency 2006b), Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio Environmental Protection Agency 1987b, 1989a, 1989b, 2008a, 2008b), The Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Rankin 1989), and Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (Ohio EPA 2006a).

Determining Use Attainment

Use attainment status is a term describing the degree to which environmental indicators are either above or below criteria specified by the Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1). Assessing aquatic use attainment status involves a primary reliance on the Ohio EPA biological criteria (OAC 3745-1-07; Table 7-15). These are confined to ambient assessments and apply to rivers and streams outside of mixing zones. Numerical biological criteria are based on multimetric biological indices including the Index of Biotic Integrity (IBI) and modified Index of Well-Being (MIwb), indices measuring the response of the fish community, and the Invertebrate Community Index (ICI), which indicates the response of the macroinvertebrate community. Three attainment status results are possible at each sampling location - full, partial, or non-attainment. Full attainment means that all of the applicable indices meet the biocriteria. Partial attainment means that one or more of the applicable indices fails to meet the biocriteria. Non-attainment means that none of the applicable indices meet the biocriteria or one of the organism groups reflects poor or very poor performance. An aquatic life use attainment table (Table 1) is constructed based on the sampling results and is arranged from upstream to downstream and includes the sampling locations indicated by river mile, the applicable biological indices, the use attainment status (*i.e.,* full, partial, or non-attainment), the Qualitative Habitat Evaluation Index (QHEI), and a sampling location description. Biological results were compared to WWH biocriteria. Rocky Fork Mohican River is currently listed as a WWH stream in the Ohio Water Quality Standards. The unnamed tributary is not listed in the Ohio WQS.

Stream Habitat Evaluation

Physical habitat is evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Rankin 1989, 1995; Ohio EPA 2006a). Various attributes of the available habitat are scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Evaluations of type and quality of substrate, amount of instream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site. As such, individual sites may have much poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. QHEI scores from hundreds of segments around the state have indicated that values higher than 60 were generally conducive to the establishment of warmwater faunas while those which scored in excess of 75 often typify habitat conditions which have the ability to support exceptional faunas.

Macroinvertebrate Community Assessment

Macroinvertebrates were collected from artificial substrates and from the natural habitats at the Rocky Fork Mohican River sites. Only natural habitats were collected at the two sites in the unnamed tributary. The artificial substrate collection provided quantitative data and consisted of a composite sample of five modified Hester-Dendy multiple-plate samplers colonized for six weeks. At the time of the artificial substrate collection, a qualitative multihabitat composite sample was also collected. This sampling effort consisted of an inventory of all observed macroinvertebrate taxa from the natural habitats at each site with no attempt to quantify populations other than notations on the predominance of specific taxa or taxa groups within major macrohabitat types (*e.g.,* riffle, run, pool, margin). Detailed discussion of macroinvertebrate field and laboratory procedures is contained in Biological Criteria for the Protection of Aquatic Life: Volume III, Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (Ohio EPA 1989a, 2008b).

Fish Community Assessment

Fish were sampled twice at each Rocky Fork fish site and once at each unnamed tributary site using pulsed DC wading methods. Fish were processed in the field, and included identifying each individual to

species, counting all fish, and recording any external abnormalities. Discussion of the fish community assessment methodology used in this report is contained in Biological Criteria for the Protection of Aquatic Life: Volume III, Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (Ohio EPA 1989a, 2008b).

RESULTS

Stream Physical Habitat

Physical habitat was evaluated at each fish sampling location. Physical habitat was assessed using the Qualitative Habitat Evaluation Index (QHEI); scores are detailed in Table 3. The Rocky Fork Mohican River sampling sites and the upstream unnamed tributary site were in an area of past channel modification, with some recovery occurring. The two upstream background sites (Rocky Fork RM 14.5 and unnamed tributary RM 0.4) were rated as fair habitat quality, and the other three sites had good stream habitat.

Table 3. Qualitative Habitat Evaluation Index (QHEI) scores and physical attributes for fish sampling sites in Rocky Fork Mohican River, 2009.

River Mile	QHEI	Habitat Rating	WWH Attributes: 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**	MWH Attributes – *High Influence*: Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/ No Cover	Max. Depth <40 cm (WD,HW sites)	**Total High Influence Attributes**	*Moderate Influence*: 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**
Key QHEI Components																																	
Rocky Fork Mohican River Year: 2009																																	
14.5	**49.5**	Fair		■				■			■		3		◆	◆	◆		3	●	●			●				●	●	●		6	1.00	2.50
14.3	**62.5**	Good		■		■		■			■		4			◆			1	●	●			●				●	●	●		6	0.40	1.60
14.0	**55.0**	Good		■				■			■		3			◆	◆		2	●	●			●				●	●	●		6	0.75	2.25
Unnamed Tributary to Rocky Fork Year: 2009																																	
0.4	**51.0**	Fair		■		■		■			■		4			◆	◆		2	●	●			●				●	●	●		6	0.60	1.80
0.1	**69.5**	Good	■	■		■	■	■	■	■	■	■	9						0		●		●						●	●		4	0.10	0.50

Fish Community

A total of 5,407 fish representing 26 species were collected from the Rocky Fork Mohican River and unnamed tributary between July and September, 2009. Relative numbers and species collected per location are presented in Appendix Table 1 and IBI metrics are presented in Appendix Table 2. Sampling locations were evaluated using Warmwater Habitat biocriteria. Of the five fish sampling locations evaluated during this study, four were achieving the Warmwater Habitat fish biocriterion. The most downstream sampling site in the Rocky Fork Mohican River (RM 14.0) did not achieve the WWH biocriterion.

Table 4. Fish community summaries based on pulsed D.C. electrofishing sampling conducted by Ohio EPA in the Rocky Fork Mohican River and an unnamed tributary from July and September, 2009. Relative numbers are per 0.3 km. The applicable aquatic life use designation is WWH.

Stream River Mile	Sampling Method	Species (Mean)	Species (Total)	Relative Number	QHEI	Index of Biotic Integrity	Narrative Evaluation
Rocky Fork Mohican River							
14.5	Wading	17	22	935	49.5	38[ns]	Marginally Good
14.3	Wading	18	21	1401	62.5	38[ns]	Marginally Good
14.0	Wading	17	19	982	55.0	33*	Fair
Unnamed Tributary							
0.4	Wading	14	14	1362	51.0	40	Good
0.1	Wading	14	14	1602	69.5	48	Very Good

Ecoregion Biocriteria: Erie Ontario Lake Plain (EOLP)		
INDEX - Site Type	MWH[a]	WWH
IBI: Headwater	24	40

* Significant departure from ecoregion biocriterion; poor and very poor results are underlined.
[ns] Non-significant departure from ecoregion biocriterion (≤4 IBI units)..
[a] Biocriteria scores for channel modified sites.

Macroinvertebrate Community

The macroinvertebrate communities from the Rocky Fork Mohican River and an unnamed tributary were sampled in 2009 using quantitative (artificial substrate) and/or qualitative (natural substrate multi-habitat composite) sampling protocols. Results are summarized in Table 5. The ICI metrics with the associated scores, and the raw data are attached as Appendix Tables 3 and 4. Of the Rocky Fork Mohican River sampling locations, only the site adjacent to the Peabody Barnes property (RM 14.3) attained the WWH macroinvertebrate biocriterion. Results from the upstream (RM 14.5) and the downstream (RM 14.0) Rocky Fork Mohican River sampling locations did not attain the macroinvertebrate WWH biocriterion and appeared to be related to poor habitat conditions from excessive siltation embedding riffles. Macroinvertebrate communities at the unnamed tributary sampling locations both achieve the WWH use based on a narrative evaluation of qualitative sampling results.

Table 5. Summary of macroinvertebrate data collected from artificial substrates (quantitative sampling) and natural substrates (qualitative sampling) in the Rocky Fork Mohican River and unnamed tributary, 2009.

Stream/ River Mile	Density Number/ft^2	Total Taxa	Quantitative Taxa	Qualitative Taxa	Qualitative EPT[a]	ICI	Evaluation
Rocky Fork Mohican River							
14.5	222	48	31	33	7	26*	Fair
14.3	826	50	33	34	8	40	Good
14.0	302	50	28	32	8	20*	Fair
Unnamed Tributary							
0.4	-	44	-	44	7	-	Marginally Good
0.1	-	44	-	44	7	-	Marginally Good

Ecoregion Biocriteria: Erie Ontario Lake Plain (EOLP)		
INDEX	MWH	WWH
ICI	22	34

[a] EPT=total Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) taxa richness, a measure of pollution sensitive organisms.
* Significant departure from ecoregion biocriterion; poor and very poor results are underlined.
[ns] Nonsignificant departure from biocriterion (≤4 ICI units).

REFERENCES

Karr, J. R. 1991. Biological integrity: A long-neglected aspect of water resource management. Ecological Applications 1(1): 66-84.

Karr, J.R., K.D. Fausch, P.L. Angermier, P.R. Yant, and I.J. Schlosser. 1986. Assessing biological integrity in running waters: a method and its rationale. Ill. Nat. Hist. Surv. Spec. Publ. 5. 28 pp.

MacDonald, D., C. Ingersoll, T. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch. Environ. Contam. Toxical.: Vol.39, 20-31.

Miner R. and D. Borton. 1991. Considerations in the development and implementation of biocriteria, Water Quality Standards for the 21st Century, U.S. EPA, Offc. Science and Technology, Washington, D.C., 115 pp.

Ohio Environmental Protection Agency. 2008a. 2008 updates to Biological Criteria for the Protection of Aquatic Life: Volume II and Volume II Addendum. Users manual for biological field assessment of Ohio surface waters. Div. of Surface Water, Ecol. Assess. Sect., Columbus, Ohio.

Ohio Environmental Protection Agency. 2008b. 2008 updates to Biological Criteria for the Protection of Aquatic Life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Div. of Surface Water, Ecol. Assess. Sect., Columbus, Ohio.

Ohio Environmental Protection Agency. 2006a. Methods for assessing habitat in flowing waters: Using the Qualitative Habitat Evaluation Index (QHEI). Ohio EPA Tech. Bull. EAS/2006-06-1. Div. of Surface Water, Ecol. Assess. Sect., Columbus, Ohio.

Ohio Environmental Protection Agency. 2006b. Ohio EPA manual of surveillance methods and quality assurance practices, updated edition. Division of Environmental Services, Columbus, Ohio.

Ohio Environmental Protection Agency. 2003. Ecological risk assessment guidance manual. Feb. 2003. Division of Emergency and Remedial Response, Columbus, Ohio.

Ohio Environmental Protection Agency. 1989a. Addendum to Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Div. Water Qual. Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

Ohio Environmental Protection Agency. 1989b. Biological criteria for the protection of aquatic life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Div. Water Quality Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

Ohio Environmental Protection Agency. 1987a. Biological criteria for the protection of aquatic life: Volume I. The role of biological data in water quality assessment. Div. Water Qual. Monit. & Assess., Surface Water Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1987b. Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Div. Water Qual. Monit. & Assess., Surface Water Section, Columbus, Ohio.

Rankin, E. T. 1995. The use of habitat assessments in water resource management programs, pp. 181-208. in W. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making. Lewis Publishers, Boca Raton, FL.

Rankin, E.T. 1989. The qualitative habitat evaluation index (QHEI): rationale, methods, and application. Div. Water Qual. Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

Suter, G.W., II. 1993. A critique of ecosystem health concepts and indexes. Environmental Toxicology and Chemistry, 12: 1533-1539.

Yoder, C.O. 1995. Policy issues and management applications for biological criteria, pp. 327-344. in W. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making. Lewis Publishers, Boca Raton, FL.

Yoder, C. O. 1991**.** Answering some concerns about biological criteria based on experiences in Ohio, *in* G. H. Flock (ed.) Water quality standards for the 21st century. Proceedings of a National Conference, U. S. EPA, Office of Water, Washington, D.C.

Yoder, C.O. 1989. The development and use of biological criteria for Ohio surface waters. U.S. EPA, Criteria and Standards Div., Water Quality Stds. 21st Century, 1989: 139-146.

Yoder, C.O. and E.T. Rankin. 1995. The role of biological criteria in water quality monitoring, assessment, and regulation. Environmental Regulation in Ohio: How to Cope With the Regulatory Jungle. Inst. of Business Law, Santa Monica, CA. 54 pp.

APPENDICES – ROCKY FORK MOHICAN RIVER AND UNNAMED TRIBUTARY, 2009

Appendix Table 1. Index of Biotic Integrity (IBI) scores and metrics for samples collected from the Rocky Fork Mohican River and unnamed tributary, 2009.

River Mile	Type	Date	Drainage area (sq mi)	Number of: Total species	Minnow species	Headwater species	Sensitive species	Darter & Sculpin species	Simple Lithophils	Percent of Individuals: Tolerant fishes	Omni-vores	Pioneering fishes	Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(0.3km)	IBI
Rocky Fork Mohican R - (17-733)																
Year: 2009																
14.50	D	07/28/2009	15.3	17(5)	8(5)	3(3)	3(3)	2(1)	5(3)	52(3)	32(3)	44(3)	48(5)	0.0(5)	424(3)	42
14.50	D	09/11/2009	15.3	16(5)	7(5)	0(1)	4(3)	3(3)	5(3)	60(1)	46(1)	57(1)	38(3)	0.0(5)	392(3)	34
14.30	D	07/28/2009	19.3	16(3)	7(5)	2(3)	4(3)	3(3)	6(3)	53(1)	20(3)	39(3)	37(3)	0.0(5)	610(3)	38
14.30	D	09/11/2009	19.3	20(5)	9(5)	3(3)	4(3)	4(3)	6(3)	55(1)	37(1)	50(3)	32(3)	0.0(5)	675(3)	38
14.00	D	07/28/2009	19.6	15(3)	7(5)	2(3)	3(1)	2(1)	5(3)	65(1)	46(1)	59(1)	30(3)	0.0(5)	422(3)	30
14.00	D	09/11/2009	19.6	17(5)	8(5)	1(1)	4(3)	3(3)	6(3)	56(1)	37(1)	52(3)	45(3)	0.0(5)	330(3)	36
Rocky Fk trib 14.43 - (17-765)																
Year: 2009																
0.40	E	09/10/2009	3.3	14(5)	7(5)	3(3)	1(1)	3(5)	4(3)	59(1)	31(1)	52(3)	21(3)	0.0(5)	556(5)	40
0.10	E	09/10/2009	3.4	14(5)	8(5)	4(5)	2(3)	3(5)	5(5)	60(1)	14(3)	67(1)	33(5)	0.0(5)	642(5)	48

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

River Code: **17-733**	Stream: **Rocky Fork Mohican River**	Sample Date: **2009**
River Mile: **14.50**	Location: upst. Peabody Barnes property	Date Range: 07/28/2009
Time Fished: 4185 sec	Drainage: 15.3 sq mi	Thru: 09/11/2009
Dist Fished: 0.30 km	Basin: Muskingum River No of Passes: 2	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
Northern Hog Sucker	R	I	S	M	5	5.00	0.53			
White Sucker	W	O	S	T	111	111.00	11.87			
Common Carp	G	O	M	T	1	1.00	0.11			
Western Blacknose Dace	N	G	S	T	4	4.00	0.43			
Creek Chub	N	G	N	T	73	73.00	7.81			
Redside Dace	N	I	S	I	1	1.00	0.11			
Common Shiner	N	I	S		172	172.00	18.40			
Sand Shiner	N	I	M	M	43	43.00	4.60			
Silverjaw Minnow	N	I	M		16	16.00	1.71			
Fathead Minnow	N	O	C	T	5	5.00	0.53			
Bluntnose Minnow	N	O	C	T	255	255.00	27.27			
Central Stoneroller	N	H	N		75	75.00	8.02			
Black Bullhead		I	C	P	1	1.00	0.11			
Largemouth Bass	F	C	C		8	8.00	0.86			
Green Sunfish	S	I	C	T	78	78.00	8.34			
Bluegill Sunfish	S	I	C	P	3	3.00	0.32			
Orangespotted Sunfish	S	I	C		1	1.00	0.11			
Pumpkinseed Sunfish	S	I	C	P	2	2.00	0.21			
Green Sf X Bluegill Sf					1	1.00	0.11			
Johnny Darter	D	I	C		51	51.00	5.45			
Greenside Darter	D	I	S	M	25	25.00	2.67			
Banded Darter	D	I	S	I	1	1.00	0.11			
Brook Stickleback		I	C		3	3.00	0.32			
Mile Total					935	935.00				
Number of Species					22					
Number of Hybrids					1					

River Code: **17-733**	Stream: **Rocky Fork Mohican River**	Sample Date: **2009**
River Mile: **14.30**	Location: upst. Longview Ave. adj. Peabody Barnes	Date Range: 07/28/2009
Time Fished: 4512 sec	Drainage: 19.3 sq mi	Thru: 09/11/2009
Dist Fished: 0.36 km	Basin: Muskingum River No of Passes: 2	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
Northern Hog Sucker	R	I	S	M	3	2.50	0.18			
White Sucker	W	O	S	T	141	117.50	8.39			
Western Blacknose Dace	N	G	S	T	153	127.50	9.10			
Creek Chub	N	G	N	T	226	188.33	13.44			
Common Shiner	N	I	S		220	183.33	13.09			
Spotfin Shiner	N	I	M		1	0.83	0.06			
Sand Shiner	N	I	M	M	43	35.83	2.56			
Silverjaw Minnow	N	I	M		18	15.00	1.07			
Fathead Minnow	N	O	C	T	4	3.33	0.24			
Bluntnose Minnow	N	O	C	T	349	290.83	20.76			
Central Stoneroller	N	H	N		220	183.33	13.09			
Creek Chub X Redside Dace		I			1	0.83	0.06			
Yellow Bullhead		I	C	T	1	0.83	0.06			
Largemouth Bass	F	C	C		13	10.83	0.77			
Green Sunfish	S	I	C	T	36	30.00	2.14			
Bluegill Sunfish	S	I	C	P	1	0.83	0.06			
Pumpkinseed Sunfish	S	I	C	P	1	0.83	0.06			
Johnny Darter	D	I	C		117	97.50	6.96			
Greenside Darter	D	I	S	M	110	91.67	6.54			
Banded Darter	D	I	S	I	4	3.33	0.24			
Mottled Sculpin		I	C		2	1.67	0.12			
Brook Stickleback		I	C		17	14.17	1.01			
Mile Total					1,681	1,400.83				
Number of Species					21					
Number of Hybrids					1					

River Code: **17-733**	Stream: **Rocky Fork Mohican River**	Sample Date: **2009**
River Mile: **14.00**	Location: Main St. (St. Rt. 13)	Date Range: 07/28/2009
Time Fished: 3805 sec	Drainage: 19.6 sq mi	Thru: 09/11/2009
Dist Fished: 0.40 km	Basin: Muskingum River No of Passes: 2	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
Northern Hog Sucker	R	I	S	M	8	6.00	0.61			
White Sucker	W	O	S	T	165	123.75	12.61			
Common Carp	G	O	M	T	6	4.50	0.46			
Western Blacknose Dace	N	G	S	T	28	21.00	2.14			
Creek Chub	N	G	N	T	172	129.00	13.14			
Common Shiner	N	I	S		169	126.75	12.91			
Spotfin Shiner	N	I	M		1	0.75	0.08			
Sand Shiner	N	I	M	M	44	33.00	3.36			
Silverjaw Minnow	N	I	M		27	20.25	2.06			
Bluntnose Minnow	N	O	C	T	388	291.00	29.64			
Central Stoneroller	N	H	N		70	52.50	5.35			
Largemouth Bass	F	C	C		12	9.00	0.92			
Green Sunfish	S	I	C	T	49	36.75	3.74			
Bluegill Sunfish	S	I	C	P	1	0.75	0.08			
Pumpkinseed Sunfish	S	I	C	P	16	12.00	1.22			
Green Sf X Bluegill Sf					2	1.50	0.15			
Johnny Darter	D	I	C		99	74.25	7.56			
Greenside Darter	D	I	S	M	35	26.25	2.67			
Rainbow Darter	D	I	S	M	1	0.75	0.08			
Brook Stickleback		I	C		16	12.00	1.22			
Mile Total					1,309	981.75				
Number of Species					19					
Number of Hybrids					1					

River Code: **17-765**	Stream: **Trib. to Rocky Fork Mohican R (RM 14.43)**	Sample Date: **2009**
River Mile: **0.40**	Location: dst. St. Rt. 13, upst. Peabody Barnes	Date Range: 09/10/2009
Time Fished: 2754 sec	Drainage: 3.3 sq mi	
Dist Fished: 0.15 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
White Sucker	W	O	S	T	111	222.00	16.30			
Western Blacknose Dace	N	G	S	T	44	88.00	6.46			
Creek Chub	N	G	N	T	143	286.00	21.00			
Common Shiner	N	I	S		18	36.00	2.64			
Spotfin Shiner	N	I	M		1	2.00	0.15			
Silverjaw Minnow	N	I	M		27	54.00	3.96			
Bluntnose Minnow	N	O	C	T	101	202.00	14.83			
Central Stoneroller	N	H	N		140	280.00	20.56			
Largemouth Bass	F	C	C		2	4.00	0.29			
Green Sunfish	S	I	C	T	4	8.00	0.59			
Johnny Darter	D	I	C		80	160.00	11.75			
Greenside Darter	D	I	S	M	5	10.00	0.73			
Mottled Sculpin		I	C		1	2.00	0.15			
Brook Stickleback		I	C		4	8.00	0.59			
Mile Total					681	1,362.00				
Number of Species					14					
Number of Hybrids					0					

River Code: **17-765**	Stream: **Trib. to Rocky Fork Mohican R (RM 14.43)**	Sample Date: **2009**
River Mile: **0.10**	Location: at mouth, adj. Peabody Barnes	Date Range: 09/10/2009
Time Fished: 2594 sec	Drainage: 3.4 sq mi	
Dist Fished: 0.15 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
White Sucker	W	O	S	T	42	84.00	5.24			
Western Blacknose Dace	N	G	S	T	93	186.00	11.61			
Creek Chub	N	G	N	T	265	530.00	33.08			
Redside Dace	N	I	S	I	5	10.00	0.62			
Common Shiner	N	I	S		34	68.00	4.24			
Spotfin Shiner	N	I	M		1	2.00	0.12			
Silverjaw Minnow	N	I	M		28	56.00	3.50			
Bluntnose Minnow	N	O	C	T	69	138.00	8.61			
Central Stoneroller	N	H	N		68	136.00	8.49			
Green Sunfish	S	I	C	T	11	22.00	1.37			
Johnny Darter	D	I	C		165	330.00	20.60			
Greenside Darter	D	I	S	M	13	26.00	1.62			
Mottled Sculpin		I	C		1	2.00	0.12			
Brook Stickleback		I	C		6	12.00	0.75			
Mile Total					801	1,602.00				
Number of Species					14					
Number of Hybrids					0					

Appendix Table 3. Invertebrate Community Index (ICI) scores and metrics for samples collected from the Rocky Fork Mohican River, 2009.

River Mile	Drainage Area (sq mi)	Number of				Percent:					Qual. EPT	Eco-region	ICI
		Total Taxa	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Mayflies	Caddis-flies	Tany-tarsini	Other Dipt/NI	Tolerant Organisms			
Rocky Fork Mohican River (17-733)													
Year: 2009													
14.50	15.9	31(4)	1(0)	3(6)	20(6)	0.1(2)	2.6(4)	1.8(2)	95.1(0)	53.5(0)	7(2)	3	26
14.30	19.3	33(4)	4(2)	4(6)	20(6)	14.0(4)	50.9(6)	1.6(2)	32.9(4)	16.4(2)	8(4)	3	40
14.00	19.6	28(4)	2(0)	1(2)	19(4)	0.3(2)	0.3(2)	6.3(2)	93.0(0)	52.8(0)	8(4)	3	20

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Rocky Fork Mohican River
upst. Peabody Barnes property

Collection Date: 09/04/2009 River Code: 17-733 RM: 14.50

Taxa Code	Taxa	Quant/Qual
01320	*Hydra sp*	1
01801	*Turbellaria*	+
03600	*Oligochaeta*	155 +
06700	*Crangonyx sp*	1 +
08200	*Orconectes sp*	+
08601	*Hydrachnidia*	+
11200	*Callibaetis sp*	+
11250	*Centroptilum sp (w/o hindwing pads)*	+
13400	*Stenacron sp*	1 +
13521	*Stenonema femoratum*	+
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	4 +
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
52200	*Cheumatopsyche sp*	13 +
52430	*Ceratopsyche morosa group*	14 +
52530	*Hydropsyche depravata group*	2 +
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
71900	*Tipula sp*	+
74501	*Ceratopogonidae*	16
77115	*Ablabesmyia janta*	10
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	85 +
77750	*Hayesomyia senata or Thienemannimyia norena*	47
77800	*Helopelopia sp*	19
78140	*Labrundinia pilosella*	+
78350	*Meropelopia sp*	9
78450	*Nilotanypus fimbriatus*	+
78655	*Procladius (Holotanypus) sp*	10
80410	*Cricotopus (C.) sp*	38
80420	*Cricotopus (C.) bicinctus*	9
80430	*Cricotopus (C.) tremulus group*	47
81200	*Nanocladius sp*	19
81825	*Rheocricotopus (Psilocricotopus) robacki*	+
82300	*Xylotopus par*	+
83040	*Dicrotendipes neomodestus*	28
84315	*Phaenopsectra flavipes*	10 +
84460	*Polypedilum (P.) fallax group*	228 +
84470	*Polypedilum (P.) illinoense*	28 +
84540	*Polypedilum (Tripodura) scalaenum group*	85 +
84790	*Tribelos fuscicorne*	19 +
85500	*Paratanytarsus sp*	10
85821	*Tanytarsus glabrescens group sp 7*	10
87540	*Hemerodromia sp*	16 +
95100	*Physella sp*	15 +
96900	*Ferrissia sp*	159 +
98200	*Pisidium sp*	2

No. Quantitative Taxa: 31 Total Taxa: 48
No. Qualitative Taxa: 33 ICI: **26**
Number of Organisms: 1110 Qual EPT: 7

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Rocky Fork Mohican River
upst. Longview Ave. adj. Peabody Barnes

Collection Date: 09/04/2009 River Code: 17-733 RM: 14.30

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	1 +
03600	*Oligochaeta*	33 +
05900	*Lirceus sp*	+
06201	*Hyalella azteca*	+
06700	*Crangonyx sp*	+
08200	*Orconectes sp*	+
11120	*Baetis flavistriga*	409 +
11130	*Baetis intercalaris*	165 +
11200	*Callibaetis sp*	+
13400	*Stenacron sp*	1 +
13521	*Stenonema femoratum*	4 +
21200	*Calopteryx sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
52200	*Cheumatopsyche sp*	524 +
52430	*Ceratopsyche morosa group*	953 +
52530	*Hydropsyche depravata group*	620 +
53800	*Hydroptila sp*	4
63300	*Hydroporini*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	27 +
70600	*Antocha sp*	4
74100	*Simulium sp*	3
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	81
77750	*Hayesomyia senata or Thienemannimyia norena*	8 +
77800	*Helopelopia sp*	41 +
78450	*Nilotanypus fimbriatus*	81
80410	*Cricotopus (C.) sp*	73
80420	*Cricotopus (C.) bicinctus*	73 +
80430	*Cricotopus (C.) tremulus group*	49
81650	*Parametriocnemus sp*	49 +
81825	*Rheocricotopus (Psilocricotopus) robacki*	170 +
82200	*Tvetenia bavarica group*	16
82300	*Xylotopus par*	+
82730	*Chironomus (C.) decorus group*	+
82820	*Cryptochironomus sp*	+
83040	*Dicrotendipes neomodestus*	8
84300	*Phaenopsectra obediens group*	+
84460	*Polypedilum (P.) fallax group*	138
84470	*Polypedilum (P.) illinoense*	16 +
84540	*Polypedilum (Tripodura) scalaenum group*	73 +
84790	*Tribelos fuscicorne*	+
85500	*Paratanytarsus sp*	8
85800	*Tanytarsus sp*	16
85821	*Tanytarsus glabrescens group sp 7*	41
87540	*Hemerodromia sp*	9
93900	*Elimia sp*	16
95100	*Physella sp*	+
96900	*Ferrissia sp*	417

No. Quantitative Taxa: 33 Total Taxa: 50
No. Qualitative Taxa: 34 ICI: **40**
Number of Organisms: 4131 Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Rocky Fork Mohican River
Main St. (St. Rt. 13)

Collection Date: 09/04/2009 River Code: 17-733 RM: 14.00

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	1
03360	*Plumatella sp*	+
03600	*Oligochaeta*	174 +
06201	*Hyalella azteca*	1
08200	*Orconectes sp*	+
08601	*Hydrachnidia*	+
11120	*Baetis flavistriga*	3 +
11130	*Baetis intercalaris*	+
11200	*Callibaetis sp*	+
13400	*Stenacron sp*	+
13521	*Stenonema femoratum*	2 +
22001	*Coenagrionidae*	+
22300	*Argia sp*	2
23600	*Aeshna sp*	+
23909	*Boyeria vinosa*	+
42700	*Belostoma sp*	+
52200	*Cheumatopsyche sp*	4 +
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
65800	*Berosus sp*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
74501	*Ceratopogonidae*	8
77115	*Ablabesmyia janta*	36
77750	*Hayesomyia senata or Thienemannimyia norena*	12
77800	*Helopelopia sp*	143 +
78140	*Labrundinia pilosella*	36
78655	*Procladius (Holotanypus) sp*	+
80204	*Brillia flavifrons group*	12
80370	*Corynoneura lobata*	4
80410	*Cricotopus (C.) sp*	24
80420	*Cricotopus (C.) bicinctus*	12
80430	*Cricotopus (C.) tremulus group*	12
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	12
81530	*Orthocladius (Symposiocladius) lignicola*	12
82700	*Chironomus sp*	+
82820	*Cryptochironomus sp*	+
82880	*Cryptotendipes sp*	+
83040	*Dicrotendipes neomodestus*	178
84300	*Phaenopsectra obediens group*	+
84315	*Phaenopsectra flavipes*	+
84460	*Polypedilum (P.) fallax group*	178
84470	*Polypedilum (P.) illinoense*	36 +
84540	*Polypedilum (Tripodura) scalaenum group*	107 +
84790	*Tribelos fuscicorne*	+
85500	*Paratanytarsus sp*	71
85800	*Tanytarsus sp*	24 +
87540	*Hemerodromia sp*	8
95100	*Physella sp*	92 +
96900	*Ferrissia sp*	306 +

No. Quantitative Taxa: 28 Total Taxa: 50
No. Qualitative Taxa: 32 ICI: **20**
Number of Organisms: 1510 Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Site: Trib. to Rocky Fork Mohican R (RM
dst. St. Rt. 13, upst. Peabody Barnes

Collection Date: 07/24/2009 River Code: 17-765 RM: 0.40

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
04935	*Erpobdella punctata punctata*	+
06700	*Crangonyx sp*	+
08200	*Orconectes sp*	+
08601	*Hydrachnidia*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11200	*Callibaetis sp*	+
17200	*Caenis sp*	+
22001	*Coenagrionidae*	+
45300	*Sigara sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
60900	*Peltodytes sp*	+
62800	*Dytiscus sp*	+
65800	*Berosus sp*	+
68708	*Dubiraphia vittata group*	+
69400	*Stenelmis sp*	+
71900	*Tipula sp*	+
72340	*Dixella sp*	+
72700	*Anopheles sp*	+
74100	*Simulium sp*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
78140	*Labrundinia pilosella*	+
78655	*Procladius (Holotanypus) sp*	+
79020	*Tanypus neopunctipennis*	+
80204	*Brillia flavifrons group*	+
80420	*Cricotopus (C.) bicinctus*	+
82700	*Chironomus sp*	+
82820	*Cryptochironomus sp*	+
83003	*Dicrotendipes fumidus*	+
83840	*Microtendipes pedellus group*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84300	*Phaenopsectra obediens group*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
85500	*Paratanytarsus sp*	+
85800	*Tanytarsus sp*	+
89700	*Limnophora sp*	+
95100	*Physella sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0
No. Qualitative Taxa: 44
Number of Organisms: 0

Total Taxa: 44
ICI:
Qual EPT: 7

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 07/24/2009 River Code: 17-765 RM: 0.10

Site: Trib. to Rocky Fork Mohican R (RM at mouth, adj. Peabody Barnes

Taxa Code	Taxa	Quant/Qual
01801	*Turbellaria*	+
03600	*Oligochaeta*	+
08200	*Orconectes sp*	+
11120	*Baetis flavistriga*	+
11130	*Baetis intercalaris*	+
11200	*Callibaetis sp*	+
17200	*Caenis sp*	+
21200	*Calopteryx sp*	+
21300	*Hetaerina sp*	+
22001	*Coenagrionidae*	+
22300	*Argia sp*	+
23909	*Boyeria vinosa*	+
44501	*Corixidae*	+
45900	*Notonecta sp*	+
52200	*Cheumatopsyche sp*	+
52430	*Ceratopsyche morosa group*	+
52530	*Hydropsyche depravata group*	+
63300	*Hydroporini*	+
64400	*Oreodytes sp*	+
65800	*Berosus sp*	+
68130	*Helichus sp*	+
68700	*Dubiraphia sp*	+
69225	*Optioservus fastiditus*	+
69400	*Stenelmis sp*	+
70501	*Tipulidae*	+
77120	*Ablabesmyia mallochi*	+
77500	*Conchapelopia sp*	+
77800	*Helopelopia sp*	+
78140	*Labrundinia pilosella*	+
78500	*Paramerina fragilis*	+
81650	*Parametriocnemus sp*	+
81825	*Rheocricotopus (Psilocricotopus) robacki*	+
82300	*Xylotopus par*	+
82820	*Cryptochironomus sp*	+
83820	*Microtendipes "caelum" (sensu Simpson & Bode, 1980)*	+
84210	*Paratendipes albimanus or P. duplicatus*	+
84315	*Phaenopsectra flavipes*	+
84540	*Polypedilum (Tripodura) scalaenum group*	+
84750	*Stictochironomus sp*	+
85500	*Paratanytarsus sp*	+
85800	*Tanytarsus sp*	+
85821	*Tanytarsus glabrescens group sp 7*	+
95100	*Physella sp*	+
96900	*Ferrissia sp*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 0
No. Qualitative Taxa: 44
Number of Organisms: 0

Total Taxa: 44
ICI:
Qual EPT: 7